

DOCUMENT RESUME

PD 205 067

HE 014 050

AUTHOR Collier, Douglas J., Ed.
 TITLE Innovations in Higher Education Management: Coping with the 80s. Contributed Papers for an NCHEMS Competition on State and Institutional Financing.
 INSTITUTION National Center for Higher Education Management Systems, Boulder, Colo.
 PUB DATE 80
 NOTE 232p.
 AVAILABLE FROM National Center for Higher Education Management Systems, P.O. Drawer P, Boulder, CO 80302.
 EDRS PRICE MF01/PC10 Plus Postage.
 DESCRIPTORS Budgeting; Case Studies; *College Administration; *College Faculty; *College Planning; Competition; Cost Indexes; Decision Making; Declining Enrollment; Educational Finance; Employment Practices; Facility Inventory; Federal Regulation; Financial Problems; Government School Relationship; Higher Education; Information Systems; Peer Groups; Personnel Policy; Program Costs; Program Evaluation; Public Policy; Research Projects; *Retrenchment; School Closing; Staff Utilization; State Universities; *Statewide Planning; Teacher Employment; Tuition
 IDENTIFIERS California; Minnesota; Program Review; State University of New York Coll at Plattsburgh

ABSTRACT

Papers concerning higher education planning and management in the 1980s that were contributed to the National Center for Higher Education Management Systems competition for the Planning and Financing Program are presented. The papers, submitted by administrators, researchers, and a student, are as follows: "Faculty Reallocation: Plattsburgh State as a Case Study," (Joseph C. Burke); "Managerial Styles in University Budget Planning" (Timothy J. Delmont); "The Utilization and Financial Characteristics of Tax-Exempt Auxiliary Corporations Affiliated with the Major Public Universities in the United States" (Robert W. Gaily); "An Identification of College and University Peer Groups" (Paul E. Vindgenfelter and James E. Bisass); "Evaluating College Campus Closings for the 1980s: A Case Application of an Optimization Model" (Stephen A. Hoenack and Janet K. Roemer); "Fear and Loathing Over Competition in Postsecondary Education" (L. P. Jones); "The Impact of Circular A-21 on Property Control Systems of the One Hundred Institutions Leading in Federal Sponsored Research" (Meredith Snapp and John D. Porter); "Information Systems for State-Level Decisions and the Budget" (Fred Thompson); "Indexing Tuition to Cost of Education: Implications for State Policy" (Dennis W. Viehland, Norman S. Kaufman, and Barbara M. Krauth); and "Program Review and the Enrollment Crisis" (Kenneth C. Green). (SW)

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Innovations in Higher Education Management: Coping with the 80s

Contributed papers for an NCHEMS Competition
on state and institutional financing

Edited by Douglas J. Collier

1980

National Center for Higher Education Management Systems
P.O. Drawer P/Boulder, Colorado
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AE 0/4052

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Preface

A great deal has been written about what the decade of the 1980s portends for higher education. Most of these scenarios reflect the extension of events that began to take place in the late 1970s. Almost every projection for the 80s incorporates the effects of the decline in the pool of traditional-age college going students. Such an enrollment projection suggests that many colleges and universities will be forced to cut back on the size and scope of the program offerings they currently offer with all of the attendant pain and dislocation brought on by such cut-backs. Most scenarios also suggest that the future will see increased competition among institutions as they scramble to increase their piece of a dwindling pie in order to simply maintain enrollment levels.

While many of the predictions for higher education in the 1980s seem foreboding, administrators and researchers have already begun to address the future by developing innovative planning and management approaches. They have begun exploring new methods for attracting students and for making their educational "product" more valuable and more attractive. They have begun to study ways of retrenching that will result in both a smaller institutional size and higher quality educational programs. They have even started thinking about competition and what it implies for colleges and universities.

The purpose of this document is to serve as a forum through which administrators and researchers can describe some of their ideas for dealing with the 1980s in hopes that others might benefit from their ideas. The document itself is a compilation of papers that were submitted to the NCH/MS Planning and Financing Program in response to a competition sponsored by the Program. The purpose of the competition was to identify ideas relevant to higher-education planning and management in the 80s. The competition solicited the ideas of practicing administrators, researchers, and students and this document represents the best of the papers that were submitted.

Glancing at the table of contents will show the reader the wide range of topics covered by the papers in this document.

The first paper "Faculty Reallocation: Plattsburgh State as a Case Study," by Joseph C. Burke, describes how one college president attempted to deal with the problem of faculty reallocation, a problem brought on by changing patterns of student demand and a series of state-imposed mandates to retrench. The case study focuses on the political ramifications of trying to make faculty reallocation decisions a "rational" decisionmaking process. The president attempted a variety of strategies for reallocating faculty positions among programs and finally found himself with the development of a series of 5-year staff plans for the college. His discussion of the trials of rational decisionmaking in a political environment

is both significant and relevant for those who might find themselves faced with a similar dilemma.

The second paper, "Managerial Styles in University Budget Planning," by Timothy J. Delmont, examines the extent to which universities utilized an "open budgeting style." Delmont defines an open style as characterized by an openness in communication, the degree to which technical analysis is used, and the degree to which the decisionmaking process is participative. He contends that as the need to retrench becomes more and more imperative, use of an open budgeting style may become a necessity in order to resolve difficult resource priority questions.

"The Utilization and Financial Characteristics of Tax-Exempt Auxiliary Corporations Affiliated with the Major Public Universities in the United States," by Robert W. Gaily, examines the use of tax-exempt auxiliary corporations by universities. In particular, he explores the degree to which such corporations might be used to give public institutions some degree of management flexibility outside the bureaucratic control of state governing bodies. He examines the strengths and weaknesses of auxiliary corporations from both the internal perspective (e.g., impact on the overall management of the institution) and the external perspective (e.g., competition with other units within the institutions for fund-raising).

The final paper written by practitioners "An Identification of College and University Peer Groups," by Paul E. Lingenfelter and James E. Elsass, is a study in which they describe an empirically based method for identifying college and university peer groups. Their study shows how peer groups can be created using a set of quantitative criteria. This type of an approach to peer group identification will undoubtedly become increasingly important as the use of peer groups in decisionmaking becomes more prevalent and as the impact of the decisions they support becomes more critical.

A second category of competition was sponsored for researchers in higher-education administration.

The first paper in this category "Evaluating College Campus Closings for the 1980s: A Case Application of an Optimization Model," by Stephen A. Hoenack and Janet K. Roemer, describes a model for evaluating campus closings. The model they outline is designed to help state-level planners decide which campuses to close down using information about size, quality, costs, and estimated enrollment demand.

The second paper in the research category "Fear and Loathing Over Competition in Postsecondary Education," by L. R. Jones, discusses the possible implications of competition on public higher-education institutions. In particular he examines how competition might affect the potential for governments to intervene in higher education through regulation (in particular their tendency to try to regulate market entry, prices, and program quality

and to require comprehensive planning as a response to the existence of competition).

"The Impact of Circular A-21 on Property Control Systems of the One Hundred Institutions Leading in Federal Sponsored Research," by Meredith Snapp and John D. Porter, is a discussion of the impact of Circular A-21 on the property control systems of the major research universities. In the first part of the paper they recommend enhancements to an institution's property accounts system that will allow them to claim a significantly larger amount of indirect costs immediately. Then they describe the results of a survey they conducted to determine the degree to which institutions take advantage of such cost recovery provisions within Circular A-21.

"Information Systems for State-Level Decisions and the Budget," by Fred Thompson, explores a number of ideas related to the type of information needed to support the management of institutions. In particular, he discusses the problems California's Data System of Instructional Resources (DSIR) had in providing the information needed to plan and manage in a competitive, student demand-oriented environment. In the process of examining the information implications of such an environment, Thompson explores a variety of ideas related to budget decisionmaking, competition in higher education, and state funding of higher education.

The final researcher paper "Indexing Tuition to Cost of Education: Implications for State Policy," by Dennis W. Viehland, Norman S. Kaufman, and Barbara M. Krauth, examines the factors that must be considered when developing a state-level tuition policy based upon the cost of education. A survey they conducted revealed that 14 states currently index tuition to the cost of education. However the principal focus of the paper is a discussion of the pros and cons of indexing tuition to the cost of education and a consideration of its implications for equity, access, state budgeting practices, institutional autonomy, and cost containment.

One last category of competition was designed to solicit papers from students:

"Program Review and the Enrollment Crisis," by Kenneth C. Green, reflects on the program review process and its changed role given the climate of declining enrollments. This paper was selected for inclusion in this document.

This compilation of papers is presented to the reader in hopes of stimulating new responses to the changes of the 1980s. The Planning and Financing Program at NCHEMS is dedicated to the development of innovative ideas that help practicing administrators more effectively plan and budget. Given the inevitability of dramatic changes in the 1980s, effective planning and budgeting will be no simple task. It is our hope that this document might aid higher-education administrators in that task.

Douglas J. Collier
Director, Planning and
Financing Program

Acknowledgments

The editor would like to acknowledge the work of each of the contributing authors who made this publication possible. It is hoped that their efforts will be rewarded by the knowledge that others will benefit by learning from their ideas:

It is also essential to thank Jack Bartram of the University of Colorado; Robert Carr of the Council of State College and University Presidents in Olympia, Washington; and Richard Allen of NCHEMS for their considerable efforts in reviewing and judging each of the papers submitted for the Planning and Financing Program's paper competition. The results of their efforts are the group of papers presented in this document.

Finally, I would like to acknowledge the efforts and support of Eileen Western who managed the compilation and production of this document. Her work was both significant and appreciated.

PRACTITIONER PAPERS

Faculty Reallocation: The Product,
The Process, and The Politics

by:

Joseph C. Burke
President
State University of New York, Plattsburgh

October 1980

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Faculty Reallocation: The Product, The Process, and The Politics

The end to growth in enrollments and resources in the Eighties will force colleges and universities to devise acceptable plans for reallocating faculty positions among academic departments. Though the growth will be gone, the habit of having its benefits will linger on with faculty, students, and society, for their aspirations and expectations have never been chained to budgetary exigencies. Students and society will continue to demand the rapid staffing of new and developing programs to satisfy their changing wants. Faculty in established fields with falling enrollments will resist programmatic shifts that can only be staffed at their expense. The end to growth will provoke a crisis in campus governance and produce a challenge for campus leaders. College and university administrators must develop reallocation plans that can meet the changing needs of students and society and can win the acceptance, or at least the acquiescence, of current faculty. The College at Plattsburgh struggled to cope with this dilemma during my first six years as President from 1974 to 1980. Perhaps our experiences with reallocation might prove useful to other institutions as they face this problem in the Eighties.

Growth in the mid Sixties and early Seventies had transformed Plattsburgh State from a small, single purpose, teacher training, institution into a comprehensive university college of five thousand students. The transformation was painless as well as dramatic. Reallocation was never mentioned, much less used. Enrollment growth produced the faculty positions required for new and expanding programs. As late as 1970, a State Master Plan had scheduled a doubling of the student body by 1980. No one disputed the inevitability of this enrollment growth or doubted that it would bring a flood of new faculty positions in its wake.

The fiscal crisis of New York State and a large drop in enrollment in the mid Seventies exploded these assumptions, but the sudden turn of events left intact the expectations of faculty and students. Though the enrollment decline proved a temporary phenomena, budget cuts became an annual problem. Enrollment grew by seventeen percent from 1974 to 1977; but the College lost over eleven percent of its teaching and non-teaching staff and its funding increases averaged less than three percent a year.

The budget crunch came at the worst possible moment. Changes in the Campus Mission and in the career interests of students demanded the rapid staffing of new and developing programs in a period when the College had to slash its authorized personnel. These developments produced gross inequities in staffing among academic departments. For example, the number of majors in Elementary and Secondary Education plummeted from nearly forty percent of the campus total in 1970 to twelve percent in 1977. Meanwhile, majors in Accounting and Business, programs started in 1973, soared to thirteen percent by 1977; and those in Environmental Science, a degree begun in 1974, climbed to seven percent. Despite these shifts, Teacher Education had forty-three professors in 1974, while Accounting and Business combined had just four and Environmental Science, two.

Only the size of these programmatic changes makes them atypical. By the Fall of 1979, forty percent of our students majored in programs that had not existed eight years earlier.

My first speech to faculty in the Fall of 1974 declared that the "more" of the Sixties and early Seventies was over for Plattsburgh State and for most colleges and universities. It predicted that the second half of the Seventies would demand the creation of a dynamic college whose capacity to respond to the changing needs of students and society could not depend on growth. I insisted that our College could not remain dynamic without a rational system of reallocating faculty lines among academic departments. Such a system required the establishment of equitable student/faculty ratios for all departments based on disciplinary needs and the implementation of an annual reallocation process that permitted the transfer of faculty lines from underenrolled to overenrolled programs.

The administration pressed the case for reallocation by presenting to every faculty member a five-year analysis of enrollment and staffing patterns for all departments. We insisted that each department review the comparative data for all academic units in order to encourage an institutional, rather than a parochial, perspective. The statistics demonstrated that gross staffing inequities existed in a number of departments and indicated that many of the current student/faculty ratios owed more to historical accidents than to disciplinary needs. In a meeting with the Executive Committee of the Faculty Senate in the early Fall, I proposed that the Senate appoint a committee to recommend equitable staffing ratios for each department, which would serve as goals to be reached within three to five years. I also informed the Executive Committee of my intention of instituting an annual reallocation process that Spring. It would place all vacant faculty positions in a central pool, whether they arose from retirements, resignations, or the end of term contracts. Though the final decision on reallocation would rest with the Vice President for Academic Affairs and the President, I asked that the Senate authorize its Faculty Affairs Committee to participate through consultation in the decisionmaking process.

The plea for reallocation seemed rational, but it clashed with the political reality of the current composition of the faculty and its representative bodies. In effect, it asked the faculty and the Faculty Senate to accept and participate in a process that conflicted with the departmental interests of a majority of its professors. Between 1974 and 1980, reallocation took positions from fourteen comparatively large departments for transfer to only eight relatively small departments. In the Fall of 1974, professors from departments that eventually lost positions constituted 62% of the total faculty; those from units that gained, only 10%; and those from groups that remained stable, 28%. Between 1974 and 1980, Senators from departments that lost positions averaged 65% a year of the faculty representatives; those from units that gained, only 7.6%; and those from groups that remained the same, 21.4%. The crucial Standing Committees of the Senate had even fewer representatives from programs that benefited by reallocation. For example, in the entire six years, both the Executive and the Faculty Affairs Committees had not a single member from a department that gained positions. Given these statistics, the surprise is not that the Senate and its Committees at times resisted reallocations plans and attempted to restrict their scope, but that they participated at all in a process that clashed with their departmental interests and those of a majority of their constituents.

The issue of reallocation also divided the College administration. Plattsburgh, along with many colleges and universities, had attempted to cope with rampant growth in the Sixties and early Seventies by adopting a decentralized structure. It had five Faculties: Humanities, Social Sciences, Science and Mathematics, Professional Studies, and General and Continuing Education. The Faculties operated almost as autonomous schools. A majority of the Deans resisted the implementation of a College-wide reallocation system. The comparatively low student/faculty ratios in two of the Faculties made them definite candidates to lose positions; and those in a third marked it as a probably prospect. Though one Faculty had a few programs that would obviously add positions, it contained several large and powerful departments that might lose them. Its Dean, along with a majority of its faculty, remained at best ambivalent on reallocation. This decentralized academic organization hampered the central administration of the College in pressing for the implementation of a College-wide system of reallocation.

The announcement by the Governor in January of 1975 of a large budget cut and position reduction transformed the reallocation issue into an immediate crisis. The Executive Budget directed the elimination of at least nine faculty positions, along with large cuts in non-teaching personnel. If the Budget obviously presented a problem, it also afforded an opportunity. I obtained permission from the Central Administration of State University and the Governor's Division of the Budget to submit within one week an alternative plan for accomplishing the cuts specified in the Executive Budget. The proposal, which was accepted by University and State officials, substituted administrative positions for the mandated deletions in faculty lines. The Plan reduced the five Faculties to two, "Arts and Science" and "Professional and General Studies". The reorganization permitted the elimination of two Deans and two Associate Deans. The Plan also deleted the positions of three Assistants to the President, an Executive Secretary to the President, and an Assistant Vice President for Student Affairs. The crisis had the effect of reducing the unrealistic expectations of the faculty on future growth; and its solution demonstrated my determination to eliminate faculty lines only as a last resort. If the mandated cuts in faculty had been made, the prospects of implementing immediately a system of reallocation would have been dashed, or at least seriously diminished.

Though the Faculty Senate in February of 1975 voted to "strongly disapprove" the promulgation of a new academic organization without appropriate consultation, most faculty seemed pleased with the new structure and delighted that the budget crisis had been solved without eliminating teaching lines. Clearly, the Senate liked the product of the reorganization, but disapproved of the process. On the next vote at the same meeting, it authorized the Standing Committee on Faculty Affairs to consult with the President on faculty reallocations for the coming academic year.

In December of 1974, the Senate had considered my request for a committee to develop weighted student/faculty ratios for each department based on the needs of the discipline. It authorized the Executive Committee to appoint an ad hoc group not to determine equitable ratios but to "study the various implications of assigning different student/faculty ratios to different departments..., as

well as the presumptive grounds for differential ratios." It charged the Committee to complete its deliberations by the end of the second semester. Three of the five faculty members on the Ad Hoc Committee came from departments that were certain to lose positions under any rational staffing formulae. It was also chaired by an Assistant to the Dean of a Faculty that would undoubtedly suffer reductions.

The Committee struggled with its task for three months. It solicited written and oral presentations from all departments on the desirability and feasibility of developing weighted ratios and on the factors to be considered in determining them. Naturally, all departments stressed the ingredients unique to their disciplines and either justified their current ratios or argued for increased staff. The Committee presented a two-page "Preliminary Report" in late March of 1975 to meet the deadline set by the Senate. The report merely conceded that student/faculty ratios should vary among departments and listed, by way of example, some factors that obviously should influence staffing levels, such as mode of instruction, contact hours, class size and class level. Though the Senate Chair reappointed the same Committee for the following academic year, the group never completed its work. Frankly, the administration and the leaders of the Faculty Senate tacitly conceded that agreement on weighted ratios was unlikely and that even the prospect of developing them appeared too threatening to a majority of the faculty and their academic departments.

Weighted student/faculty ratios by discipline made educational, but not political, sense. By raising a general issue that touched every department, it spread anxiety across the Campus. The imagined losses of positions flowing from such ratios far exceeded the number of positions that were likely to be reallocated in practice. Though the failure to develop such ratios was predictable, the attempt constituted an essential step in the politics and the process of developing a system for reallocation. It prevented opponents from asserting that no reallocation should occur until the faculty could determine what constituted equitable ratios for each department.

The practical approach through the annual reallocation process proved more successful. It threatened directly each year only those departments with vacant positions in the pool. The first consultation with the Faculty Affairs Committee in early June 1975 followed an obvious pattern. Since this was the first effort at reallocation, the Committee, probably wisely, took a conservative approach. The reallocation pool held twenty-four positions, most of which arose from the end of term contracts. The Committee recommended the reallocation of only four lines, all of them generated by resignations and retirements. It claimed that the obvious staffing needs of growing programs could be diminished by avoiding course duplication with the more established departments and by utilizing the multidisciplinary talents of existing faculty to teach courses in the expanding fields. Unfortunately, the administration felt that the situation demanded the transfer that year of six positions, with the additional two lines coming from non-renewals. A better strategy for the first attempt at reallocation might have been to accept intact the recommendations from the Faculty Affairs Committee and to avoid initially the use of non-renewals.

Though the Faculty Affairs Committee had not recommended the reallocation of positions that involved non-renewals, it had accepted in principle that such positions became a part of the reallocation pool. Their inclusion in the pool, and use by the administration, produced a stormy reaction that threatened the entire process of reallocation when the Faculty returned for the Fall Semester in 1976. In the previous year, the Senate had charged the Faculty Affairs Committee to prepare "in consultation with the President 'A Policy on the Reallocation of Faculty Positions'." The policy recommended to the Senate in the Fall of 1976 declared:

A college in a prolonged period of steady-state resources and staff positions must be especially vigilant to maintain a posture of adaptability to changes in institutional academic requirements. As faculty positions became vacant through resignation, retirement, or at the end of a term contract, a decision must be made on where each vacant position can most effectively be used to fulfill the institution's academic needs. . . . While the final responsibility for these decisions rests with the college administration, it is imperative that faculty perspective on reallocation become an integral part of the decisionmaking process through interactive consultation.

The report also proposed that the Senate authorize the Faculty Affairs Committee to consult annually with the administration on reallocation.

The Committee had hoped to soften the impact of its acceptance of non-renewals for reallocation by suggesting that in such cases the administration should explore "ways to provide for the incumbent through the assignment of new responsibilities. . . ." This effort failed. The Faculty Union on Campus, a chapter of the statewide United University Professions, warned all faculty not to participate in a process that might result in a loss of jobs for their colleagues. The Senate obviously felt the influence of the Union position when it debated the Report of its Faculty Affairs Committee in October. After two hours of passionate argument, the Policy Statement passed only when the Chair of the Senate broke a deadlock by voting its favor. The Senate then rejected the recommendation from the Faculty Affairs Committee that it consult permanently with the administration in the reallocation process. Finally, after a number of members had left, the Senate by a close vote authorized the Faculty Affairs Committee to consult for that year only and to report on the results at the next session of the parent body. Clearly, the Senate had sent an unmistakable warning to its Faculty Affairs Committee.

The Committee got the message. In December, it surveyed the faculty on two questions:

- "1. Should the Faculty Affairs Committee (or any other committees of the Faculty Senate) make recommendations to the President on matters relating to the reallocation of teaching faculty positions. . . .?"
- "2. If the Faculty Affairs Committee does make recommendations to the President, would you prefer that it consider only the reallocation of vacant positions. . . and not. . . the reallocation of positions occupied by incumbents?"

The responses from 51% of the faculty demonstrated that the issue divided them no less than their Senate representatives. Fifty percent thought the Faculty Affairs Committee should make recommendations to the administration on reallocation; but 42% disagreed and 8% remained undecided. On the second question, 45% felt the Committee should not consider for reallocation positions occupied by incumbents at the end of their term contracts, yet 41% believed they should and 14% were uncertain. Faced with this division, the Committee went with the largest percentages. It decided to consult on positions generated by resignations and retirements, while refusing to consider those occupied by incumbents. It later agreed to deal with the latter, but only after the administration had vacated them by non-renewals. The pattern established in this first effort at reallocation was repeated in the following two years. The Senate annually authorized the Faculty Affairs Committee to consult for that year only; and the Committee consistently tried to restrict the number of lines transferred.

Despite these difficulties, the annual reallocation process between 1974 and 1977 took 23 faculty positions from departments with comparatively low student/faculty ratios. Unfortunately, budget reductions eliminated 9.5, leaving only 13.5 for reallocation.

<u>Positions Lost</u>		<u>Positions Gained</u>	
Education	6	Business	4.50
English	3	Environmental Science	3
Physical Education	2	Biology	1
Physics	2	Chemistry	1
International Studies	2	Computer Science	.50
Art	1	Geography	.50
Computer Science	1	Special Education	2
Home Economics	1	Comprehensive Educational Center	1
History	2		<u>13.50</u>
Nursing	1		
Foreign Languages	1		
Music	1		
	<u>23</u>		

Forty-eight percent came from resignations; 39% from non-renewals; and only 13% from retirements. Given the high percentage from non-renewal and the political power of the departments that lost positions, the question arises as to why the faculty allowed the process to continue for three years. Reallocation appeared to have few faculty advocates, for even professors from those programs gaining positions seemed reluctant to support publicly a system that adversely affected the departmental interests of many of their colleagues. On the other hand, the annual reallocation approach had the advantage of confining the inevitable protests to those few departments that lost lines in any given year. Undoubtedly, the administration's success in handling annual budget reductions with only the smallest cuts in teaching lines partially explains faculty acquiescence in reallocation. Finally, the data circulated each year comparing student/faculty ratios for all departments presented an irrefutable case for reallocation. Faculty could, and did, dispute the specifics of reallocation, but they could not deny its necessity.

By the Spring of 1977, it became clear that three years of reallocation had failed to staff adequately new and growing programs. The annual reallocation process had also produced unintended side effects. It played havoc with planning, since departments never knew whether, or when, they might gain or lose positions. This uncertainty created anxiety among junior faculty who feared that their positions might be transferred at the end of their term contracts. Even junior members from departments with reasonable student/faculty ratios often imagined their positions in jeopardy. The administration could not reassure them without appearing to short circuit the consultation process. The annual review also encouraged the administrators to recommend only one-year contracts. To give multi-year contracts to faculty in some departments and not in others would seem to prejudge the results of the yearly consultation. In addition, vacancies usually arose in the late spring or early summer, which left insufficient time to find and attract the best candidates in academic fields where rising enrollment made faculty recruitment a growing problem. In summary, the annual reallocation approach depended upon the random occurrence of vacancies rather than on the real and timely needs of the academic departments. In addition, the reallocation pool "ran dry" after three years of intensive use. The relative youth of the faculty meant few retirements; and resignations came increasingly in academic fields where heavy enrollments demanded replacement rather than reallocation.

Obviously, the College needed a new approach that would transfer positions while avoiding the defects in the annual reallocation process. Again, external pressure provided the occasion for internal change. In May of 1977, the Central Administration of State University required that each of its units accompany its budget request for fiscal 1978-79 with a five-year forecast of enrollment and staffing levels for current and projected programs. The administration of the College decided to use this request to develop a five-year staffing plan as an alternative to the annual reallocation system.

The methodology for the Plan involved a variety of inputs. Naturally, enrollment trends received considerable attention. A straight-line projection, based on the historical rate of growth or decline in majors for the last five years, established an exaggerated trend. A weighted average, counting more heavily the number of majors in recent years, provided a moderated projection. Within the parameters of these two trend lines, we estimated the number of majors for each program by considering state and national data on program preferences and career opportunities and by utilizing three years of statistics on the program choices of our applicants for admission. The initial projection produced a total enrollment for the College that far exceeded what the State of New York was likely to fund at an acceptable appropriation per student. We then set an enrollment target for the College in 1982-83 based on an estimate of the availability of State funding and redid the projection of majors for each academic program as a percentage of this target.

These projections indicated that, if the College allowed several popular programs to grow on student demand, it would experience an unplanned revolution in its educational mission. A Campus that had struggled to become a comprehensive

college from a single purpose teacher training institution could, if it succumbed completely to student demands, find itself transformed into a single purpose business and professional school. To avoid this result, the Plan set the number of majors for several popular programs at a level that would ensure a viable total enrollment for the College yet maintain an enrollment balance among its academic programs. A computer program developed by the National Center for Higher Education Management Systems allowed the conversion of the estimated number of majors for each program into the projected departmental enrollments, which included the course load generated by non-majors as well as majors.

The task remained to determine staffing levels in each department. Again, the approach utilized a variety of inputs. An annual publication by the Central Administration of State University allowed a comparison of the student/faculty ratios of departments at Plattsburgh with those for the nine other Senior Arts and Science Colleges in the System. The Plan usually made adjustments when the staffing levels of a department at Plattsburgh differed widely from the average for the same unit in the Senior Colleges. When such variances reflected a conscious choice of campus priorities rather than a malapportionment of faculty, the staffing plan continued them. For example, a revised Mission Statement, developed by a large committee of faculty, students, and administrators, had selected nine academic areas for special emphasis based on the quality of faculty and facilities and on student needs. The Five-Year Plan reflected this emphasis by allowing those departments richer student/faculty ratios than their counterparts at the other SUNY campuses. A preliminary analysis revealed that no plan could correct all staffing inequities in five years. Even the more realistic target of removing gross inequities would have required the transfer of approximately forty faculty positions. Simulation of how and where such a large number of lines could be obtained demonstrated that it could not be achieved without devastating faculty morale and without a radical change in the mission of the College.

Much has been written about the merits of retrenching entire degree programs as a means of producing faculty lines for reallocation. A careful analysis of its potential benefits and costs at Plattsburgh led to a rejection of retrenchment. Most of the College's departments with comparatively low student/faculty ratios were in the traditional liberal arts, where ninety percent or more of their enrollments flowed from service courses for non-majors. Elimination of the majors in several of these disciplines would have produced few lines for reallocation, since they needed most of their faculty for service courses. Retrenchment of such programs would have seriously undermined liberal education on campus and would have damaged the morale of the entire liberal arts faculty.

Retrenchment of a large professional program, which did not offer service courses for non-majors, appeared at first glance an acceptable solution. Simulation of the consequences of such a decision revealed that it might well reduce the total enrollment of the Campus below the level needed to support an adequate budget. It appeared doubtful that the College could replace enrollments in the retrenched program by comparable increases in other fields. The Resource

Requirement Prediction Model, developed by NCHEMS, also demonstrated that the elimination of a large professional program would raise dramatically the cost per credit hour in a number of the liberal arts disciplines by removing the course enrollments generated by majors from the retrenched program. As a result of these simulations, the Five-Year Plan used program reduction rather than program retrenchment.

The Plan proposed the shift of twenty-five full-time equivalent faculty lines from underenrolled to overenrolled programs. Only nineteen involved the actual transfer of faculty positions. The other six utilized current faculty to teach courses within their expertise in programs outside their home departments:

Proposed Reallocation

Lose		Gain	
Earth Science	1	Business	8
Education	7	Computer Science	3
French	3	Environmental Science	2
History	1	Food and Nutrition	1
Music	1	Geography	1
Philosophy	1	Mass Media	1
Physics	1	Sociology	1
Psychology	1	Special Education	1
Spanish	2	Total	19
Theatre	1		
Total	19		

In addition, the following faculty shifts will be made:

- Anthropology - .33 FTE faculty each semester to Environmental Science
- Biology - 1 FTE faculty each semester to Environmental Science
- Chemistry - 1 FTE faculty each semester to Computer Science
- Education - 1 FTE faculty each semester to Special Education
- English - .50 FTE faculty each semester to Environmental Science
- Math - 1 FTE faculty each semester to Computer Science
- Physics - .66 FTE faculty each semester to Environmental Science

Total = 5.99

The Plan provided for the annual review and revision, if necessary, of its enrollment projections and staffing targets.

Current as well as projected enrollments demonstrated the need for the Five-Year Plan. Despite the previous efforts at reallocation, by 1977 the ten programs scheduled to lose positions had a collective student/faculty ratio of 17.4 to 1, while the eight slated to gain them had a composite ratio of 28 to 1.

Although the nature of many of the disciplines losing lines required a lower ratio than most of those that obtained them, the disparity was obviously excessive. The Plan attempted to reduce these gross inequities.

The Five-Year Plan also tried to remedy the uncertainty and the weaknesses inherent in the annual reallocation approach. It sought to make reallocation more rational and less painful by spreading the shift of positions over five years and by utilizing the multidisciplinary expertise of current faculty to offer courses in developing programs. The time span allowed the fullest use of both retirements and resignations, which cushioned the impact on current faculty. Its authors also hoped the Plan would encourage early retirements in departments scheduled to lose positions. The administration, after discussions with the departments concerned, would determine the year for the transfer of each position. Such decisions would consider when the departments needed the positions, when those that held them could best afford to lose them, and when the reallocation would have the least harmful effect on any incumbents in those lines. It was hoped that in most cases the reallocations could be scheduled so that it would have only minimal effect on existing faculty and that contractual obligations could be fully respected.

The Plan also attempted to diminish the scramble by departments for enrollments solely to keep or increase the size of their current faculty. Since it set staffing levels for five years, growing departments would gain nothing by obtaining more students than those projected in the Plan. Departments with declining enrollments would know that the Plan had considered these trends when it fixed the number of their faculty. It was expected that the future would require only minor adjustments to solve small shifts in enrollments among departments. The College could handle these slight variations by relying exclusively on resignations and retirements unanticipated in the five-year projections.

The Five-Year Plan responded to a request from the Central Administration of State University. Unfortunately, that directive came in late May of 1977 at the end of the Spring Term and required a reply by early July. Though the administration prepared the Plan in consultation with the Budget and Resources Committee of the Faculty Senate, the deadline for its submission prevented its general discussion on campus. The administration presented the Plan to the Central Office of State University as a tentative proposal and promised a finalized document after a full discussion with the faculty and students during the coming Fall Semester. Even though the Plan had been developed in full consultation with the Budget and Resources Committee, the administration decided to accept the sole responsibility for its authorship. We feared that any declaration of shared responsibility for such a controversial plan might appear to "scape-goat" the Senate Committee and could endanger consultation with faculty groups in the future. My opening speech to the Faculty in September presented the full details of the Plan, explained its motivation, and defended its specific proposals. The speech

included a wealth of data on enrollment and staffing trends for each department that clearly supported the need for a fresh approach to reallocation. I emphasized that the Plan represented only a tentative proposal; urged its full discussion by faculty and students, and solicited alternative solutions. I promised to call a Faculty Meeting at the end of the Fall Term to present a final Plan.

The proposal generated a heated, but one-sided, debate on Campus. On the Senate floor, in faculty and departmental meetings and in student forums, it was universally criticized and condemned. A visitor to Campus might well have concluded that the Plan had no advocates outside the administration. Faculty and students from programs that received positions were conspicuously absent or strangely silent. Despite my plea that critics should propose their own solutions, most faculty and students condemned the Plan without suggesting alternatives. The debate supported the adage that academics often regard the process as more important than the product. Many complained that the administration always developed such plans during the summer when most faculty and students had left campus. Others thought that academic freedom and due process demanded consultation with each of the departments adversely affected before the development of the Plan and its submission to the Central Administration of State University. Some felt that only the Faculty as a whole or its governance bodies could legitimately produce such Plans. Others believed that the administration should not have submitted even a tentative proposal without its ratification by majority vote of the faculty.

Some faculty, who opposed the Plan, did propose alternatives. Unfortunately, the desirability of many of their solutions was exceeded only by their impossibility. Several suggested that the College merely recruit students into majors so that our future admissions would match current staffing patterns. Others insisted that the administration should simply demand more faculty lines from the State. One group proposed reducing the number of majors in popular programs to a level appropriate for their current staff, without considering the potential effect of such a step on the total enrollment of the College and the budget cut that might result. Another group insisted that the staffing problem would vanish, if the College imposed a core curriculum requiring students to take a large number of specific courses in the underenrolled liberal arts departments. This approach could not reduce the staffing needs of professional programs or help the liberal arts in general, since students in professional majors already took two-thirds of their course work in the liberal arts fields.

The debate did evoke a number of important and dominant themes. The first suggested that the College in its rush to develop the full range of degree programs had neglected liberal learning for all students, whatever their major. Many who echoed this theme felt that the Five-Year Plan cut too deeply into the liberal arts faculty, especially in the Humanities. A second theme insisted that the College should utilize more fully the multidisciplinary talents of its

existing faculty to support growing academic programs. The third raised the possibility that some realistic admissions restrictions could moderate, though not eliminate, the staffing needs of growing programs. A comprehensive and creative Report from the Undergraduate Studies Committee of the Faculty Senate included all of these themes. It managed to voice the legitimate concerns of the faculty, while recognizing the real problems that the Five-Year Plan had attempted to correct.

The revised Five-Year Plan, presented in a speech to faculty in December of 1977, reflected these themes. It reduced the number of positions slated for transfer from 19 to 13 and restored most of the cuts made in the Humanities (2 each to French and Spanish and 1 each to music and philosophy). The revision also cut the reallocations to Business by 3 and took 1 each from Computer Science, Geography, and Sociology. It coped with these reductions by lowering enrollment targets for several popular programs and by setting annual admission ceilings to keep their number of majors within these limits.

The speech attempted to capitalize on the prevailing impression among many faculty and students that the College should somehow strengthen liberal education on campus. I proposed that the administration and the Executive Committee of the Faculty Senate appoint a Task Force of faculty and students to propose a new general education program for the College and promised to fund its work by keeping vacant for one year a top administrative position. I urged that this new program be tailored to the needs of our students and to the multidisciplinary talents of our faculty. (Two years later, the Faculty Senate adopted a new general education program for the Campus.)

The Revised Five-Year Plan is now in its fourth year. Its enrollment projections have proven reasonably accurate; and its reallocations have been accomplished with minimal effect on departments that lost positions and without violating the contractual rights of faculty. Its successes, or at least the absence of major problems, appear to have persuaded most faculty of its necessity. In response to a survey taken as part of my evaluation as president in 1979, the faculty voiced general approval of the Revised Five-Year Plan. Fortunately, that evaluation occurred after two years of experience had established the value of the Plan.

The Five-Year Plan failed in only one respect. It did not supply enough faculty positions to satisfy the needs of our most popular programs. For example, by the Fall of 1979, Accounting and Business had 70 majors per faculty; Computer Science, 60 to 1; and Mass Media, 52 to 1. The additional transfer of a significant number of faculty lines between departments now appears impossible. Between 1974 and 1980, the College has reallocated 42 positions, 14% of its total faculty. Six years of extensive reallocation has left all of the departments with comparable or higher student/faculty ratios than their counterparts in the other units of State University. The problem lies with the excessive student/faculty ratio for the entire College, the highest of the ten Senior Colleges in the University System.

This Fall the administration proposed a Second Five-Year Plan to solve this problem. Previous reallocation plans dealt primarily with the faculty, or the supply side of the student/faculty equation. The new Plan starts with the demand side. It reduces total enrollment by four hundred students over five years, largely through selective cuts in the number of majors in the most popular programs.

Comparative data with the other Senior Colleges demonstrate that Plattsburgh is overenrolled as well as understaffed. These statistics indicate that the State should allow the reduction without a loss in budget and staff, since it has not provided adequate support for the number of students currently enrolled.

The Plan also seeks to enhance the attractiveness of several programs and to utilize more fully the talents of current faculty by combining professors from fourteen departments into five multidisciplinary Centers: Art, Music and Theatre; Business and Economics; Environmental Studies, Human Services; and Teacher Education. A final element calls for the retrenchment of our Campus Laboratory School (N-8) and the reallocation of its sixteen teaching positions to popular undergraduate programs and to the new Centers.

The Second Five-Year Plan, developed in consultation with the Budget and Resources Committee, has been presented to the Faculty and to the student body for discussion and revision. The administration also submitted it as a tentative proposal to the Central Administration of State University and to the Governor's Division of the Budget. I have promised to present a revised Plan to the faculty and students in early January.

It is too early to foretell the fate of the Second Five-Year Plan, either on the Campus or in the Capitol at Albany. Although faculty seem pleased with the selective enrollment reduction and with the reallocation of positions from the Campus School, some professors from departments merged into Centers oppose this step. Others applaud the concept of the Centers, but most of them are not personally involved. The reaction of officials from State University has been supportive; the response from the State Government remains a question. Only time will tell how the Plan will fare in these multiple arenas. If past experiences offers a guide, the campus discussion will undoubtedly improve the Plan. University and State officials will probably accept it as a rational way of meeting the challenge of the Eighties by satisfying the changing needs of students and society without depending on growth in enrollment and resources.

After six years of experience, what have we at Plattsburgh learned about the product, the process, and the politics of faculty reallocation:

1. That the process and the politics of reallocation are as important as the product.
2. That multi-year reallocation plans are decidedly preferable to an annual ad hoc process.
3. That reallocation should seek to achieve rather than determine the Mission of a college.
4. That a practical, inductive, approach to reallocation is better than a theoretical, deductive approach.
5. That the annual circulation to all constituencies of full information on funding and staffing levels for all academic and non-academic units of the College is essential to creating an atmosphere conducive to reallocation.

6. That, though the faculty and its committees can shape and revise reallocation plans through consultation, the administration must initiate and accept full responsibility for proposals that affect adversely the careers and departments of current faculty.
7. That the administration should not anticipate public support for reallocation plans even from faculty and departments that will benefit by them.
8. That the administration can expect initially only faculty acquiescence, or tacit acceptance, for reallocation proposals--approval will come later, if it comes at all.

Managerial Styles in University
Budget Planning

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November 1980

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Managerial Styles in University Budget Planning

Institutional budgeting has been characterized as an increasingly significant administrative function, the operating budget having been described by many administrative officers as "the most important educational document in the university (Lee and Bowen 1975, p. 58)." In the present climate of financial constraint and accountability in postsecondary education, budgeting has become, if possible, even more important.

This paper deals with an area of budgeting within higher-education institutions, namely, the development of budget requests in large public universities. The study has focused on the managerial styles used by university executive officers in preparing FY80 and FY81 operational budget requests to state authorities. The use of an "open" managerial style has been investigated in 32 public research universities, research findings having indicated the extent and preference among administrative officers for open budgeting practices.

The theoretical perspective of the study has been discussed in Section 1 of this paper. Section 2 has dealt with the design used to investigate research questions. Highlights of findings and conclusions about openness in budget development have been described in Section 3. Implications of the findings for further research and practice have been offered in Section 4.

Theoretical Perspective

Importance of Study Topic

The question of managerial style has been of importance to scholars and practitioners alike, influencing especially the processes and outcomes of administrative behavior in complex universities (Hodgkinson 1970; Astin and Scherrei 1980). Moreover, the resolution of organizational problems or crises often requires the use of varying managerial decisionmaking styles, appropriate to both the structure and traditions of the organization and the personal perspective of top management (Weathersby 1975). In other words, the managerial style of university executive officers might well define the administrative climate of an institution, influencing also its capacity to react and perform in a changing environment.

The present research study has proposed a specific managerial style, called the open model of budgeting, to better inform and elicit institutional support for university budget making processes. Provision of this detailed model might also allow university administrative officers to assess their contributions, and those of internal colleagues and constituent groups, to the budget planning process. Moreover, the development of the open model

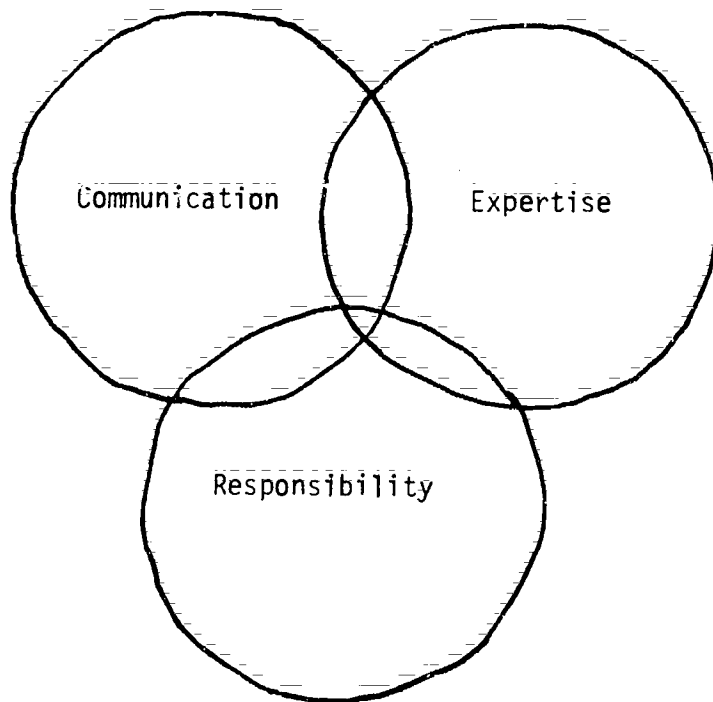
of budgeting is consistent with research recommendations proposed at the National Research Agenda Conference, sponsored by the National Institute of Education. At the conference, academic and administrative practitioners ranked the topic "comparative effectiveness of open and closed managerial styles" first among 50 proposed research topics about the finance, productivity, and management of postsecondary institutions (NCHEMS 1976). Participants cited the need for research insights into executive-level managerial decision-making in this present period of financial stress and change.

Models of Budgeting

The open model of budgeting posits a participative, functional approach to budget development, having been based chiefly on Burkhead's functional typology of governmental budget planning and decisionmaking (1956). Burkhead described budgeting as the interaction of three functions, overlapping but distinctive from one another: communication, expertise, and responsibility (Figure 1).

Figure 1

Typology of Budgetary Functions



He defined them in the following fashion (1956, pp. 52-6):

1. Communication consists of hearing the representatives of affected groups...being conversant with their way of thinking and able to establish a reciprocal exchange with them.
2. Expertise consists of measurement and comparison of the consequences of alternative public policies in so far as possible in quantitative terms...undertaken by staff to assess important economic, sociological, (and) administrative considerations.
3. Responsibility requires an appraisal of the political power groupings...to test the realism of proposals in relation to these groupings and to...face criticism for the decisions that are made.

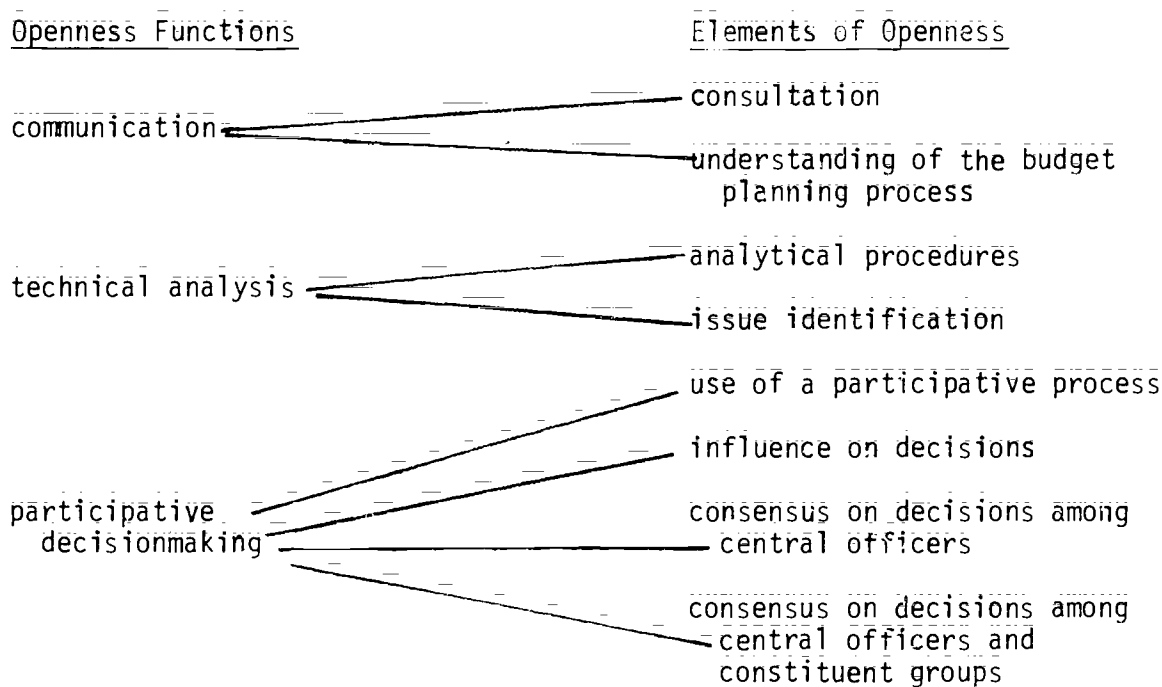
Burkhead's approach has emphasized the need for communication between decisionmakers and affected groups, quantitative analysis of budget requests and policies, and the use of what might be called a political decisionmaking style.

The proposed model has followed Burkhead's assertion that budgeting involves an interplay of primary functions. These functions have been defined in similar but more comprehensive terms than those proposed by Burkhead. As hypothesized, the open model consists of three primary functions, communication, technical analysis, and participative decisionmaking, and eight related variables which were perceived as critical elements in university budget planning processes (Figure 2).

Though not identified through an empirical analysis, openness variables were carefully selected and defined in terms of the "technical" and "political" budget activities frequently attributed to public budgeting processes (Schick 1980; Caruthers and Orwig 1979). The open function of technical analysis was associated with administrative or technical budgeting procedures, these being primarily the use of quantitative measures and systems for request and issue analysis. The functions of communication and participative decision-making were closely associated with political activities, such as bargaining, information sharing, and negotiation about budget requests. In summary, a goal of this study was to propose a typology which incorporated both technical and political aspects of budgeting, the categories of activity perceived as fundamental to budget development in both governmental and higher-education institutions:

Figure 2

Functions and Elements of the
Open Model of Budgeting



In the proposed model the function of communication has reference to consultation, understanding and feedback about budget proposals between decisionmakers and constituents; consultation occurring through formal and informal means (Moos 1972; Lee and Bowen 1975; Millett 1968). Technical analysis has reference to budget request review, often by professional staff, to compare and contrast the merits and weaknesses of proposals and to raise pertinent issues (Balderston 1975; Rourke and Brooks 1966; Glenny et al 1975). The function of participative decisionmaking has described a politicized style of decisionmaking characterized by negotiation, attempts at decision influence, and consensus building (Scott 1975; AAUP 1966; Mortimer and McConnel 1979).

Research Design

Study Sample/Survey Instrument.

A multiple sample, comparative survey design was used to investigate major and supporting questions about the open model of budgeting. The Budget Planning Profile (BPP), a survey instrument developed for the study,

was directed to three groups of central officers who prepared institutional budget requests in 32 state universities: vice presidents for academic affairs (VPAA's), vice presidents for finance or administration (VPF's), and central budget staffs (CBS'). In a preliminary survey of Research I and II-level institutions (Carnegie Commission on Higher Education 1973), these respondents had been identified as accessible and expert participants in the budget planning process.

The BPP, a closed, multiple choice instrument, consisted of 32 questions about the functions, elements, and activities of planning hypothesized from the open model of budgeting. Pretested among executive officers and staff at the University of Minnesota, the BPP probed the respondents' knowledge and preference for open budgeting practices at their flagship or system-level institutions. Responses were secured from approximately two-thirds of the 96 potential respondents, return rates among respondent groups having been as follows: half of the 36 VPAA's, two-thirds of the 28 VPF's and three-fourths of the 32 CBS'.

Treatments of Findings

A two stage analysis of responses was completed, the first to be discussed in the following section. The second stage of analysis will be dealt with in a later section of the paper. In the first stage, responses to the 32 BPP questions were summarized and measured, the general purpose of this stage of analysis being to answer one of the two major questions of the study: have executive officers used open budget planning processes in preparing budget requests? Two measures, the analysis of variance procedure anova (Nie et al 1975) and Fattu's nomograph (University of Minnesota 1946), indicated statistically significant differences among group responses, suggesting varying perceptions and preferences about budgeting activities.

Study Findings

Selected findings dealing with the primary functions of the open managerial style, communication, technical analysis, and participative decisionmaking, will be highlighted. Planning activities of two sets of participants will be described: 1) central officers, these being chief executive officers (CEO's), chief academic officers (CAO's), central budget staffs, and trustees/regents; and 2) internal constituent groups, that is, the collegiate deans, faculty budget or planning committees, department chairs, and student representatives.

Communication

Consultation about budget requests submitted to central administration tended primarily to involve the central officers of the university. Approximately 90 percent of all respondents believed and preferred that CEO's

consulted with vice presidents and budget staffs in the initial stages of the planning process. About two-thirds of the total respondents also indicated that CEO's met with trustees/regents and CAO's with deans and budget staffs to discuss the initial parameters of request development. Though little consultation with constituent groups occurred during the planning process, CEO's tended to seek reactions from these groups about final budget recommendations. For example, more than three-fourths of the respondents believed and preferred that the CEO's or their representatives met with faculty groups, such as a budget committee, the faculty senate, or senior members of the faculty for this purpose.

In general central administrative officers were also identified by respondents as possessing the widest understanding of budget planning activities, including budget roles, strategies, policies, and decision criteria, i.e., "most of" the central officers, but not institutional constituent groups, were thought to be familiar with the institutional strategy for justifying budget requests to state authorities (Table 1).

Technical Analysis

Additional descriptive findings indicated that many but not all of the technical procedures associated with openness were used in budget development: Over 80 percent of all respondents believed and preferred that central budget staffs prepare budget instructions and develop data or planning schedules such as estimates of institutional income, historical faculty position counts, and program or instructional cost data. Respondents also strongly favored staff analyses of budget issues and assessments of the attitudes and priorities of state authorities about budget requests; however, fewer respondents supported the use of more comprehensive staff procedures such as written reviews of requests, request rankings, or recommendations on funding levels (Table 2).

Study findings indicated that other procedures contributing to the rational development of budget requests have also been introduced, namely, 1) selection of budget review criteria, the most important of which, in order, were: centrality, quality, demand, and program costs; and 2) issue identification and analysis, the following concerns having been identified as critical budget issues: the percentage increase in faculty pay, program quality, enrollment trends, and the size and political saleability of requests.

Several other technical procedures were not followed regularly, the request process itself appearing to be a somewhat confusing and unpredictable one. For example, vice presidents rarely, or very occasionally, adhered to budget instructions, as shown in the mean scores which follow:

Table 1

Familiarity of Constituent Groups with the Strategy of the
Central Officers in Justifying Budget Requests to State Authorities

- Vice Presidents for Academic Affairs (N₁=18)
- △ Vice Presidents for Finance/Administration (N₂=19)
- Central Budget Staffs (N₃=24)

Individuals or Groups	Degree of Familiarity ^a			
	None Were	Some Were	Most Were	Don't Know
Vice Presidents	1	2	■ △ 3 ○	4
Central Budget Staffs	1	2	■ △ 3 ○	4
Trustees/Regents	1	2	△ ■ 3 ○	4 *
Collegiate Deans	1	2	△ ■ 3 ○	4
Faculty Budget or Planning Committees	1	2	△ ■ 3 ○	4
Department Chairs	1	△ ■ 3 ○	4	4
Student Representatives	1	■ 2 △	3	4

^a Mean scores of each sample group. Significance of differences between high and low means using anova has been indicated by an asterisk (*) at the .05 level of probability. Summary statistics may be obtained from the author upon request.

Table 2

Percentage of Respondents Who Perceived and Preferred that Central Budget Staffs
Prepared Analyses of Collegiate Budget Requests^a

Analyses of Budget Requests Prepared by Central Budget Staffs	Vice Presidents for Academic Affairs (N ₁ =18)		Vice Presidents for Finance/Administration (N ₂ =19)		Central Budget Staffs (N ₃ =24)	
	Prepared Analyses	Should Prepare	Prepared Analyses	Should Prepare	Prepared Analyses	Should Prepare
Analyses of Major Budget- Related Issues	83.3 (18)	83.3 (18)	94.4 (18)	94.1 (17)	86.4 (22)	95.0 (20)
Assessments of Attitudes and Priorities of State Authorities	72.2 (18)	72.2 (18)	66.7 (18)	70.6 (17)	77.3 (22)	75.0 (20)
Suggested Priorities or Ranking of Requests	55.6 (18)	50.0 (18)	55.6 (18)	64.7 (17)	65.2 (23)	68.2 (22)
Specific Recommendations on Funding Levels for Selected Requests	53.3 (15)	53.3 (15)	56.3 (16)	60.0 (15)	57.9 (19)	55.6 (18)
Specific Recommendations on Funding Levels for all Requests	44.4 (18)	44.4 (18)	44.4 (18)	47.1 (17)	59.1 (22)	60.0 (20)
Written Reviews of all Collegiate Requests	35.3 (17)	35.3 (17)	44.4 (18)	52.9 (17)	33.3 (21)	30.0 (20)
Written Reviews of Selected Collegiate Requests	40.0 (15)	46.7 (15)	33.3 (15)	50.0 (14)	31.6 (19)	53.3 (14)

^a Percentages have been computed for the number of respondents shown in parentheses.

Mean Scores Indicating Adherence by the Vice
Presidents, as a Group, To the Budget
Instructions
(1=Never, 2=Sometimes, 3=Usually, 4=Almost Always)

Respondent
Groups (N)

VPAA's (18)	1.6
VPF's (19)	1.4
CBS' (24)	1.3

Similarly, a majority of total respondents could not identify the central officer having primary responsibility for coordination of the budget planning process. Moreover, only two-fifths of the total respondents perceived and preferred that budget hearings were held at which collegiate deans and faculty spokespersons presented budget requests to an assembled group of central officers.

Participative Decisionmaking

Little or mixed evidence existed that CEO's and vice presidents used broadly participative and consensual processes in fashioning budget-related recommendations and decisions. Two-thirds of the VPAA and VPF respondents believed that a participative process was used in making a majority of the budget-related decisions identified in the BPP survey, i.e., decisions about the dollar size of the faculty pay plan or student tuition policies. However, a similar percentage of budget staff respondents indicated that such a process was used in making only two of these 14 decisions.

In general the respondents indicated that the extent of influence by constituent groups on 14 budget-related decisions included in the BPP was limited (Table 3). In none of the decisions was either "extensive" or "much" influence said to be exercised. In only three of the 14 was "some" influence clearly felt, these being decisions about the annual percentage increase in the faculty pay plan, the dollar size of the plan, and funding priorities of the total budget request.

A high level of agreement existed among respondents that consensus emerged among central officers on nearly all budget-related decisions. Over three-fourths of the vice presidents and budget staffs believed such consensus occurred on at least 11 of the 13 decision items included in the survey form. In particular, over 85 percent of all respondents believed such consensus existed on decisions about funding priorities and faculty positions and pay plans.

Though the respondents indicated that consensus about decisions did exist among central officers, little evidence of consensus between these officers and constituent groups was provided. Fewer than half, and usually no more than a third, of the total respondents believed a consensus existed with respect to any of the 13 decision areas included in the BPP. The overarching

Table 3

Extent to Which Budget-Related Decisions Were Influenced By
University Internal Constituent Groups

Decisions Reached About	Extent of Influence ^a				
	No	Very Little	Some	Much	Extensive
The Annual Percentage Increase in the Faculty Pay Plan	1	2	0 3 Δ ■ 4		5
The Dollar Size of the Faculty Pay Plan	1	2	0 3 Δ ■ 4		5
The Identification of Funding Priorities in the Total Budget Request	1	2	0 2 ■ 4		5
The Nature of the Consultative Process with the Faculty	1	2	0 Δ 3 ■ 4		5*
The Total Number of Academic Positions Requested	1	2	0 Δ 3 4		5
The Criteria Used by the Chief Executive Officer and the Vice Presidents, as a Group, in Reviewing Budget Requests	1	2	0 Δ ■ 3 4		5
Student Tuition Policies or Rates	1	2	0 ■ Δ 3 4		5
The Dollar Size of the Total Budget Request	1	2	Δ 0 ■ 3 4		5
The Strategy for Presenting the Budget Request to State Authorities	1	2	■ Δ 0 3 4		5
The Mix of Academic and Civil Service Positions Requested	1	2	0 Δ ■ 3 4		5
The Amount of Funds to be Held in Reserve by the Central Officers	1	0	2 ■ 3 4		5
The Nature of the Budget Instructions	1	0	2 ■ Δ 3 4		5
The Format of Budget Request Documents for State Authorities	1	0	Δ 2 ■ 3 4		5
The Extent to Which Budget Decision Making Meetings of the Chief Executive Officer and Vice Presidents Were Open to Media Coverage	1	0	Δ ■ 2 3 4		5

^a Mean scores for each sample group. Significance of differences between high and low means using anova has been indicated by an asterisk (*) at the .05 level of probability.

impression was that central officers and constituent groups reached little or no consensus on all of the major budget-related decisions:

Correlational Findings

Once budgeting practices in sample institutions had been summarized, a second stage of analysis was attempted. The purpose of this second stage was to answer the second major research question of the study: have open budgeting processes been related to each other in meaningful or significant ways? In other words, were budgeting functions interrelated in practice, as hypothesized in the open model and suggested by Burkhead's functional typology.

In an exploratory fashion measures of correlation and association were applied to initial findings to assess relationships among study variables, statistical significance being set at both .01 and .05 levels. Two-way crosstabs and phi, product-moment, and point-biserial correlation coefficients (Fructer and Guilford 1978) were calculated among these variables, many of which had been selected for analyses through principal factor analysis procedures (Nunnally 1978):

Correlational findings indicated that open budgeting elements and activities, when introduced, were typically conducted in an interdependent fashion. Each of the major openness elements was related significantly to at least one other; most, in fact, were related to two or more variables. In other words, these correlational findings have suggested that when one type of openness variable has been introduced in the budget planning process, one or more related variables were also likely to be found. Selected examples of these correlational findings follow:

Consultation by CEO's in the preliminary stages of budget planning appeared to enhance understanding among constituent groups of process roles, strategies, and funding priorities. The use of analytical procedures such as the preparation of data schedules and review criteria also tended to promote understanding of planning procedures as well as the identification of significant issues. In summary, the use of consultative and analytical procedures by executive officers might well tend to increase understanding of the planning process among consultant groups:

The correlational findings indicated also that central officers and constituent groups tended to support budget decisions 1) when they understood the roles of significant participants in the process, such as process coordinators, central budget staffs, and faculty budget committees, and 2) when they had knowledge of the "major products" of the process, these being decision criteria, budget policies, request priorities, and request strategy. In other words, consensus about budget decisions is especially related to knowledge about the major activities and products of the budget process:

The use of a participative process was related significantly to nearly all other openness variables, as shown in Figure 3. Its existence might well signal a basic commitment by executive officers to the concept of joint planning and decisionmaking in the budget process.

Conclusions of the Study

Conclusions reached by the author have been based chiefly on selected findings about two study questions: 1) have executive officers used open budget planning processes in preparing budget requests, and 2) have such processes been related to each other in significant ways? These conclusions have represented a few of the many conclusions drawn from the total findings of the study:

1. CEO's and vice presidents in major public universities have developed similar managerial styles in the budget planning process, most utilizing what might be called a "cabinet style" of budgeting. In this style many openness procedures have been introduced in the central administration but not on an institution-wide basis. Consequently this style appears to be a credible but inadequate method of budget development.

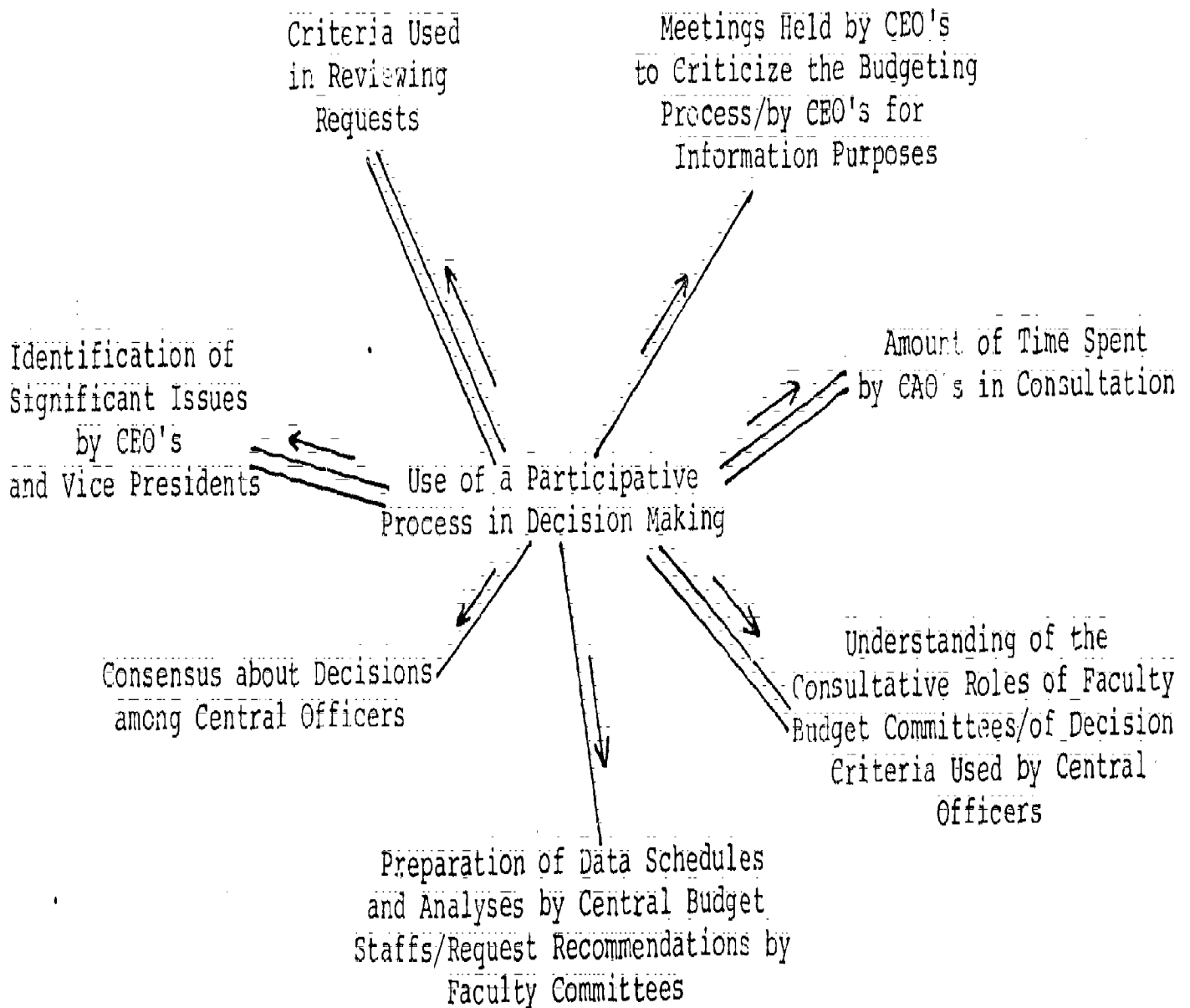
The central officers who practiced and endorsed this approach appear to have fashioned budgeting processes which promoted a) the preparation of well-recognized planning aids, such as factual data, budget review criteria, and issue analysis, b) identification of funding priorities, and c) communication and decision consensus among administrators most responsible for budget development.

Use of this approach, however, has also contributed to an inefficient planning effort, reduced the likelihood of rigorous analysis of budget requests, and resulted in little understanding, participation, influence, and support among constituent groups for budget decisions. At issue is whether this present approach remains adequate when a) demands for budget-related information from internal constituents and external authorities will likely increase; b) competition for resources will intensify; and c) legal and political challenges to governance and management practices can be expected.

2. The open style of budget planning might well be an especially appropriate approach to budgeting in this period of fiscal austerity and administrative accountability. Openness procedures represent efforts to efficiently and democratically develop budget proposals. Like the democratic political process, however, openness might carry with it unpredictable and unexpected consequences, namely:

Figure 3

Relationship of Use of a Participative Process
to Communication, Technical Analyses, and Decision Variables^a



^a Relationships shown exceeded the five percent level of significance based on yes/no crosstabulations (——) and point-biserial (====) correlation coefficients. Summary 39 statistics may be obtained from the writer upon request.

a time-consuming consultative process; excessive paperwork and documentation; undue influence by central budget staffs; unrealistic expectations among participants about their access to budget information or decisionmaking processes; and excessive challenges from constituents to the central authority of administrators, lessening the likelihood of flexibility or freedom in the latter's decisionmaking.

The application of technical and political procedures to budget development offers the following possible advantages over the present cabinet style:

- a. Openness might well promote a more reasonable, understanding process, emphasis having been placed, for example, on process coordination and information sharing in preliminary and later stages of budget development.
- b. Openness could provide a potential means for internally resolving issues and inevitable conflicts about resource priorities, by sharpening internal debate, sensitizing participants to issues likely to be raised by state authorities, and promoting consensus on budget requests. Similarly when serious attempts have been made to inform participants and include them in decisionmaking, the "winners" and "losers" in the budget process have less difficulty understanding and accepting, if not favoring, final decisions.
- c. Openness also will likely contribute to the development of defensible budget requests. The availability of factual data and reasoned analysis should ease the burden of decisionmaking for executive officers, providing them with rational, understandable justification for requests favored by internal constituents or external publics or both.
- d. Perhaps most importantly openness in budget planning will communicate a willingness on the part of academic institutions for self-governance, for the shared assessment of performance and direction in institutional life. In combination with other major governance functions such as long-range planning and program review, its use should signal to insiders and outsiders alike, that major universities could reasonably assess the needs and distribution of their resources while retaining their strongest traditions in a changing fiscal and political environment.

Implications of the Study

Study findings have provided tentative confirmation of the value of an open managerial style in budget request preparation. Elements of such a style might well be applicable to other university resource or institutional planning processes, such as the development of retrenchment and reallocation plans, capital requests or annual budgets. Executive officers at the University of Minnesota, for example, have recently used broadly consultative and analytical procedures in linking short and long-range resource planning, emphasizing especially the roles of a "Planning Council" and a "Presidential Drafting Group" staffed by representatives from central administration and constituent groups. As a result of these efforts, institutional planning objectives, funding priorities, program needs, and management information systems are better understood.

In this present research study the usefulness of an open managerial style has been indicated without empirically investigating its effectiveness or impact on budget process outcomes. Additional research specifically assessing the relationship of openness variables to the products or outcomes of budgeting should be undertaken. Research directed to different institutional samples and additional, wider, groups of respondents is also advisable. Such research might well suggest further contributions and limitations of openness in budgeting, planning and related administrative processes.

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The Utilization and Financial Characteristics of
Tax-Exempt Auxiliary Corporations Affiliated
with the Major Public Universities
in the United States

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May 1980

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Introduction

In the Spring of 1977 the National Association of College and University Business Officers (NACUBO) sponsored a study to examine the utilization and financial characteristics of auxiliary corporations affiliated with the major public universities in the United States. A questionnaire was forwarded to the chief fiscal officers of the 111 major public universities that are members of both NACUBO and the National Association of State Universities and Land Grant Colleges (NASULGC) in an attempt to uncover the general characteristics of the universities, the names of the auxiliary corporations affiliated with the universities, the name and address of the individuals responsible for the operation of those corporations, and the opinions of the university chief fiscal officers as related to the utilization of auxiliary corporations. Eighty-three percent of the chief fiscal officers responded to that questionnaire and 256 individual corporations were uncovered. A second questionnaire was forwarded to the individual responsible for the operation of the auxiliary corporation to obtain information concerning the formation of the corporation, the organizational and fiscal relationship of the corporation to the university, and the fiscal relationship of the corporation to the university, and the fiscal characteristics and status of the corporation. Information related to sixty percent of the corporations was obtained and an analysis of the various types of corporations was completed.

Background

In a 1966 report of the Committee for Voluntary Support of the National Association of State Universities and Land Grant Colleges it was stated that just as a decline in tuition income would jeopardize the progress of every private college in the nation, a drop in state funds would threaten public institutions (1966). Their report pointed out that although the amount of state tax support was rising in dollars, it was declining as a percentage of total income for many public institutions, and with growing competition for state tax dollars, the percentage threatened to decline even more. Why could public colleges and universities be threatened with becoming "tax assisted" rather than "tax supported" institutions? There is no simple answer to this question, however, the following factors are thought to have contributed to the present situation.

Loss of Confidence by Constituencies Served. During its great period of expansion in the 1960's, public higher education acquired serious problems along with its growth and accomplishments. It became inflexible to a great extent, lax in its intellectual and moral standards, insensitive to the needs of society, and self-serving to the point that its purpose was not

clear. Funds were available, applications had reached the pressure point, education had been sold as the possible answer to everything, and the entrepreneur had learned how to work within the non-profit organization. Leadership could make mistakes and survive because "next year's increase could bail out this year's mistake." The management came from both the "old guard" being in the right place at the right time and from those who were opportunity seekers. The educational institution continued to accept the concept that educational leaders were developed by faculty moving to administration, administration to management, and management to leadership without much prior preparation or experience. The problems on the campuses resulted primarily from conflicts between those who wanted rapid change and overhaul and those who were rigid in their outlook, and relied on what had worked in the past. In many instances the solution to problems was more staff and facilities approached in the same traditional way as we attempted to raise student expectations and "vocalize" the liberal arts education.

The 70's brought with them the same management and administrative philosophy; unionization or threat of unionization of most groups on campus; increased federal and state requirements, a more demanding student body and community, expensive facilities, and an unclear mission. David Rogers, President of the Robert Wood Johnson Foundation, summarized the situation by saying, "Universities in their totality have become too big, too expensive, too much an end in themselves, and too detached from the problems of our complex inter-dependent world." The mission or purpose of the college or university has not been well defined and communicated to its several constituencies.

Competitive Market. The application pressure from the traditional eighteen-year old market has declined because the baby boom that faced education is on the downward side of the curve, the Vietnam War and threat of a draft is no longer pressuring students to continue to stay in education, students are becoming "job" oriented, and the "value" of education is now being questioned by a large segment of the population. Public higher education is having difficulty approaching the appropriation source and making a convincing argument based upon the need for growth. The politician and the majority of his constituency are not convinced of the demand, and "quality education" cannot be devined to the satisfaction of the taxpayer. The public sector now finds itself not only competing with the private sector but with itself for the same traditional students. Federal financial assistance is being awarded to the student based upon cost, and, to some extent, the student with financial need is being placed in a position of being able to select the institution based upon something other than cost. Space is available for the student in public higher education, and the public is aware of the duplication, overabundance of graduates in fields not in demand, and the cost of maintaining something that doesn't appear to be relevant.

Inflation and Competition for Tax Dollar. As the share of the total expenditure of public higher education coming from other than appropriated sources (students, federal government, etc.) increases, the politician and taxpayer will make the case that education is in a unique position of raising revenue to pay for its service unlike other state human service agencies, therefore, the appropriation could continue to represent an increasingly smaller share of the total expenditure for public higher education. Welfare, mental health, and prison reform will demand a greater share of the tax dollar and those "state agencies" cannot turn to the client served for revenue to cover expanded programs or increased costs due to inflation. Helen I. Shell has indicated that we may have reached, "a possible 'funding plateau' as state and federal governments increasingly recognize and expand funding to other social priorities such as health care and ecology (1973)." The pressure will be on the politician not to increase taxes or borrow funds for expansion of services, but will be told by the voters and taxpayers to take the resources from some other state program. The increased costs of public higher education may have to be absorbed by the institution. At a time when state appropriations are becoming more difficult to obtain and public institutions need the flexibility to maximize the return on its existing resources, politicians will attempt to exercise much more influence on the recipient of the public dollar. Criticizing the "irrelevant" and "costly" programs will add to the credibility problem of public higher education. In contrast with the 1960's the politician now obtains votes by publicly being critical of the public higher education establishment, and the need for better management and centralization is being sold as synonymous. Public higher education will be controlled more when receiving proportionately less.

Innovative managers in public higher education will attempt to cut costs and increase productivity to stay within the resources available to them, but this will be attempted at a time when the educational institution is facing financial burdens because of runaway inflation, collective bargaining, affirmative action, environmental and safety requirements, confidentiality and freedom of information legislation, and more state fiscal controls. Mr. Norman L. Epstein, Chief Counsel for the California State Colleges, has summarized the situation by stating, "Public institutions, particularly, often find themselves saddled with prohibitions which make the practical conduct of business affairs impossible. In California, for example, almost any purchase of over \$25 by a state agency must be cleared through Sacramento (1968)." At a time when the management needs the flexibility, the internal and external forces influencing the public institution are making it more difficult to exercise management prerogatives.

In the next decade public higher education will be competing for students and financial support. The public universities will increasingly be seeking sources of private funding and flexibility not normally available to a state supported and controlled institution. This study examined the utilization and financial characteristics of the tax-exempt auxiliary corporation affiliated with the major public universities, which is one of the legal entities utilized to develop private resources to allow universities flexibility to meet their objectives. The greatest significance of the information obtained from the study will be the impact on those public colleges and universities that presently do not utilize affiliated private corporations or that are in the process of exploring the establishment of one or more of these legal entities. This is particularly true with the four-year "state" colleges and public two-year comprehensive community colleges. As those institutions who presently do not have affiliated corporations begin to explore this concept, they will need to understand the relationship between the educational institution and the corporation and the financial and legal implication of such a relationship.

Auxiliary Corporation Defined

The legal entity should be understood and defined before exploring the question of how public institutions have utilized these organizations. The private auxiliary organization under consideration may be characterized as applying to those affiliated or subsidiary entities (also frequently called "satellite corporations") that are separately organized and usually incorporated with federal income tax-exempt status [usually under Internal Revenue Code Section 501 (c) (3)] and which have some direct associational relationship with a public degree-granting institution of higher education (Francis 1975). As stated, they are normally incorporated and chartered by the state as non-profit legal entities and controlled by governing boards separate from the governing boards of the sponsoring educational institution. The "associational relationship" is usually created by having individuals connected with the educational institution (trustees, administrators, faculty, students, and/or friends of the university) serve on the controlling board of the auxiliary organization. The organizations are frequently called "convenience" corporations and have been created by the administration of the college or university for the purpose of resolving a specific problem.

Findings

The responses (computer file contained information from 80 universities) from the chief fiscal officers indicated that the public universities had an average of 3.2 auxiliary tax-exempt non-profit corporations affiliated with

their universities. Ten percent of the universities responding indicated that they had no auxiliary corporations operating on their campuses, however, five indicated that they had in excess of ten corporations. The universities with the greatest enrollments and largest educational and general budgets had the greatest number of corporations. There seems to be very little correlation between the number of corporations in existence and the expenditure per student by the university or the amount (percent of E & G Budget or appropriation per student) of support derived from state appropriation. Nine of the eighty universities studied have been referred to by NASULGC as "historically black universities" because they were founded by the Second Morrill Act of 1890. There was much less auxiliary corporation activity at these universities.

The chief fiscal officers of over one-fourth of the universities studied indicated that the number of corporations had increased over the past five years, however, ten percent indicated that the number actually decreased. Over half of the universities indicated that the auxiliary corporations furnished a greater share of the total university resource over the past five years, and 53.7% of the universities studied anticipated greater utilization in the next five years.

Over seventy percent of the administrations of the universities studied had some involvement in the budget process of the corporations, and ninety-six percent of those chief fiscal officers with auxiliary corporations indicated that the budgets of the auxiliary corporations included general support and/or reimbursement of expenses to the university, although only half of the universities included this resource in the educational and general budget of the university. Half of the universities with corporations indicated that the administration maintained the accounts of the corporations, over one-fourth utilized the same audit agency for both university and corporations, and 22.2% of those universities with corporations included the financial statements of the corporations as part of the financial statements of the universities. The more the university administration is involved in the budget process of the corporation the more likely it is for the university to include the audited financial statements of the corporation with the financial statements of the university.

Although nine of the universities indicated that they were required to expose the resources of the auxiliary corporations when submitting a budget request and that in their opinion this influenced the appropriation, the evidence obtained shows no significant difference in state support between the nine and those that were not required to submit information concerning the auxiliary corporations during this budget process.

The study analyzed 150 separate corporations and isolated the following sixteen types of auxiliary corporations:

1. General Foundation (45)
2. Research Related (17)
3. Alumni Support (15)

4. Support of Individual Schools (10)
5. Student Unions and General Auxiliary Service (10)
6. Real Estate (7)
7. Athletic Support (6)
8. Specialized Activities Support (4)
9. Student Publications (4)
10. Student Housing (4)
11. Bookstores (3)
12. Health Related (5)
13. Faculty Clubs (2)
14. Investment Holdings (6)
15. 4-H Support (2)
16. Miscellaneous (10)

Each type of corporation was analyzed and their particular general and financial characteristics summarized.

Although the administration, faculty, and students were more likely to uncover the need for the creation of the auxiliary corporation, the trustees, alumni, and friends of the university were more likely to be involved in the actual legal creation of the corporations. Administrators, alumni, and friends were more likely to be represented on the boards of directors than faculty, trustees, and students, although there was much variation between types of corporations. The president of the university served as a director on nearly half of the corporation boards and the chief fiscal officer of the university served as a director on over one-fourth of the corporation boards. Forty percent of the chief operating officers of the corporations were fully paid employees of the university, and nearly sixty percent of the chief operating officers of the corporations held a university title. Over a quarter of the corporations had no employees, however, nearly twenty percent of the corporations employed over twenty-five staff members. The number of employees varied greatly depending upon type of corporation. There was much less union/collective bargaining activity in the corporations compared to the universities they served.

The following median ranges of the financial characteristics of all auxiliary corporations furnishing the information establishes a financial profile of the corporations studied:

Revenue from Sales of Goods and Services	\$	50,000	-	\$	250,000
Revenue from Interest		10,001	-		32,000
Revenue from Dividends		1	-		10,000
Revenue from Sale of Assets		50,001	-		250,000
Total Gross Income	\$	250,001	-	\$	1,000,000
Gross Income from Dues and Assessments					None
Gross Income from Contributions, Gifts and Grants		100,001	-		1,000,000
Gross Receipts		1,000,001	-		5,000,000
Disbursements for Exempt Purposes		100,001	-		500,000

Excess of Receipts over Expenses	\$ 50,001 - \$ 100,000
Assets	250,001 - 1,000,000
Liabilities	250,001 - 1,000,000
Net Worth	250,001 - 1,000,000

Nearly forty percent of the corporations furnishing the financial data had over \$1,000,000 in gross receipts in FY 1976 and nearly sixty percent of the corporations furnishing the financial information had surpluses between \$1 and \$100,000. Over twenty percent had surpluses in excess of \$500,000 and approximately twenty percent recorded operating deficits or broke even for FY 1976.

Forty-nine of the corporations indicated that they participated in unrelated business activity and five auxiliary corporations owned the majority of stock in a business corporation. Eleven of the corporations received federal grants during the period studied, thirteen corporations were utilized as agents of the universities for administering federal grants, and eight even received indirect cost reimbursements from the federal government for services provided by the universities. Nearly sixty percent of the corporations furnishing the financial information indicated that they intended to expand their fund raising activity in the next fiscal year. Fifty-five corporations held title to real estate with a median book value ranging from \$100,000 to \$500,000. Nearly sixty percent of the corporations owning real estate paid real estate taxes on that property.

81.3 percent of the chief operating officers of the auxiliary corporations indicated that a primary reason for creating the corporation was to create operational and fiscal flexibility for the university. Only twenty-three (15.3%) corporations indicated that one of the reasons for creating the corporation was to limit the legal liability of the university. Seventy-one percent of the corporations studied indicated that upon dissolution, the assets of the corporation would be transferred to the university.

Seventy-one (47.3%) of the corporations studied indicated that they contributed funds to the university for restricted purposes (median range of \$50,001 to \$200,000). Eleven corporations (eight general foundations, two research related corporations, and one investment corporation) contributed in excess of \$1,000,000 to the universities supported during FY 1976, and forty-six corporations indicated that they made unrestricted donations to the universities (median range of \$50,001 to \$200,000). Thirty-five (23.3%) of the corporations indicated that they liquidated invoices for expenses incurred by the universities.

The following comments relate to the specific types of corporations uncovered and described in the study:

- The general university foundation was the most common (30% of corporations studied) nonprofit auxiliary corporation found on the public university campus. The university foundation's primary

purpose was fund raising, and in FY 1976 nearly half of the foundations received over \$1,000,000. Over sixty percent of the foundations studied had assets over \$1,000,000. Very few (2) foundations received grants from either the federal government or state governments, however, twenty-six foundations (57.8%) indicated that they had received a grant from a private foundation in the last fiscal year (1976). Nearly eighty percent of the foundations indicated that they intended to increase their fund raising efforts in the next fiscal year.

- The research related corporation was the second most common corporation found on the public university campus. It was primarily founded by the university administrators to ease the administration of research grants. No students appeared on the controlling boards of this type of corporation. One research corporation employed 3,633 employees and coordinated all the research in the public higher educational institutions in an entire state. Eight of the seventeen research corporations studied had assets of over \$1,000,000.
- Unlike other types of corporations, the alumni corporations received a substantial amount (mean of \$27,472) of their revenue from dues and assessments from members. The alumni corporations had average assets of \$516,575 in FY 1976.
- Ten of the corporations studied were organized to support individual schools (law, pharmacy, business, engineering, music), and in most cases the chief operating officers were professors within the schools supported. The corporations organized to support individual schools had average assets of \$388,732.
- The auxiliary service corporations were created primarily by the administrations and had annual average gross sales and receipts of \$2,609,432 in FY 1976.
- None of the corporations formed to hold title to real estate had any employees.
- Two-thirds (4) of the corporations formed to support athletics indicated that they were formed to create flexibility for the universities served. The three athletic corporations presenting the financial information indicated average contributions, gifts, and grants of \$572,406 in FY 1976.
- Four of the corporations studied were formed to support specialized activities such as libraries, a museum and an orchestra. Gross receipts for this type of corporation averaged \$97,336 from all sources and had annual average excess of receipt over expenses of \$2,882.

- The boards of directors of student publication corporations included only faculty, students, and friends of the universities.
- No alumni, faculty, or friends of the university served on the boards of the housing corporations studied.
- The chief operating officers of all three bookstore corporations were paid entirely by the corporation, as well as the chief fiscal officers of the corporations. The average gross sales and receipts for bookstore corporations studied was \$3,152,969 in FY 1976 with average assets of \$1,184,360 in the same year.
- Health care facility and service corporations were created to operate a free standing ambulatory health care facility to serve as an out-patient teaching facility for a medical school, to operate an entire medical school, to collect health service fees from students, and to collect professional fees related to a medical school.
- The faculty club corporations had average annual gross sales and receipt of \$321,673.
- The boards of directors of all the investment corporations included the president of the universities served but none of the chief fiscal officers of the universities served.
- Two of the auxiliary corporations affiliated with the major public universities were created to support the 4-H youth programs throughout the state in which they were found.

Implications

The findings of the study have substantiated the fact that public universities have utilized private nonprofit corporations to a significant extent and that these corporations have furnished the universities with resources that have created operational flexibility and support to meet institutional objectives.

General

Better Understanding of the Public University Organization. To many outside observers the public university is a single administrative unit that receives its financial support from the state through appropriation. Becoming aware of the existence of the auxiliary corporation should assist in understanding the complex nature of the university. The individual or organization doing business with the university should realize that through the use of the private corporation, the university may have a legal entity that is legally outside the control of the state political structure and bureaucracy. The university may have the flexibility to address any problem it faces through

the use of the private entity but the choice not to may be an administrative decision based upon priorities.

Increased Creation of Auxiliary Corporations. The knowledge of the existence of the auxiliary corporations and the degree to which they have created financial resources may spark interest at public institutions (universities, state colleges, and community colleges) that presently do not utilize this private legal entity to develop resources. Increasing state controls over a more difficult appropriation to obtain will result in the leadership of public institutions of higher education to investigate the use of all flexibility. Knowledge of the utilization of auxiliary corporations could very well speed up the process of creating new corporations within the public sector. This could be especially true of schools within the university that may be experiencing a decreasing level of financial support.

Increased Administrative Interest in Auxiliary Corporations. If the leadership of public institutions of higher education begins to investigate the utilization of auxiliary corporations, the various administrative segments of the university will be required to understand the legal entity and its peculiar characteristics because they will have the responsibility of administering these "private" organizations which have a new set of operating parameters. New budget processes may have to be developed, new fringe benefit programs may have to be established, new auditing requirements may have to be examined, the university's information system may have to be revamped, and/or new "risk seeking" personnel may have to be recruited.

Increased Private Fund Raising Activity by Public Institutions. The fact that ten universities received over \$1,000,000 from their foundations and that over half of the foundations received over \$1,000,000 in FY 1976 indicated that the public universities are utilizing the auxiliary corporations to raise private funds to a significant degree. This private source of funding for the public institution will be developed to a greater extent in the future and the public educational institutions will be developing more sophisticated fund raising techniques. The fact that the study uncovered a small number of nonprofit auxiliary corporations owning business corporations may lead to college and universities exploring this mechanism as a method of resource development.

Increased Interest in Auxiliary Corporations by Political Leadership of the State. Although a small number (nine) of the corporations studied were required to expose the resources of the corporation in the state budget process at the time the data was collected, the knowledge of the existence of private auxiliary corporations affiliated with the university by the political leadership of any one state could result in increased interest in the university private resources and the fiscal autonomy created by the existence of the private legal entity.

Support of Independent Colleges and Universities in Seeking Public Support. If a case can be made that public institutions are developing a significant amount of support from the private sector, the independent colleges and universities could be assisted in their efforts to gain support from public sectors.

Internal

Strengths and Advantages. The general endorsement of the further development of private legal entities on and off the university campus by the trustees might allow the various segments of the university to address problems in a comparatively unrestrictive fashion. The freedom allowable (over 80% of the corporations studied were created for this purpose) in a private environment would act as an incentive for many faculty, administrators, and students to exercise their innovative abilities. Faculty may be much more likely to contribute time to a legal entity over which they exercise more control; therefore, a private corporation that directly benefits the university or a segment of the university, may become the recipient of creative ideas that are constantly flowing on a university campus. The potential speed of decisionmaking by the private legal entity may allow that idea that once was discarded to be resurrected and explored with success.

A corporation locally created and controlled may also become an outlet for the development of leadership for the university. The autonomy of the private legal entity and "bottom line orientation" will permit the evaluation of performance of those that are given the authority to operate in the new environment. Activities in which faculty, administrators, and students were involved privately might become affiliated with the service function of the university and this recognition might lead to a much higher level of morale within the university.

The separate corporation may be the mechanism to by-pass restrictive university policies and state laws and regulations.

- Management personnel of the university may have much flexibility concerning "corporate" employees as compared to the "state" employees of the university. The study indicated far less collective bargaining activity in the private corporations.
- Expenditures that are necessary to the institution, but not thought to be "normal" state expenditures can be processed through the private corporation without the time consuming, and sometimes politically damaging approval process of the state. Expenditures, such as insurance coverage, that are not appropriate for the state might be essential for the university when negotiating a contract for services. Gifts for prominent alumni in recognition of loyal service may be very appropriate for a university.

- The private corporation can borrow funds without approval of the state and may by-pass the necessity for obtaining a special capital outlay appropriation from the legislature.
- The corporation can negotiate a contract with a vendor and, therefore, potentially save time and money over the cumbersome bidding process of the state.
- Payments can be made immediately for services rendered which may be necessary to obtain the desired service. This may be particularly significant in those states where payment for services may be required to be processed through a state agency.
- Assets of the corporation can be liquidated when no longer needed and/or of use and the cash retained for further utilization which may not be allowable by the university in some states.
- The corporation may allow flexibility in determining fees for services compared to various approvals established by state rate setting commissions.

Weaknesses. The flexibility of the private corporation has the potential of being a weakness as well as a strength. The freedom of action of the corporation could create conflict with existing university procedures and administrative structures. Any new organization created to support another needs to have its mission and objectives clearly defined or conflicts may arise. The relationship of the two legal entities should also be clearly defined to assist in potential liability questions.

The existence of a separate legal entity creates the additional responsibility for the leadership of the university to explain the role and need for the corporation to the many university constituencies. The new organization will require that the administration of the university establish and understand an additional set of parameters and operating policies. The establishment of a corporation will create a separate set of reporting and filing requirements with the state and federal governments. The separate corporation will require another budget process to be coordinated through another governing board and require the establishment of a reporting process to keep the university leadership appropriately informed.

Problems. In the planning process of the public institution each objective should be evaluated and a determination made as to whether the private corporation can or should be utilized to assist in the accomplishment of each particular objective. The first problem would be to decide the appropriateness of the corporate form. The corporation should not be utilized unless the university cannot satisfactorily resolve the problem through normal sources. The operational relationship between the private corporation and the public university needs to be defined. Will the use of

space on the campus require a lease? What university support services can be provided the corporation and at what cost? Are administrative offices of the university placed in a compromising position for holding a position in the corporate structure? If the private corporation gets into fiscal difficulty, is the university absolved of the legal and/or moral liability? Are there town/gown problems created by the entrepreneurial activities of the corporation?

The composition of the controlling board must take into consideration the constituencies served. Human resources important to one activity of the university should not be drawn away by another. The fund raising activity of one corporation should be coordinated with the development function of the university or other corporations. Resources allocated by the corporation should not duplicate resources made available by the university. The decisionmaking process of the corporation(s) should be known by the leadership of the university to maintain appropriate control.

Personnel selected to manage self-supporting auxiliary organizations need to be screened carefully. They should be oriented to the "bottom-line." Unlike many other activities in higher education the managers' responsibilities for self-supporting activities can be evaluated on the basis of results. The budget is not an allocation based upon need but is to a great extent based upon the characteristics and energy of the manager(s). Does the staff have the innovative ability to produce income in a manner never tried before in a particular situation? Are they intrigued with producing income from taking risks? The managers of a self-supporting affiliated corporation cannot cover a deficit by merely transferring funds, presenting a deficiency budget to the appropriation source, or asking the trustees to increase tuition or fees to generate revenue from a captive market.

External

Threats and Risks: The flexibility created by the utilization of auxiliary corporations could bring pressure from several external groups depending upon the political climate of the state and depending upon how extensive the university develops the use of these private legal entities. If the university already enjoys a significant amount of fiscal autonomy from the state bureaucratic and legislative structure, the use of auxiliary corporations may not be given any attention. However, in a state where the university is seeking channels to get out from under a great deal of political influence, the creation and utilization of auxiliary corporations must be accomplished in a very discreet manner. Even though this study indicates that the appropriation isn't being significantly influenced by the existence of auxiliary corporations, fiscal autonomy in many states is a politically sensitive issue. If the executive branch perceives that it will have less control over the management process, it may bring pressure on the university when it attempts to develop and utilize the private legal entity. If the legislative branch concludes that its influence on behalf of the taxpayers is diminishing, even though fiscal autonomy has been

legislatively granted, pressure may be felt during the budget process as well as through other legislative processes.

If the activities of the nonprofit corporation or business corporation controlled by the nonprofit corporation begin to compete with the business community in the local area or even throughout the state, the university may have a town (state)/gown problem to address. If this issue becomes serious enough, it may have an effect on the ability of the university to raise private funds or to gain support for increased appropriations. If the nonprofit corporation extends itself into significant unrelated business activities, the university may be challenged by the Internal Revenue Service which again may result in negative public reaction.

The extent to which the activities of the auxiliary corporation(s) compete with the fund raising structure of the independent sector of higher education will determine the amount of reaction from that source. If the auxiliary corporation becomes eligible for funding sources (i.e., state bonding authorities, foundations, etc.) that have been traditionally the domain of the independent colleges, they may be perceived as a threat and again incur subtle pressure from several sources, including the legislators that have traditionally supported the independent sector.

Opportunities. The auxiliary corporation, being relatively free from state administrative law and policy, has the flexibility to address any problem or need facing the university. The only restriction, assuming the charter has been written in broad enough form, is the availability of raising adequate resources to accomplish defined objectives, and the private corporation may in fact have ready access to resources not available to the university to accomplish these objectives. Individuals and corporations may more likely donate cash, controlling stock ownership, art work, real estate, patents, manuscripts, etc. to a private legal entity out from under the control of the state than to take the risk that the state may, through legislative or other political influence, utilize the asset in a manner not suitable to the donor. Foundations may not be permitted under governing policy to fund publicly created and controlled agencies and subdivisions. The corporation may be able to apply and receive federal grants more readily because of matching requirements or time constraints. The private corporation may accomplish objectives by debt financing not permissible under state law.

The auxiliary corporation may be utilized in a manner that provides a needed service to the university or a subdivision of the university but may be outside the direct service parameters of the university. The engineering faculty may want to participate in the development of a "research park." The business faculty and students may want to establish a marketing research firm as a learning laboratory. The administration may want to enter contractual arrangements with organizations outside the state or country not permissible under state regulations. A donor may offer the university a gift that is entrepreneurial in nature and the private corporation may be necessary to assume the financial and public relations risk. The university may be asked to participate in the development of land directly adjacent to

the campus for residential, industrial, and/or commercial purposes, and although it may be beneficial for the university to participate for various reasons, a state entity may not be able to get directly involved in such activities.

The private corporation may be the mechanism to obtain private leadership (Board of Trustees may be political appointees with much less talent or resources needed by the university) involved and supporting the public university. The administration may be able to recommend individuals to serve on corporate boards that would not be considered for appointment as Trustees. The private corporation may through these new contacts gain access to resources not presently available to the university. This may be the process through which the university can approach "new money" that is looking for an association with an educational institution. Members of boards of directors of private auxiliary corporations may also have access to political influence not available through trustees.

All of the above potential external opportunities brought about by the utilization of private auxiliary corporations may assist the university to step into the economic and social mainstream of the society it is attempting to serve.

Conclusion

The need for the public institutions of higher education to consider the development of private resources has been expressed by Dr. Howard R. Bowen, President of the University of Iowa, when he stated, "Legislators do not look with favor on the extras that will make the difference between adequacy and excellence. The public institutions, which wish to strive for exceptional performance are, therefore, forced to look to private resources for the funds needed to lift them above the commonplace or the mediocre. Those public institutions that have achieved greatness have done so with the help and encouragement of private resources and private leadership (1966)." The non-profit auxiliary corporation is a private resource and one alternative for providing the public institution a link to private leadership. If it is a mechanism which will assist in the development of additional revenues and management flexibility for higher education, it needs to be examined and understood. This study sought to determine what a university or college staff member might like to know about auxiliary corporations in the process of exploring additional sources and methods of developing private resources.

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An Identification of College and University Peer Groups

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September 1980

An Identification of College and University Peer Groups

Study Overview

For several years the Board of Higher Education staff has prepared annual studies of faculty compensation in comparison with compensation at peer institutions in other states. The groups of peer institutions used in these studies have been based primarily upon a 1972 study by Dr. Craig Bazzani. The primary purpose of this study is to develop an expanded and improved framework of peer institutions for comparative purposes.

The general approach of the study is similar to the methodology used in several other recent efforts to identify peer institutions. First, data on a number of institutional characteristics, such as: size, complexity of academic programs, admissions selectivity, and external research support are examined through the statistical technique of factor analysis. The factor analysis reduces a large number of variables into a smaller number of composite variables (called factors) that "explain" the variation among all the institutional characteristics examined.

Second, the statistical technique of cluster analysis is used to group institutions with similar factor scores together. This technique systematically compares the factor scores of various institutions and groups like institutions together in a progressive manner. Although the cluster analysis technique results in reasonable homogenous groups, it is helpful to test and where necessary to modify its results with a third technique, discriminant analysis.

Discriminant analysis is used to test whether each institution in the various clusters is actually placed in the group that most closely matches its characteristics. Some institutions invariably tend to fall in between two somewhat similar groups. The process of comparing institutions used in the cluster analysis works in such a way that institutions that are somewhat similar to two different groups may not be classified in the group that most closely approximates its characteristics. The discriminant analysis technique identifies such institutions and enables the analyst to reclassify them to the more appropriate group. In this study such a reclassification was made and the results were tested with a second discriminant analysis.

These techniques were used in this study in group 417 public controlled institutions and 671 privately controlled institutions into peer groups. Data for twenty-eight institutional characteristics, drawn primarily from HEGIS surveys, were used to describe the various institutions.

Although the study's methodology is similar to other efforts, many more institutional characteristics are examined and the number of institutions included is much greater than in other available studies.

Eighteen peer groups were developed for public institutions and twenty-seven groups were developed for private institutions. All of the institutions in the various groups are identified in Appendix B.

Although it is impractical to achieve "perfect" clusters of peer institutions through any approach, a discriminant analysis of the groups in Appendix B indicates that over ninety percent of all institutions are classified in the group which best matches their characteristics. On the basis of these results, the framework of peer institutions developed in this study will be useful for comparative purposes in studies conducted by the Board of Higher Education staff.

While these peer groups are clearly an improvement over other alternatives, neither this classification framework nor any other is immune to change or beyond improvement. Studies such as this should be periodically updated through the use of more current data, and efforts to improve the data and techniques used to identify comparison groups should be continued.

Although such groups are useful for comparisons of various types, the comparison groups are far from being perfectly homogeneous and the data examined do not and cannot include all potentially relevant variables. These limitations should not be forgotten as the groups are used in policy analysis.

Introduction and Background

Since its creation in the early 1960's, the Illinois Board of Higher Education has been interested in the results of various types of interinstitutional comparisons. It is natural for statewide higher education planners and coordinators to ask questions such as how State appropriation support of one institution compares to the support of another institution, how State appropriated support for Illinois public and/or private institutions compares to State appropriated support of institutions in other states, or how compensation of Illinois higher education employees compares to compensation paid to similar employees in other states. Also, groups such as the budget office of the Governor or Legislative appropriation committees often request that such interinstitutional comparisons be made.

Over the years, the Illinois Board of Higher Education staff has made use of such comparisons in the development of planning and budget recommendations. The area in which interinstitutional comparisons have been used most extensively by the Board of Higher Education staff is faculty compensation and salary. This type of interinstitutional comparison was first used by the Board of Higher Education staff in the late 1960's, and an annual summary and analysis of interinstitutional comparisons of faculty compensation and salary has been made since fiscal year 1975.

Interinstitutional comparisons are often criticized because, in important ways, every institution of higher education is unique. This limitation must be kept in mind as comparisons are made, but it does not mean that comparisons are never useful or valid. Although institutions are clearly unique when examined in detail, there are many general characteristics that are shared by groups of institutions. General comparisons of such characteristics provide useful information for board policy decisions; in many respects decisions made at the State level such as the need for salary increase funds for a university can only be considered in the context of general information.

In addition to the criticism that no two higher education institutions are alike, there is another limitation of interinstitutional comparisons that is important in the case of staff compensation. This limitation is related to the complexity and multi-dimensional nature of the academic labor market. Within the academic labor market, each academic department is an active and independent participant. For any given academic department the faculty labor market could span one or more academic disciplines, which may be segmented further into individual markets based on considerations such as departmental reputation. Departments within each institution compete in these many markets for faculty, and the relevant market may be quite different for various departments within an institution.

The complexity of the labor market and the difficulty of measuring each academic department's position in the market forces agencies such as the Board of Higher Education to focus on institutions rather than individual academic departments, even though the departmental level is where the competition actually occurs. The ability of Illinois institutions to compete in the general academic labor market is measured by comparing the average compensation in Illinois institutions to the average compensation in similar institutions in other states. It is assumed that the average compensation for each institution is an adequate proxy measure for the participation of its academic departments in the various labor markets in which they compete for faculty.

Because this approach has been used to measure how well Illinois institutions are faring in the academic labor market, the method used to identify peer institutions for each Illinois institution is very important. Since fiscal year 1975, the annual compensation and salary reports prepared and presented by the Board of Higher Education staff have used a peer institutional framework for the Illinois public universities developed by Dr. Craig Bazzani. This study has been made in order to refine and update the groupings used in the Bazzani study (1972).

Threshold Approaches for Identifying Peer Institutions

The vexing problem of selecting peer institutions for interinstitutional comparison purposes has troubled higher education administrators and researchers for a number of years. Several comparison frameworks have been developed, and two that have been used widely, are institutional classification schemes developed by the Carnegie Commission on Higher Education and the American Association of University Professors. Of these two schemes, the Carnegie Commission approach is probably more sound in that it recognizes several institutional characteristics including degree and academic programs offered; amount of federal support received for organized research; and a measure of undergraduate admission selectivity.

In a paper discussing the general topic of identifying peer institutions; Terenzini, Hartmark, Lorang and Shirley categorized the Carnegie Commission Classification scheme, and others like it, as "threshold" models (1979, p.2). They also identified the weaknesses of using "threshold" models for interinstitutional comparison purposes. Summarized, these weaknesses are: arbitrariness in selecting threshold points; threshold points are usually limited to a small number of institutional variables, and the selection of the threshold points; in fact, specifies the classification structure (1979, p. 1-3). Basically threshold models are highly dependent on subjective judgments of the person or persons who design the classification structure.

Recently, the National Center for Education Statistics (NCES) with assistance from the National Center for Higher Education Management Systems (NCHEMS) developed yet another taxonomy for grouping postsecondary institutions. The types of programs offered and the number of students participating in the programs were used as the basis for classifying institutions (Makowski 1980, p.4). This institutional classification scheme used three numerical criteria for classifying higher education institutions:

1. Number of degrees earned by type of degree (doctorate, masters or baccalaureate).
2. Number of fields in which degrees were earned.
3. Ratio of degrees completed in several specific fields to total degree completions.

Five major categories of institutions were identified based upon these numerical criteria. However, institutions are still classified into these major categories using a "threshold" approach. For example, institutions which grant a minimum of 30 doctoral-level degrees in three or more doctoral-level programs are categorized as major doctoral-granting institutions (Makowski 1980, pp.5-6). While this taxonomy is an improvement over the Carnegie Commission classification system, it still has the weaknesses of the "threshold" approach.

Bazzani Comparison Framework

As was stated above, the Illinois Board of Higher Education staff recognized the value and usefulness of interinstitutional compensation and salary comparisons in the late 1960's. As a part of this interest, Dr. Craig Bazzani developed a faculty compensation comparison framework by identifying specific peer institutions for each of the Illinois public universities (1972).

The Bazzani framework does not have the weaknesses of the "threshold" types of institutional classification schemes because it uses a number of institutional variables for identifying comparable institutions without making arbitrary assumptions about "thresholds" of difference. Bazzani used a statistical technique called cluster analysis for grouping similar institutions based upon eight institutional variables. The institutional variables used by Bazzani were:

1. Total professional staff
2. Total degrees (number of bachelor, master, doctoral and professional degrees)
3. Number of graduate degrees

4. Number of doctoral programs
5. Percentage of graduate degrees to total degrees
6. Full-time-equivalent enrollment
7. Growth rate/percent change in enrollment, 1960 to 1970
8. Percentage of full professors to total professional staff (1972, p. 29):

The cluster analysis grouped the 140 randomly selected institutions into seven separate clusters (Bazzani 1972, p. 29); and Illinois public universities were placed into three of the seven cluster groups identified by the cluster analysis.

The second part of the Bazzani study identified the major determinants of average compensation for the institutions used in his analysis. For this part of his study, Bazzani selected a combination of institutional and State variables. Among these variables, the number of doctoral programs, an institutional variable, was identified as the most influential factor in determining faculty compensation levels. The second leading factor was per capita income, a State variable (1972, p. 62). Taken as a whole, the institutional variables used in the Bazzani study were found to be better predictors of average compensation than the State variables examined (1972, p. 72).

Since Bazzani completed his work, the Illinois Board of Higher Education staff has used the Bazzani peer institutional groups in the annual reports on faculty compensation and salary. However, the Bazzani framework has a number of limitations. The first of these is that Governors State and Sangamon State Universities were excluded because they were not operational at the time Bazzani did his study. Another limitation is the fact that Southern Illinois University and the University of Illinois were handled as one campus, respectively, rather than multi-campus universities; at the time Bazzani did his study, these two universities did not report average faculty compensation and salary data for each of their separate campuses.

The Bazzani study also did not provide "peer" groups for Illinois private institutions. A final problem with continued use of the Bazzani framework is the fact that fiscal year 1971 data was used in the study. Since fiscal year 1971 substantial program and enrollment changes have probably occurred at many institutions. These changes could result in different institutional clusters using a replication of the Bazzani study technique with more current data.

Recognizing these limitations, the Board of Higher Education staff undertook a study to identify a new institutional peer structure for interinstitutional comparison purposes. The remainder of this paper describes the approach used and the results of the project.

Approach Used for Identifying Peer Institutions

Considerations Used in Selecting an Approach

A number of considerations influenced the selection of an approach for identifying a new set of institutions for peer comparisons to Illinois colleges and universities. The approach selected should be objective, that is, it should not require the Board of Higher Education staff to make a series of subjective decisions. The approach selected should meet the following criteria: be able to accommodate a large number of institutions; have the capability to handle a large number of individual factors for each institution included in the group being studied; be equally valid whether applied to public institutions, private institutions or public/private institutions combined; and, ideally have been applied previously to a comparable task with some measure of success.

The study approach selected was developed and used by Terenzini, et al., at the State University of New York at Albany (SUNY Albany) (1979, p. 2). This study approach met all of the criteria which were enumerated above. In addition, the results of the Terenzini study were intuitively satisfactory.

The statistical method used by Terenzini, et al., to handle a large number of institutional variables was factor analysis. The factor analysis was applied to fourteen separate institutional variables, which were reduced to four general factors: full-time student emphasis, faculty salaries, graduate/research orientation, and size (1979, p. 9). After identifying the four factors, Terenzini, et al., used a cluster analysis technique to place 176 institutions into groups and then a discriminant analysis to verify the clustered groups.

The institutions included in the Terenzini, et al., study offer the doctorate degree and in the most recent three years had conferred an annual average of fifteen or more doctorate degrees in a minimum of three non-related disciplines (1979, p. 4). (These criteria are used by AAUP to classify institutions into Category I) (1979, p. 336). While the focus of the SUNY-Albany study was limited to a smaller number of institutions than were planned for this study, the basic approach used seemed promising.

In addition to the SUNY-Albany study, there have been other studies involving the measurement of similarities and differences among higher education institutions which used factor analysis and cluster analysis. McShane used the cluster analysis technique for the classification of medical schools (1977), and Smart used factor analysis and discriminant analysis to investigate organizational diversity in American higher education (1980). Factor analysis also was used in the analysis of thirtythree institutional variables in a study by Astin of 335 higher education institutions (1962).

Data Used for Study

The scope of a study of this nature is limited by the quantity and quality of data available. Most data used in this study was collected by the U.S. Department of Education through the Higher Education General Information Survey (HEGIS). Through HEGIS, data is reported annually by higher education institutions in the following areas: finances, student enrollment, degrees awarded, and number of employees. In addition to HEGIS, some data was taken from the annual AAUP faculty compensation and salary report. The only additional source of data was the Barron's Index of undergraduate selectivity (1978). The HEGIS and AAUP data used were for fiscal year 1977. Data for 1,126 institutions were collected.

Using the data available, the first step in the study was to identify institutional variables which could be used to separate the institutions into "peer" groups. In all, thirty-two separate institutional variables were selected and these are identified on Table 1. Of these variables, sixteen were developed by the Board of Higher Education staff. The remaining variables were selected from various other studies. A source for each variable used is also shown on Table 1. The following is a brief description of the institutional variables selected.

Control. Two categories of institutional control were used - public and private.

Barron's Index. A measure of undergraduate admissions selectivity which is published annually. The index places all colleges and universities into six groups based on their respective admissions selectivity (1978).

No. of Bachelors Degrees Awarded. The number of bachelors degrees awarded for an academic year as reported through HEGIS. This is a measure of program size at the undergraduate level of instruction.

No. of Masters Degrees Awarded. The number of masters degrees awarded for an academic year as reported through HEGIS. This is a measure of program size at the masters level of instruction.

No. of Doctors Degrees Awarded. The number of doctorate degrees awarded for an academic year as reported through HEGIS. This is a measure of program size at the doctoral level of instruction.

No. of 2-Digit HEGIS Disciplines, Bachelor Degrees. The number of 2-digit HEGIS disciplines in which bachelor degrees are offered. This is a measure of program breadth at the bachelor's level.

No. of 2-Digit HEGIS Disciplines, Masters Degrees. The number of 2-digit HEGIS disciplines in which masters degrees are offered. This is a measure of program breadth at the masters level.

No. of 2-Digit HEGIS Disciplines, Doctoral Degrees. The number of 2-digit HEGIS disciplines in which doctoral degrees are offered. This is a measure of program breadth at the doctorate level of instruction.

Bachelors Degrees per 4-Digit HEGIS Discipline. The number of bachelor degrees for each 4-digit HEGIS discipline. This is a measure of program depth at the bachelors level of instruction.

Masters Degrees per 4-Digit HEGIS Discipline. The number of masters degrees for each 4-digit HEGIS discipline. This is a measure of program depth at the masters level of instruction.

Doctoral Degrees per 4-Digit HEGIS Discipline. The number of doctoral degrees for each 4-digit HEGIS discipline. This is a measure of program depth at the doctoral level of instruction.

Total Bachelor Degrees in Education per Total Bachelor Degrees. The number of bachelor degrees granted in the discipline of education per the total number of bachelor degrees granted. This is a measure of program comprehensiveness at the bachelors level of instruction.

Total Masters Degrees in Education per Total Master Degrees. The number of masters degrees granted in the discipline of education per the total number of masters degrees granted. This is a measure of program comprehensiveness at the masters level of instruction.

Total Doctoral Degrees in Education per Total Doctoral Degrees. The number of doctoral degrees granted in the discipline of education per the total number of doctoral degrees granted. This is a measure of program comprehensiveness at the doctoral level of instruction.

Percentage of Undergraduate Students Who Are Full-Time. Percentage of total undergraduate enrollment which are enrolled full-time. This variable is a undergraduate student characteristic.

Total FTE Enrollment. Total full-time-equivalent (FTE) enrollment at all levels of instruction. This is a measure of overall size.

Total FTE Enrollment of Graduate Students. Total full-time-equivalent enrollment of graduate students at all levels of instruction. This is a measure of overall size at the graduate level of instruction.

Total First Professional FTE Enrollment. Total FTE enrollment in first professional degree programs. This is a measure of overall size of first professional degree programs.

Total Professional Staff. The full-time-equivalent number of professional staff employed by the institution. This is a measure of overall size.

Total Educational and General Expenditures. Total education and general expenditures reported in the HEGIS Financial reports. This is an overall measure of financial support required to operate the institution.

Grant Contract Revenue. Current fund grant contract revenue reported in the HEGIS financial reports. This is a measure of externally funded research support received by the institution.

Number of Faculty by Rank. The number of faculty are reported by rank annually by the American Association of University Professors (AAUP). This is a measure of overall size and an indication of the experience and maturity level of faculty employed by each institution.

- number of full professors
- number of associate professors
- number of assistant professors
- number of instructors

Percentage of Total Faculty Who Are Full Professors. The percent of total faculty who have reached the rank of full professor. This is an overall measure of the experience and maturity level of the faculty employed by the institution.

Faculty Workload. The ratio of total FTE enrollment to the total number of faculty employed by the institution. This is an overall measure of the workload attainment of faculty employed by the institution.

Total Degrees Conferred per Total Enrollment. Total number of degrees conferred for all programs per total FTE enrollment. This is a measure of overall program and student quality for each institution.

In addition to these variables, four variables which measure average faculty compensation by academic rank were considered during the initial selection process. These variables are designated separately on Table 1 because they were excluded from the final factor analysis. The reason for excluding these variables is that a primary purpose for developing an institutional framework is to make interinstitutional comparisons of average faculty compensation. If average compensation variables had been included the groupings could have been heavily influenced by these variables. The results would then be much less useful for examining relative compensation with regard to other factors.

Most of the variables used are measures of overall size and the comprehensiveness of programs offered at all levels of instruction, but several may be considered indirect measures of program quality. First, the Barron's Index is an indirect measure of undergraduate program quality at a specific institution. The underlying assumption is that institutions which are highly selective in admitting undergraduates also have high quality undergraduate instructional programs.

Second, the ratio of degrees conferred to total enrollment may also be considered an indirect measure of quality, assuming that institutions which have a high ratio of degrees awarded to total enrollment also offer high quality instructional programs. However, this may also be a measure of the institution's admission selectivity - those institutions which are most selective in admitting students would be expected to have the highest degree completion ratio. Degree completion ratios can be misleading, however. An institution with low standards or an institution with many transfer students or short term degree programs could have a high degree completion ratio.

A third indirect indicator of quality is amount of external grant funds per professional staff member. Presumably, a high quality faculty will tend to be more successful in attracting external grants to the institution.

In a recently published paper, Smart, et al. identified various measures which directly or indirectly reflected quality or prestige within the academic community. They used variables such as the average composite SAT Verbal and Math scores for each institution being examined, and composite university scores on ratings of doctoral faculty in studies by Carter and by Roose and Anderson (1980). While these variables may be useful in the process of separating institutions into similar qualitative groups, few would agree that they are adequate measures of institutional quality.

Of the variables used in this study, those which measure program breadth, depth and comprehensiveness have, to our knowledge, not been used previously. These variables measure dimensions other than overall size which are intuitively important in distinguishing among institutions. By measuring a number of institutional dimensions, it is anticipated that the institutional groups resulting from this study will be more acceptable.

The program comprehensiveness measures used in the study require further explanation. The comprehensiveness measure was used to determine the extent to which an institution offers degree programs across a variety of the academic disciplines. A totally comprehensive institution would award degrees in all academic disciplines at all student levels, and it is unlikely that one discipline would account for a disproportionate share of the total.

Rather than count the number of disciplines in which degrees are awarded for each institution, this study used the ratio of degrees offered in the field of education to total degrees offered. It was assumed that an institution which awards a large proportion of its total degrees in one specific academic discipline is less comprehensive than an institution with a more balanced array of degree programs. Education was selected because many state universities have evolved from teacher preparation institutions. While many of these institutions have changed their official names from college to university, they remain heavily committed to the preparation of elementary and secondary school teachers.

Study Methodology

The methodology used in this study is similar to the one used in the Terenzini study to identify higher education institutions having attributes and characteristics similar to SUNY-Albany (1979, p. 1). This methodology includes the use of factor analysis, cluster analysis, and discriminant analysis to identify peer groups.

First, factor analysis is used to identify a small number of factors, based upon common relationships among a larger number of variables, that can be used more easily to construct peer groups. Second, cluster analysis is used to group institutions according to their relative similarity on the various factors that were identified in the previous step. Third, discriminant analysis is used to test whether the clustering technique has, in fact, resulted in groups that are as closely similar as possible. In this study, a few institutions were moved into more appropriate clusters based upon the results of the discriminant analysis, and an additional discriminant analysis was made to confirm that the new groupings improve the cluster.

The computer software programs used to run the factor analysis, cluster analysis, and discriminant analysis are those developed by the University of California (Dixon and Brown 1979). These programs are referred to as the Biomedical Computer Programs and the reference numbers for the programs used follow:

Factor Analysis - P4M (Dixon and Brown 1979, pp. 656-654)

Cluster Analysis - P2M (Dixon and Brown 1979, pp. 633-642)

Stepwise Discriminant Analysis - P7M (Dixon and Brown, 1979, pp. 711-733)

In the following sections each of these statistical techniques is described in greater detail:

Factor Analysis. Factor analysis is a branch of statistical science, first developed and used in the field of psychology (Harman 1976, p. 3). Since its development in the field of Psychology, factor analysis technique has been used

widely in other fields such as medicine, economics, political science, and sociology (Harman 1976, p. 7). The factor analysis technique has also been used widely in various higher education research efforts (Astin 1962; Smart, Elton, and Martin 1980).

The factor analysis technique has the capability of bringing order out of the relationships among a large number of variables (Harman 1976, p.8). A satisfactory factor analysis results when the solution yields a small number of factors which convey all of the essential information of the original, larger number of variables. The primary reason for developing the factor analysis technique is to attain scientific economy of description (Harman 1976, p. 4).

Cluster Analysis. Cluster analysis is a statistical method for grouping a large number of cases using measures of similarity or dissimilarity among different variables, or as in the case of this study, among different factors based upon a larger group of variables.

Initially in the clustering process, each case is considered to be a cluster on its own. At each step of the clustering process, the two clusters which have the shortest mathematical distance between them are combined and joined to form a new cluster (Dixon and Brown 1979, p. 633). The clustering process is continued until all cases being examined are clustered into a single, large cluster. This clustering process is referred to as Ward's hierarchical cluster analysis method (McShane 1977, p. 10). To achieve the purpose of the cluster analysis the user of the cluster analysis must select an optional pattern of clusters from the numerous patterns that appear at various stages of the clustering process (Terenzini 1979, p. 7). This shortcoming is the reason for using a form of discriminant analysis to verify the classification of cases which resulted from the cluster analysis.

Discriminant Analysis. Discriminant analysis is a statistical technique that enables the user to examine previously established groups and determine:

- The variables or (in this case) factors that best describe the differences among the groups;
- The importance of each of the variables or factors in accounting for the differences among the groups;
- The extent to which individual cases (or institutions) are similar to the average characteristics of their respective groups; and
- The group to which individual cases should be assigned if, in fact, their best "fit" is not in their original group (Tatsuoka 1970).

The discriminant analysis is begun by identifying the factors used in the cluster analysis that best discriminate between the clusters selected.

This factor is the first to be entered into discriminant analysis. In a stepwise fashion, the discriminant analysis then selects the other factors in order of their importance in explaining the separation of the clusters. Then group means are calculated for each of the factors that are found to be important in the first step (the important factors are called discriminant functions) and the groups are "mapped" into space. The factor scores for individual institutions can then be compared to the "location" of their cluster means.

Because the cluster analysis procedure works on the principle of joining the cases or clusters which are most similar, those cases which cluster near the end of the clustering process tend to be dissimilar to other institutions in the cluster. The clustering process is not complete until all cases have been included into a cluster. Those cases which tend to be unlike any other case and are forced into a cluster late in the process may not be assigned to the cluster that best matches their characteristics. The discriminant analysis technique will determine whether or not all cases have been consistently classified, and, if they have not, it will specify the cluster into which they would have been more appropriately classified.

Study Results

Results of the Factor Analysis

The twenty-seven institutional variables used in this study were entered into the factor analysis. Five factors were identified as having eigenvalues greater than one. These five factors explained 75.7 percent of the variance among the institutional variables used in this study.

The factor analysis first identifies the principle axis along which there is a maximum of variance. Then a second axis, constructed orthogonally (uncorrelated) to the first, accounts for the maximum amount of variance which remains. This process is continued until all the variance among the variables used is explained (Cooley and Lohnes 1971, p. 130). The five factors identified in this study explained more than 75 percent of the variance in the twenty-seven variables. These five factors were orthogonally rotated using Kaiser's varimax criterion. Standardized factor scores for each of 1,118 institutions were produced based on the rotated factors.

Table 2 shows the amount of variance explained by each of the five factors. Factor One, with an eigenvalue of 13.99, accounted for more than 50 percent of the variance among the institutional variables, and factor Two explained nearly nine percent of the total variance. Examining each of the five factors from top down in Table 2, it can be observed that each factor explains progressively less of the total variance among the original twenty-seven institutional variables. A successful factor analysis explains a large proportion of the variance with a small number of factors (Dixon and Brown 1979, p. 661). Based on this criterion, the results achieved in this study appear to be satisfactory.

Table 3 shows results of the rotated factor loadings. Because of the strong positive loadings on variables which measure overall institutional size and program comprehensiveness, the first factor has been referred to as "Overall Size and Program Comprehensiveness." The second factor has been labeled "Overall Size and Program Comprehensiveness at the Doctoral Level." For this factor, there was a negative loading on the percentage of total FTE enrollment which is undergraduate. Current fund revenues from grants and contracts also loaded heavily on this factor, confirming that institutions having strong comprehensive doctoral programs are also active in research.

The variable which loaded most strongly on the third factor is the Barron's Index of selectivity of undergraduate students. For this reason this factor has been labeled "Undergraduate Admission Selectivity." Five of the institutional variables loaded negatively on this factor. All of these variables measured program comprehensiveness at the three student levels of instruction - bachelors, masters and doctorate. Even though it was not a strong loading, the Ratio of Total Degrees Conferred to Total FTE Enrollment loaded on factor three. This loading suggests that institutions which are selective in admitting undergraduates also have a higher degree of success rate towards graduation and the receipt of a degree. The third variable which loaded positively with factor three is the Percentage of Total Faculty Who Are Full Professors, suggesting that institutions which have high standards for undergraduate admission also have a proportionally high percentage of total faculty who are full professors.

Two of the three variables which loaded heavily on factor four are measures of program depth and comprehensiveness at the masters level. For this reason, this factor has been labeled as "Program Comprehensiveness at Masters Level." The ratio of total degrees conferred to total FTE enrollment also loaded heavily on this factor. The only negative loading on this factor was the percentage of total enrollment which is undergraduate and, in view of the variables which heavily loaded on this factor, this is logical.

The fifth factor was influenced heavily by a single positive loading from the variable which measures faculty workload. Therefore, this factor has been titled "Faculty Workload." This factor had three additional variables which loaded negatively. The negative loadings suggested that institutions which have relatively high faculty workload ratios tend to have lower undergraduate admission standards, a smaller percentage of faculty who hold rank of full professor, and a small number of doctoral programs.

Table 4 is a summary of each of the five factors used in this study and the title given to each. Standard factor scores for each of the 1,118 institutions in this study were produced by the factor analysis program. These scores are shown in Appendix A (Table A-7).

Results of the Cluster Analysis

The standard factor scores for each of the 1,118 institutions were then entered into a cluster analysis. Initially, all institutions were clustered together. Selecting the optimal number of clusters is difficult and subjective, and in this study, it was made even more difficult by the total size of the institutional population being used. For this reason the institutional population was divided into public and private institutional groups. This division assisted in interpreting the results of the cluster analysis, and the discriminant analysis to be discussed later in this report revealed several basic differences between the public and private institutional population.

The 416 public institutions for which standard factor scores had been computed clustered into eighteen groups. The size of these groups ranged from one institution to seventy-nine. The Illinois public universities were included in eight of the eighteen separate groups.

Factor scores for 671 privately controlled institutions were entered into the cluster analysis and a total of twenty-seven institutional groups were selected for further examination. These institutional groups ranged in size from two to 157 institutions.

Results of Discriminant Analysis

Table 5 shows the results of the discriminant analysis. As mentioned earlier, the discriminant analysis program adds, in a stepwise manner, the factors in decreasing order of significance. Factor One, Overall Size and Program Comprehensiveness, was the most significant factor in discriminating among the eighteen groups of public institutions. The second most significant factor was Program Comprehensiveness at the Masters Level (Factor four). The third most significant factor was Faculty Workload (Factor Five).

In addition to measuring the extent to which each of the five factors discriminate among the eighteen public institutions selected, the discriminant analysis provides a corroboration for the eighteen institutional groups through a classification analysis. The results of this classification analysis are shown on Table 6. Among all eighteen groups, 91.4 percent of the institutions were classified in the group that most closely matches its characteristics.

For purposes of this study, the discriminant analysis was performed twice. Over 85 percent of the total institutions were identified as being properly classified after the first discriminant analysis. Then the misclassified institutions were placed in a more appropriate institutional group based on the analysis. The second discriminant analysis run was made to determine the extent to which the groupings were improved by the reclassification of these institutions.

In view of the large number and the diversity of institutions included in the cluster analysis, the classification of 91 percent of all institutions in groups that are statistically distinct from all other groups is a highly satisfactory result.

In addition to the classification analysis, the discriminant analysis program provides plots of the location of the group centroids for each of the institutional clusters. Terenzini, et al. suggested that these plots might assist planners and administrators in understanding how the institutional groups resemble each other. The plotting is done using the first and second canonical variables, which are composite measures of the factors used in the discriminant analysis. Because they are composite measures of the five factors used in the study, it is difficult to describe and label them. The reader can review the composition of these variables by referring to the coefficients for all five of the canonical variables in Appendix A (Table A-8).

Figure 1 is a two-dimensional plot of these institutional groups which included Illinois public universities using canonical variables I and II. Because the actual mathematical plot of these variables is in five-dimensional space, it is difficult to interpret the locations on a two-dimensional scale. On one dimension institutions X and Y may appear to share locations when in space they are a considerable distance from each other. However, the plots on Figure 1 do show that a number of quite distinct institutional groups have been identified.

Table B-1 in Appendix B is a listing of the specific institutions within the institutional groups which include public universities. These groups reflect all of the reclassifications which resulted from the second discriminant run.

Table 7 is a listing of the specific institutions within the eight institutional groups which include Illinois public universities. These groups reflect all of the reclassifications which resulted from the second discriminant run. For an examination of institutions within all eighteen groups which resulted from this study, refer to Appendix B.

Table 7 summarizes the results of the discriminant analysis for private institutions. The factor which was most important in discriminating among the private institutions was Program Comprehensiveness at the Masters Level, Factor Four. The second most important factor for the private institutions was Overall Size of Graduate Programs and Program Comprehensiveness at the Doctoral Level, Factor Two.

This result is somewhat different from the result of the public institution discriminant analysis. For the public institutions, the most important factor was Overall Size and Program Comprehensiveness, Factor One. Factor Four was also the second most important in discriminating among the public institutions. The differences in the discriminant analysis for private institutions may be partially

explained because private institutions, as a group, apparently do not offer a broad range of academic programs at all three student levels. Therefore, the factors which were heavily loaded by the institutional variables measuring size and scope of graduate programs emerged as very important in discriminating among the private institutional groups.

As for public institutions, a second discriminant analysis was performed after reclassifying certain institutions not properly classified in the original cluster analysis. Table 8 shows the percentage of private institutions which were misclassified after this second discriminant analysis. For all twenty-seven institutional groups 93.3 percent were found to be properly classified. This is a marked improvement over the results of the first discriminant analysis run in which 82.9 percent were properly classified. The twenty-seven groups of private institutions are presented on Table B-2 in Appendix B.

Figure 2 is a plot of the private institutional groups which include Illinois institutions. This plot was constructed using canonical variables I and II, which are composite measures of the five factors which were most influential in discriminating among the institutional groups. The statistical data for these variables is reported in Appendix A (Table A-9).

Again, it must be stressed that the plot in Figure 2 has been reduced to two dimensions. Therefore, institutional groups which appear to be quite similar could in fact be quite dissimilar in the five-dimensional space. However, the plots are useful in determining the extent of differences among the various institutional groups. Group 25, which includes Northwestern and the University of Chicago, is quite distinct from the other groups. The remaining institutional groups which include Illinois institutions appear to be more similar, but the group centroids do indicate several distinct groups.

Institutional Groups of Illinois Institutions

Public Universities. Of the eighteen total institutional groups used in the discriminant analysis eight included Illinois public universities. Table B-1 in Appendix B is a listing of the institutional groups which include public universities.

Eastern Illinois University is in Group Three with thirty-six other institutions and Sangamon State University has been classified into Group Six with twenty-eight other institutions. After the cluster analysis, Sangamon State was placed into Group Seven, but the results of the discriminant analysis indicated that it should be included in Group Six. In some respects Sangamon State University appears to be different from the average institution in either Groups Six or Seven, but it seems to be more similar to institutions in Group Six than Group Seven.

Chicago State, Northeastern Illinois, Western Illinois and SIU-Edwardsville were all placed into Group Seven with a total of thirty-two institutions. Chicago State was originally placed into Group One by the cluster analysis, but the discriminant analysis indicated that Group Seven was a more appropriate cluster.

SIU-Carbondale was placed into Group Twelve by the cluster analysis, but the discriminant analysis indicated that it is more appropriately classified with Group Eleven. Illinois State and Northern Illinois remain in Group Twelve with a total of forty-one institutions.

The University of Illinois-Chicago Circle was placed into Group Fourteen by the cluster analysis; and it remained identified with this group after discriminant analysis. Governors State University was placed in Group Sixteen with a total of only four institutions. This suggests that Governors State is unlike most other public institutions included in this study.

The University of Illinois at Urbana/Champaign was clustered into Group Seventeen with nine other institutions. It should be noted that seven Big Ten institutions were identified as a part of this group. Northwestern University was excluded because they are a privately controlled institution, and the Universities of Indiana and Iowa were placed into another institutional group. This result is possibly due to the fact that these two institutions are not as large as the seven Big Ten institutions in Group Seventeen, and apparently do not offer a broad range of programs at all three student levels - undergraduate, masters and doctorate. It should also be noted that these two universities are located in states which have separate large land grant institutions - Purdue and Iowa State.

All but one of these institutional groups appear to be satisfactory. The group which includes Governors State University contains only four institutions. For calculating measures such as average compensation by faculty rank, a larger population would be more acceptable for making meaningful statistical inferences. However, the data used in this study suggest that Governors State University and the three other institutions in Group Sixteen are quite distinct from any of the other institutional groups found in the study. The data also suggest that there are a relatively small number of institutions in the public institutional population which are similar to the University of Illinois - Chicago Circle (13 institutions) or at Urbana/Champaign (10 institutions).

Private Institutions. Of the twenty-seven private institutional groups selected from the cluster analysis, seventeen included at least one Illinois private institution. Only two of these seventeen institutional groups had less than ten institutions. Group Twenty-One (Rosary College) had a total of five institutions while Group Twenty (College of St. Francis) had six. Table B-2 in Appendix B is a listing of the institutional groups which include private institutions

The cluster analysis placed Northwestern University into Group Nineteen with Loyola University (Chicago) and DePaul University. However, the discriminant analysis suggested that Northwestern University was misclassified in Group Nineteen and moved it to Group Twenty-Five. This result intuitively is more satisfactory because Northwestern University is more commonly associated with the institutions in Group Twenty-Five, and not with institutions in Group Nineteen.

The discriminant analysis for the private institutional population also identified another potential problem in classifying private institutions: Many private institutions are church-related, offering extensive theological programs at the undergraduate and graduate levels. Degree data for these programs are reflected in the various ratios used to measure program depth, breadth and comprehensiveness. Therefore, an institution which awards a large proportion of its total masters degrees in theology would be classified as being similar to an institution which awarded a large proportion of its total masters degrees in engineering. This problem could be corrected by including an institutional variable which measures the degree to which theological programs are represented in the institution's curriculum.

A detailed listing of institutions in each of the public and private institutional groups is included in Appendix B.

Conclusion

As stated earlier, the purpose of this study was to identify various institutional comparison groups for public and private institutions in Illinois. The primary reason for identifying groups of private institutions is to have a basis for the comparison of average compensation and salary in Illinois institutions to similar institutions in other states. The institutional groups resulting from this study appear to be acceptable for average compensation and salary comparisons. They will be used in an analysis of average compensation and salary that will be provided in subsequent reports by the Board of Higher Education staff.

While the results of this study were acceptable, there may be ways of improving such studies in the future. First, the basic data used for the study was collected in fiscal year 1977. If possible, it would be desirable to conduct later studies on more current data. However, a difference of one or two fiscal years would probably produce only marginal changes in the study results.

Another possible means of improving studies of this type may be the introduction of more institutional variables which measure program quality. While such measures are often subjective and controversial, they are relevant to the question of faculty compensation and they may be useful in distinguishing groups of peer institutions. In subsequent studies it may be desirable to include more institutional variables of this nature.

Although the results of this study are satisfactory in terms of its intended purpose, it is important to stress that no grouping of institutions can be considered definitive or final. Colleges and universities are complex, constantly changing organizations. The clusters of peer institutions which were found in this study may well be different in five years as institutions change. For this reason such studies should be updated periodically.

Tables

TABLE 1

INSTITUTIONAL VARIABLES SELECTED FOR THE STUDY AND SOURCE OF VARIABLES

ABBREVIATION Code	Institutional Variables	SOURCE			ED Paper	ED Original
		Bazzani Paper	REHEC Paper	REHEC Paper		
CON	Control*					X
SPEDW	Sparsity Index		X			
ABR01	No. Bachelors Degrees Awarded ¹	X			X	
ABR02	No. Masters Degrees Awarded	X			X	
ABR03	No. Doctoral Degrees Awarded	X			X	
ABR04	Breadth-No. Two Digit DEGREES (Bachel. Deg.)					X
ABR05	Breadth-No. Two-Digit DEGREES (Masters Deg.)					X
ABR06	Breadth-No. Two Digit DEGREES (Doctoral Deg.)					X
ADR01	Depth-Avg. Bachel. Deg./6 Digit DEGREES ²					X
ADR02	Depth-Avg. Masters Deg./6 Digit DEGREES					X
ADR03	Depth-Avg. Doctoral Deg./6 Digit DEGREES					X
ACOMP1	Comp-Total Bachel. Deg. in Ed./Total Deg.					X
ACOMP2	Comp-Total Masters Deg. in Ed./Total Deg.					X
ACOMP3	Comp-Total Doctoral Deg. in Ed./Total Deg.					X
AF106	% of FT Students-Undergraduate		X			
B014	Total FTE	X			X	
B016	Total Graduate-FTE ³	X			X	
F021	Total Faste-Prof. FTE (Full-Time)					X
B151A1	Total Faste-Prof. FTE	X				X
F022	Total Non-Faste Gen. Expenditures			X		
F023	Current Time Sec ⁴ , Grants Cont. (1/5)		X			X
DR011	Rat. of Faste					X
DR012	Rat. of Non-Faste/Total					X
DR013	Rat. of Faste/Non-Faste					X
DR014	No. of Faste/Non-Faste					X
DR015	% of Faste/Non-Faste Professors					X
DR016	Female/Total Faculty/Non-Faste Faculty		X			X
DR017	Total Degrees Completed/Total Enrollment					X

INSTITUTIONAL VARIABLES DATA COLLECTED FOR THE STUDY

DR011	Avg. Faculty Compensation Professors	X
DR012	Avg. Faculty Compensation Assoc. Profs.	X
DR013	Avg. Faculty Compensation Asst. Profs.	X
DR014	Avg. Faculty Compensation Instructors	X

Control was not a variable used in analysis. DR017 was used extensively for sorting.

Footnotes:

¹ Bazzani's variable was actually in two parts: total No. of Degrees Awarded and No. of Graduate Degrees. After a discussion, we decided on the total No. used in the current study.

² REHEC had a variable somewhat related to this, one entitled, Ratio of Fields in which Degree earned.

³ REHEC used a similar variable, Ratio of degree completions in specific fields to total degree completions.

Table 2

AMOUNT OF VARIANCE EXPLAINED BY FIVE FACTORS

Factor	Description of Factor	Variance Explained (Eigenvalues)	Percentage of Variance Explained	Cumulative Percentage of Variance Explained
One	Overall Size and Program Comprehensiveness	11.9919	51.802	51.802
Two	Overall Size of Graduate Programs and Program Comprehensiveness at Doctorate Level	1.4259	8.99	60.80
Three	Undergraduate Admission Selectivity	1.1762	6.39	67.20
Four	Program Comprehensiveness at Masters Level	1.0713	6.53	73.73
Five	Faculty Workload	1.0739	6.59	80.32

ROTATED FACTOR LOADINGS FOR FIVE FACTORS - ONLY LOADINGS OF 0.25 OR GREATER REPORTED

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Description of Variable	Factors					Common Variance
	Factor 1 Undergraduate and Programs Completion Rates	Factor 2 By Full Size and Program Completion Times of the Doctorate Level	Factor 3 Undergraduate Adaptivity Activity	Factor 4 Faculty Productivity	Factor 5 Faculty Quality	
No. of Bachelor Degrees Awarded	0.936					0.875
Total UG Enrollment	0.926	0.195				0.875
No. of Associate Professors	0.919					0.875
No. of Assistant Professors	0.895	0.272				0.875
No. of Full Professors	0.852	0.1				0.875
Dept. of Bachelor Progs	0.796			0.334		0.770
Total Professional	0.782	0.353				0.852
Total Graduate EE Ratio	0.776	0.526				0.9015
Total Educational and General Expenses	0.769	0.565				0.9528
Breadth of Bachelor Programs	0.723	0.383		0.356		0.8125
No. of Master Degrees Awarded	0.700	0.508		0.299		0.8991
No. of Doctorate Degrees Awarded	0.672	0.619				0.8853
Breadth of Associate Programs	0.651	0.658				0.800
No. of Instructors	0.650		0.378			0.7999
Breadth of Bachelor Programs	0.640		0.277	0.786		0.7559
Total Total Professional Exp. Total Enroll	0.638	0.776				0.7776
Percentage of Total Enrollment Undergraduate		0.771		0.367		0.8611
Current Fund Revenue from Grants and Contracts	0.665	0.515	0.265			0.7850
Dept. of Doctor Programs	0.599	0.617				0.7212
Doctoral Titles			0.716		0.296	0.6595
Characterization of Bachelor Programs			0.702			0.5095
Quality of Instruction				0.761		0.9766
Ratio of Total Degrees (Masters) to Total UG Enrollment			0.331	0.654		0.5592
Completion Rates of Doctor Programs			0.375	0.631		0.5942
Faculty Retention					0.806	0.6671
Ratio of Total Faculty Undergraduate Programs	0.351		0.435		0.669	0.5734
Completion Rates of Doctoral Programs	0.338	0.372	0.355		0.339	0.5182

081

90

91

Table 4

DESCRIPTION OF FIVE FACTORS RESULTING FROM FACTOR ANALYSIS

Factor	Description of Factors
One	Overall Size and Program Comprehensiveness
Two	Overall Size of Graduate Programs and Program Comprehensiveness at Doctorate Level
Three	Undergraduate Admission Selectivity
Four	Program Comprehensiveness at Masters Level
Five	Faculty Workload

Table 5

RESULTS OF DISCRIMINANT ANALYSIS
PUBLIC INSTITUTIONS

Step	Number of Factors	Factor	Approximate F-Ratio (a)	Discriminant Value (b)	
				Degrees of Freedom	Total Variance
1	One	Overall Program Comprehensiveness	110,706	177	0.64
2	Four	Programs at Masters Level	95,209	3678	1.33
3	Five	Faculty Work	85,615	51718	1.56
4	Two	Over. Size of Graduate Programs and Program Comprehensiveness at Doctorate Level	78,106	62,1556	1.67
5	Three	Undergraduate Admissions Selectivity	64,350	8571914	1.88

(a) Degrees of Freedom var. from 177/399 on Step 1 to 8571914 on Step 5.

(b) The table value of significance is an approximate measure of the statistical significance from the discriminant value. If statistically significant, the approximate F-ratio must be > than the threshold value. The high significance level (assuming $\alpha = .01$) is indicated by the central probability level.

Table 6

RESULTS OF CLASSIFICATION ANALYSIS
PUBLICLY CONTROLLED INSTITUTIONS

Institutional Group	Percent Correctly Classified	Classified Groups																		Total Number
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
One	85.52	51	4	0	1	4	0	0	0	2	0	0	0	0	0	0	0	0	0	67
Two	85.4	0	19	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	77
Three		0	0	15	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	83
Four	91.29	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	111
Five	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111
Six	84.8	1	1	0	0	0	28	0	1	0	2	0	0	0	2	1	0	0	0	111
Seven	79.5	0	2	2	1	2	0	31	0	0	1	0	0	0	0	0	0	0	0	119
Eight	100.0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	111
Nine	98.5	1	0	0	0	0	0	0	0	66	0	0	0	0	0	0	0	0	0	122
Ten	100.0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	111
Eleven	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110
Twelve	89.71	0	0	0	5	0	0	0	0	0	0	1	1	0	0	0	0	0	0	111
Thirteen	100.0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	99
Fourteen	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111
Fifteen	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111
Sixteen	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111
Seventeen	90.9	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	10	0	111
Eighteen	100.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	111
Total	91.42	55	26	17	22	12	28	32	6	66	7	47	41	11	6	7	0	0	1	418

* Total number of institutions prior to dissemination analysis

Table 1

RESULTS OF DISCRIMINANT ANALYSIS
PRIVATE INSTITUTIONS

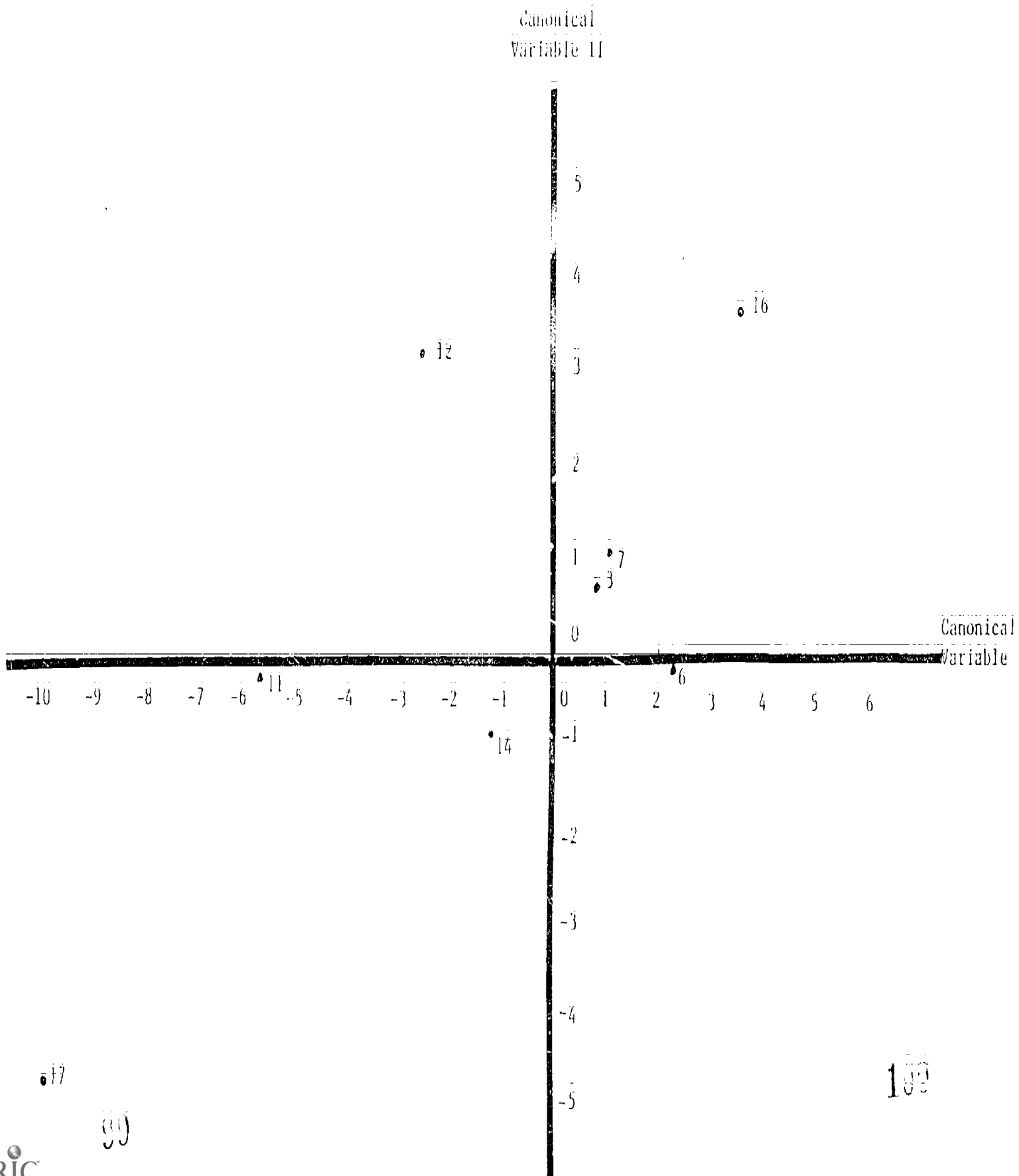
Step	Factors	Approximate F Ratio (a)	Interpolated Table Threshold Value for Significance Using an F-Distribution (b)	
			Degrees of Freedom	Threshold Values
1	Four Program Comprehensiveness at Bachelor Level	165.974	26/644	1.89
2	Two Overall Size of Graduate Programs and Program Comprehensiveness at Doctorate Level	156.160	52/196	1.51
3	Five Faculty Workload	130.649	38/1921	1.57
4	One Overall Size and Program Comprehensiveness	114.174	107/565	1.35
5	Three Undergraduate Admission Selectivity	105.889	140/1158	1.30

(a) Degrees of freedom vary from 26/644 on Step 1 to 140/1158 on Step 5.

(b) The table value of significance is an approximate measure of the statistical significance from the F-distribution. To be statistically significant, the approximate F ratio must be $>$ than the threshold value. The high significance test, assuming $\alpha = .01$, was used as the critical probability level.

Figure 1

LOCATION OF GROUPS WHICH INCLUDE ILLINOIS PUBLIC UNIVERSITIES



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Figure 1

COORDINATES FOR CANONICAL VARIABLES I AND II -
 INSTITUTIONAL GROUPS WITH ILLINOIS PUBLIC UNIVERSITIES

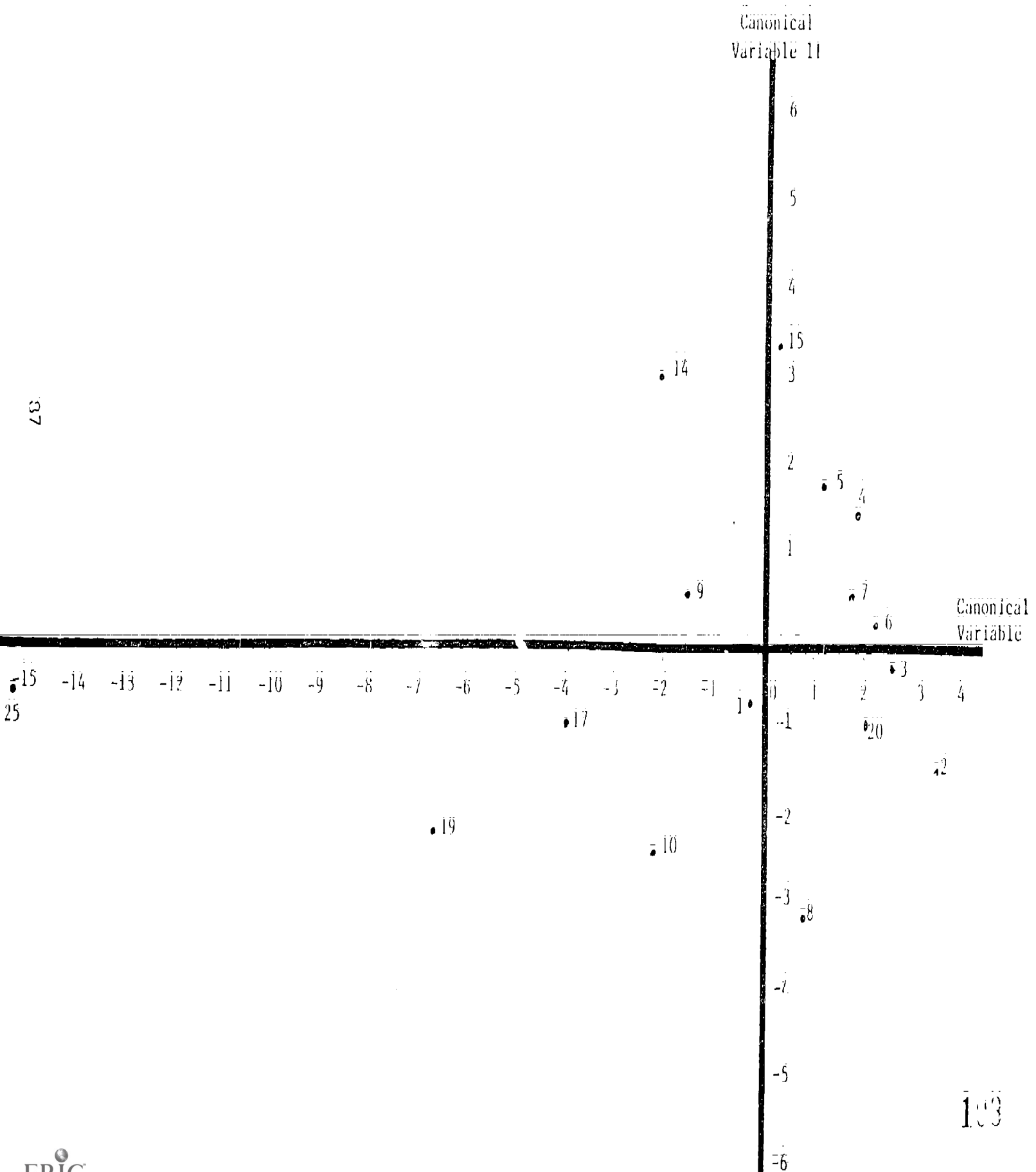
<u>Groups</u>	<u>Canonical Variable I</u>	<u>Canonical Variable II</u>
Three	0.82	0.79
Six	2.37	-0.01
Seven	0.93	1.10
Eleven	-5.49	-0.09
Twelve	-2.59	3.23
Fourteen	-1.08	-0.80
Sixteen	3.51	3.79
Seventeen	-9.73	-4.62

Group Location of Illinois Public Universities

<u>Groups</u>	
Three	Eastern Illinois
Six	Sangamon State
Seven	Chicago State; Northeastern Illinois; Western Illinois and Southern Illinois University-Edwardsville
Eleven	Southern Illinois University-Carbondale
Twelve	Illinois State and Northern Illinois
Fourteen	University of Illinois-Chicago Circle
Sixteen	Governors State
Seventeen	University of Illinois-Urbana/Champaign

Figure 2

LOCATION OF GROUPS WHICH INCLUDE ILLINOIS PRIVATE INSTITUTIONS



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Canonical Variable

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Figure 2

COORDINATES FOR CANONICAL VARIABLES I AND II =
 INSTITUTIONAL GROUPS WITH ILLINOIS PRIVATE INSTITUTIONS

<u>Groups</u>	<u>Canonical Variable I</u>	<u>Canonical Variable II</u>
One	-0.40	-0.57
Two	3.29	-1.36
Three	2.48	-0.29
Four	1.13	1.70
Five	1.06	1.80
Six	2.09	0.25
Seven	1.67	0.61
Eight	0.77	-3.24
Nine	-1.64	0.62
Ten	-2.34	-2.40
Fourteen	-2.23	3.12
Fifteen	0.10	3.45
Seventeen	-4.02	-0.91
Nineteen	-6.71	-2.07
Twenty	1.98	-0.88
Twenty-one	-4.02	-6.11
Twenty-five	-15.02	-0.58

Group Location of Illinois Private Institutions

<u>Groups</u>	
One	St. Xavier, Mundelein
Two	Eureka, Trinity
Three	Illinois Benedictine, Judson
Four	Elmhurst, Illinois Wesleyan, Augustana
Five	Lake Forest, Barat, Principia
Six	Millikin, Greenville, Monmouth, MacMurray
Seven	North Park, McKendree, Aurora, North Central, Illinois College, Quincy, Trinity Christian
Eight	Olivet Nazarene
Nine	Bradley
Ten	Illinois Institute of Technology, George Williams
Fourteen	Wheaton
Fifteen	Knox
Seventeen	Roosevelt, Lewis
Nineteen	Loyola-Chicago, DePaul
Twenty	College of St. Francis
Twenty-one	Rosary
Twenty-five	University of Chicago, Northwestern

Table 8

RESULTS OF CLASSIFICATION ANALYSIS
PRIVATE INSTITUTIONS

Institutional Group	Percent Classified	Classified Groups													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
One	98.5	62	0	0	0	0	0	0	0	1	0	0	0	0	0
Two	86.0	0	80	1	0	0	8	0	0	0	0	0	0	0	0
Three	97.8	0	1	65	0	0	0	0	0	0	0	0	0	0	0
Four	93.8	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Five	97.9	0	0	0	0	65	0	1	0	0	0	0	0	0	0
Six	96.8	1	6	0	0	0	60	2	0	0	0	0	0	0	0
Seven	93.8	0	0	1	0	0	1	61	0	0	0	0	0	0	0
Eight	91.7	1	0	0	0	0	0	0	11	0	0	0	0	0	0
Nine	88.0	2	0	0	0	0	0	0	0	22	0	0	0	1	0
Ten	90.6	0	0	0	0	0	0	0	0	0	29	0	0	0	0
Eleven	92.1	0	1	0	0	0	0	0	1	0	0	12	0	0	0
Twelve	100.0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
Thirteen	83.1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Fourteen	95.0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
Fifteen	85.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sixteen	85.7	0	0	0	0	0	0	0	0	9	0	0	0	0	0
Seventeen	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eighteen	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nineteen	89.7	0	0	0	0	0	0	0	0	0	2	0	1	0	0
Twenty	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Twenty-one	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Twenty-two	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Twenty-three	83.1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Twenty-four	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Twenty-five	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Twenty-six	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Twenty-seven	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	94.8	65	82	59	60	66	71	65	11	71	61	12	12	7	19

Table B (Continued)

RESULTS OF CLASSIFICATION ANALYSIS:
PRIVATE INSTITUTIONS*

Instructional Group	Percent Correctly Classified	Classification Group														Total Number**
		15	16	17	18	19	20	21	22	23	24	25	26	27		
One	98.52	0	0	0	0	0	0	0	0	0	0	0	0	0	61	
Two	85.0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	
Three	92.3	0	0	0	0	0	0	0	0	0	0	0	0	0	77	
Four	91.8	0	0	0	0	0	0	0	0	0	0	0	0	0	17	
Five	92.9	0	0	0	0	0	0	0	0	0	0	0	0	0	72	
Six	96.8	0	0	0	0	0	0	0	0	0	0	0	0	0	62	
Seven	91.8	0	0	0	0	0	0	0	0	0	0	0	0	0	65	
Eight	91.7	0	0	0	0	0	0	0	0	0	0	0	0	0	17	
Nine	88.0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	
Ten	90.6	0	0	1	0	0	0	0	0	0	0	0	0	0	62	
Eleven	92.3	0	0	0	0	0	0	0	0	0	0	0	0	0	11	
Twelve	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	
Thirteen	13.3	1	0	0	0	0	0	0	0	0	0	0	0	0	6	
Fourteen	95.0	0	1	0	0	0	0	0	0	0	0	0	0	0	50	
Fifteen	85.7	24	4	0	0	0	0	0	0	0	0	0	0	0	38	
Sixteen	85.7	2	18	0	0	1	0	0	0	0	0	0	0	0	21	
Seventeen	100.0	0	0	25	0	5	0	0	0	0	0	0	0	0	26	
Eighteen	100.0	0	0	0	5	0	0	0	0	0	0	0	0	0	20	
Nineteen	89.7	0	0	0	0	26	0	0	0	0	0	0	0	0	29	
Twenty	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
Twenty-one	100.0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	
Twenty-two	100.0	0	0	0	0	1	0	0	0	0	0	0	0	0	9	
Twenty-three	81.1	0	0	0	0	0	0	0	0	5	0	0	0	0	16	
Twenty-four	100.0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	
Twenty-five	100.0	0	0	0	0	0	0	0	0	0	0	10	0	0	10	
Twenty-six	100.0	0	0	1	0	0	0	0	0	0	0	0	3	0	3	
Twenty-seven	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	
Total	91.32	24	21	27	1	27	6	5	0	5	4	10	4	0	371	

* Total number of instructional hours prior to all subsequent analysis.

** Listing of 100-hour private first-hour(s) in each group is provided as a separate addendum to Table 9.

ADDENDUM TO TABLE 8

Privates

<u>Group 1 - N=65</u>	<u>Group 8 - N=11</u>
Mundelein St. Xavier	Olivet Nazarene
<u>Group 2 - N=80</u>	<u>Group 9 - N=23</u>
Eureka Trinity	Bradley
<u>Group 3 - N=49</u>	<u>Group 10 - N=32</u>
Illinois Benedictine Judson	Illinois Institute of Technology George Williams
<u>Group 4 - N=30</u>	<u>Group 14 - N=19</u>
Elmhurst Illinois Wesleyan Augustana	Wheaton
<u>Group 5 - N=46</u>	<u>Group 15 - N=27</u>
Lake Forest Barat Principia	Knox
<u>Group 6 - N=71</u>	<u>Group 17 - N=27</u>
Millikin Greenville Monmouth MacMurray	Roosevelt Lewis
<u>Group 7 - N=65</u>	<u>Group 19 - N=26</u>
North Park McKendree Aurora North Central Illinois College Quincy Trinity Christian	Loyola-Chicago DePaul
	<u>Group 20 - N=6</u>
	College of St. Francis
	<u>Group 21 - N=5</u>
	Rosary
	<u>Group 25 - N=10</u>
	Northwestern University of Chicago

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RESEARCH PAPERS

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Evaluating College Campus Closings for the 1980s:
A Case Application of an Optimization Model

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November 1980

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Introduction*

It is widely believed that most states overbuilt their public higher-education facilities during the postwar period and that there will be severe problems of excess higher-education capacity in the 1980s. However, there is little analytical basis currently available to determine which programs and institutions represent excess capacity. Without objective criteria, state governments will be inclined to make across-the-board reductions at higher-education facilities, even if it would be preferable to close some institutions and expand others. Further, whenever criteria for budget cuts are ambiguous and unpredictable, state planners and legislatures will receive little of the cooperation from institutional administrators and faculty that is required to cope with the problem of excess higher-education capacity.

This paper provides a case application to community colleges in northeastern Minnesota of an optimization model designed to assist policymakers in making choices about campus closings. With detailed institutional data on size, quality, and costs, and estimated enrollment demand functions, the model can be used to calculate optimal choices for program and institutional closings. In the model the state's objective is to insure that specified proportions of enrollment demand for each program at each defined location in the state are satisfied with a minimum total expenditure of state funds. With declining enrollments, the state can close and consolidate programs to achieve cost savings that result partly from lower unit costs in surviving programs. To maintain access travel grants must be given to students living near the closed programs to allow them to attend elsewhere. The optimization model incorporates this tradeoff between institutional cost savings and expenditures for travel grants.

Description of the Model

The optimization model is designed to search out the consequences of alternative closings of campuses until it finds a case where the state's higher-education costs are minimized subject to constraints. For each

*The research underlying this paper is part of an ongoing project on statewide higher education planning supported by the University of Minnesota administration and the Minnesota Higher Education Coordinating Board. We wish to thank David J. Berg, Director, Management Planning and Information Services, for his encouragement. Daniel J. Pierro and William C. Weiler of the Management Information Division have contributed to the project on statewide higher-education planning. We are grateful to Colleen T. Davidson and Jean L. Twite for helping to prepare this paper.

hypothetical closing of a campus, the model's search examines the costs of travel grants necessary to induce students to make the choices leading to the alternative enrollment levels. The model's computer programs are designed so that the search leading to the constrained minimization of cost can be performed in a finite number of steps at reasonable cost.

The state's total higher-education costs, consisting of the sum of per student costs times enrollments in all institutions plus the costs of travel grants to students, constitute the model's "objective function." The constraints include per student costs in each institution,* equations representing students' enrollment demand behavior, and requirements for minimum levels of combined total enrollments in those institutions remaining open. Each constraint is important. If there were no constraint on per student costs, the optimization model would seek solutions where class sizes and faculty/student ratios increase indefinitely. The per student institutional cost constraint thus enables the policymaker to establish minimum standards of quality and ensure that the model's solutions are realistic. Similarly, the constraint on total enrollments avoids solutions that lower costs at the expense of reducing access below desired levels. The constraint of enrollment demand behavior requires taking into account the costs of inducing students to alter their institutional choices.

In most states little attempt has been made to reallocate enrollments among existing institutions or to close any of these institutions. The nature of institutional costs are both administrative and academic, and some vary with the level of enrollments and some do not. When enrollments increase, costs that increase do so at somewhat decreasing rates. But per student total costs decrease more rapidly because the larger enrollments are spread over those "fixed" costs that do not vary with enrollments. This environment was favorable to states as enrollments secularly increased during the postwar period. The situation will be reversed during the 1980s and states will therefore face higher per student costs in their colleges and universities. Given these higher costs, it is appealing to close some campuses and take advantage of the economies that would result from their students enrolling at the other campuses.

However, as already noted, these potential economies tend to be offset by costs of travel grants to increase enrollments at the campuses that remain open. For example, if a campus were closed those students living nearby would face higher travel costs and often additional living expenses if they were to attend a more distant campus. An appropriate requirement is that

*The constraint on institutional per student costs consists of separate constraints on class sizes, workloads, faculty/student ratios in individual programs of surviving institutions, and faculty salaries. Policymakers can separately specify each of these components of costs.

total enrollments in all remaining institutions after a campus is closed must equal total enrollments before the closing, although other required levels of enrollments can be specified. The tradeoff between costs of travel grants and economies in institutional costs is central to the optimization model.

The model is designed to recalculate a state's combined total costs --fixed and variable institutional costs plus costs of travel grants to students living near those institutions to be closed--under as many different assumptions about campus closings as policymakers specify. These can include all possible or any number of specified combinations of institutions remaining open and all possible or any specified number of enrollments in open institutions.* By recalculating costs, the model's program continues to search for a solution where total costs decrease, i.e., where economies from larger enrollments in surviving institutions offset costs of travel grants more than the previous solution, until there are no solutions with lower costs. Aside from calculating the "optimum" closings that minimize a state's total costs, the model can be used to calculate a state's total costs for as many particular campus closings as the policymaker wishes to specify.

Implementation of the Model

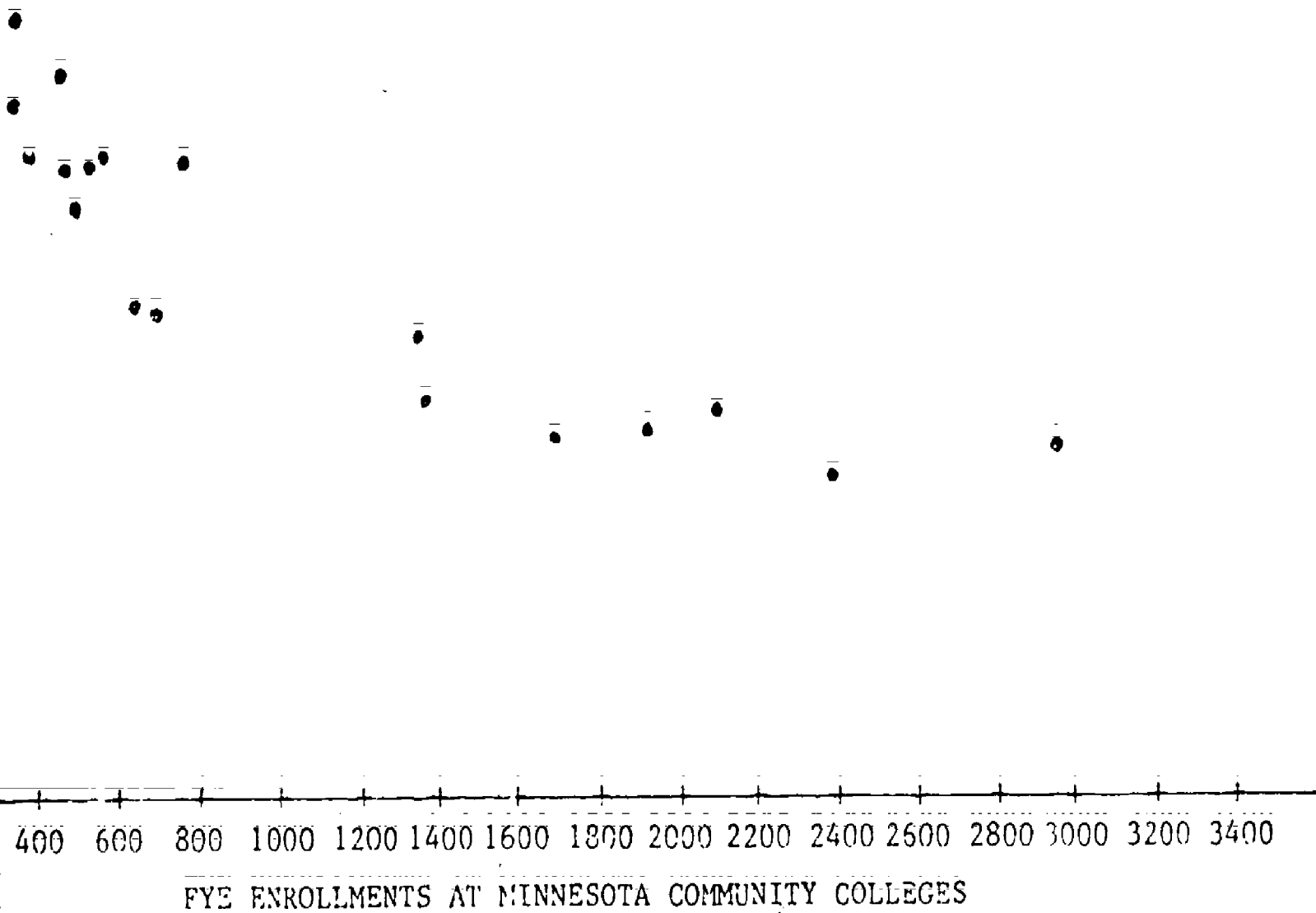
Because the optimization model systematically explores the tradeoff of economies from larger institutions against the cost of grants to students when campuses are closed, relationships between institutional costs and enrollments, and between enrollments and grants, must be incorporated into the model. The model itself must be designed so that it can economically perform a large number of calculations. The following briefly describes our experience in measuring each type of relationship and in designing the model.

Institutional Costs

Because we are concerned with the economies that can be realized from larger institutions, the cost relationships in the optimization model must show how per student costs vary with the level of enrollments. These cost relationships may be determined empirically or be based on planned levels of the variables that determine costs. We used empirically determined relationships in the case application presented here. For example, the following figure shows how administrative costs per student in Minnesota community

*The model can also be used to analyze closing and consolidating specialized academic programs within institutions that remain open.

FIGURE
 SUPPORT COSTS AND FYE ENROLLMENTS IN MINNESOTA COMMUNITY COLLEGES
 For 1976-77
 (in 1979 dollars)



Report on Minnesota Community College System," Higher Education Coordinating Board:
 Support costs were converted into 1979 dollars.

colleges vary with enrollments levels.* We analyzed the reasons for such relationships by focusing on the individual components of costs and building up costs from them. In regard to administrative costs we found that some components of cost such as senior staff vary little with enrollments while other components such as middle level staff and data processing capability vary less than proportionally to enrollments. Note that the economies from higher enrollments are especially large at lower initial levels where a given increase in enrollments is a larger fraction of total enrollments sharing fixed resources.

We found that institutions tend to maintain core faculty specializations at low levels of enrollments. Thus when enrollments increase from low levels there are some economies from spreading the increased enrollments over core faculty. That is, the hiring of additional faculty is less than proportional to increases in enrollments, although these economies are less pronounced than in the case of administrative costs. The relationships showing how faculty size varies with enrollments are also used to determine how many faculty in closed institutions are reassigned to surviving institutions.**

Whether historical or planned cost relationships are used in the model, it is designed to permit an economical evaluation of the consequences of alternative posited cost relationships; the sensitivity of results can be readily evaluated. Such differences could result from alternative policies as well as from errors. For example, there may be alternative proposals for the absorption of faculty of a closed institution at expanded campuses. One issue we explored results from our observation that one relatively new campus with very high costs has a number of disciplinary departments with many recent Ph.D.'s from top schools. The same disciplinary departments in older institutions have many faculty without Ph.D.'s or faculty trained in other fields. The optimization model can readily incorporate the costs of adding specific faculty from an institution to be closed to particular departments of a surviving institution.

We had anticipated that the cost analysis would be very expensive; but actual expense has turned out to be modest.

*These data underlie the regression analysis for this component of institutional costs.

**The optimization model does not specify the actual individual faculty reassignments; these must be determined by a separate analysis of particular academic programs and faculty capabilities.

Enrollment Behavior

We need to be able to predict how many of an institution's students would attend each surviving institution and how many would not attend at all, if an institution is closed. Further, we must predict the enrollment response to grants in order to determine the cost of maintaining a specified total level of enrollments at open institutions after a campus is closed. These predictions are based on estimated enrollment demand equations in which attendance at each institution is a function of numbers of eligible high school graduates, socioeconomic variables, and distance from the student's home to each institution.* These distances translate into equivalent dollar costs faced by students because travel takes time and requires cash outlays.** Distance also affects the choice whether to live at home and commute or to live on campus.

When a campus closes, we interpret its distance from a student's home as increasing to a point where no one attends. The estimated effects of distance to each remaining institution are used to predict the resulting increases in their enrollments. Ordinarily these increases do not sum to former levels of enrollments at the closed institution because of the higher costs faced by students living near the closed institution. However, enrollments can be increased by giving travel grants to students, and the necessary sizes of travel grants can be predicted from the enrollment demand equations. The estimated effects of distance, combined with the estimated cash and dollar equivalent time costs of travel, constitute the basis for determining the sizes of the grants. Unfortunately, it is impossible to identify those particular students whose attendance at a more distant institution is contingent on receiving a grant; it is necessary to give grants to all students in defined categories (e.g., living near an institution to be closed), including those whose attendance choices are not influenced by the grant. Travel grants can be restricted to use at one or more specified institutions.

A considerable amount of research on enrollment demand behavior has already been performed; and our estimates of demand functions for the

*The actual equations and calculations are available to the reader on request.

**The early cost-benefit analysis of the supersonic transport included empirical studies of the value of travel time. A study of the value of travel time in automobiles is provided by Maslove (1972). Hoenack and Weiler (1975) as well as the present study use Maslove's estimates, labor market data, and computerized studies of travel time between different locations to estimate cash equivalent values of students' commuting times.

optimization model are a straightforward extension of existing work.* One problem we did encounter is that from the perspective of students living in an area of a campus, one alternative campus is geographically directly beyond another alternative campus, so that the distances faced by these students to the two alternatives are highly correlated. For example, note on the map how variations in distances to the institution at Hibbing for students living near the institution at Virginia. In such cases it was necessary to estimate equations for alternative geographical areas over which the correlation was smaller.

An unusual data base in our state permitted us to use data for individual students in our equations; most other states would need to use data aggregated for individuals up to the individual high school level.

The Optimization Model

The optimization model has non-linear equations for enrollments and costs, and, therefore, we could not use readily available and economical "linear programming" optimization techniques. We found that non-linear optimization programs are available, but are very costly to use without careful modification. In order to be generally applicable to a wide variety of optimization problems, available programs cannot take many of the computational shortcuts that would lower our computation costs because these would prevent other uses of the program. As a result, each solution of the model could cost as much as a prohibitive \$1000. A graduate student in operations research spent several months modifying an available program* with computational shortcuts useful to us. The model can now be solved for less than twenty dollars and we expect the solution cost to decrease further as we gain experience.

An Application of the Optimization Model

An important advantage of the optimization model is that it presents the enrollment and cost effects on all institutions in a state that result from closing any one campus. The model also searches out alternative campuses that could be closed by rapidly recalculating the enrollment and cost effects. However, these merits of the model present certain difficulties in illustrating its usefulness. A very large number of separate tables would be required to compare the enrollment and cost effects of repeated

*Summaries of research on enrollment demand behavior are provided in Jackson and Weathersby (1975) and Radner and Miller (1975). Similar geographical analyses of enrollment demand behavior are provided by Hoenack and Weiler (1975), Orvis (1975), and Wilson (1976).

**The "SYMQUAD" program is described in Cohen and Stein (1978).

alternative closings of campuses until an optimum is reached. Therefore, we have selected a comparison of two particular alternative campus closings in order to show how the model deals with the tradeoff between economies of size and student grants in just two tables.

Policymakers in Minnesota are already concerned about the possibility of excess higher-education capacity in the area of northeastern Minnesota known as the Iron Range. The institutions we selected for possible closing are Hibbing Community College and Mesabi Community College located, respectively, in the cities of Hibbing and Virginia. These two campuses are relatively close to each other, and, as we shall see, if one is closed many of its enrollments and faculty would be absorbed by the other. Thus we may think of the closing of one as a partial consolidation with the other.

All of the institutions that would receive students from closing one of these two institutions are shown on the map and include a community college in International Falls (Rainy River Community College), the state university system campus at Bemidji, and the University of Minnesota campus at Duluth. The several vocational technical institutes in this region are also shown. One reason for selecting a case application from the region in the map is because virtually all enrollments would remain in the region after closing Hibbing or Virginia: a result unimportant in applying the model but helpful in illustrating it. We subsequently refer to each campus by the name of the city in which it is located.

The presentation is in three parts. We first consider the effects on enrollments at other campuses that result from closing the campus at Hibbing or Virginia. These effects are presented under the alternative assumptions that there are not student grants to maintain access after closing a campus and then that such grants are provided. Subsequently considered are the costs of the increased enrollments at the campuses remaining open. Finally, we summarize the results and consider the other issues that must be dealt with before a policy recommendation can be made.

Changes in Enrollments at Campuses That Remain Open

Table 1 presents the estimated changes in enrollments at other institutions in the region shown on the map after individually closing the community colleges in Hibbing and Virginia. Rows IA and IB give initial levels of 1979 headcount enrollments from the "Hibbing Area" and the "Virginia Area" at the institutions located in the cities indicated in the columns. The optimization model is designed to calculate alternative definitions of areas served by institutions. An arc must be about 30 miles at its farthest point to encompass the homes of most of these institutions' students. Because Hibbing and Virginia are only about 20 miles apart, mileage arcs of more than ten miles about these cities would intersect each other. Similarly, thirty mile arcs would intersect the comparable arcs for Grand Rapids and Ely. We therefore defined each institution's service area as

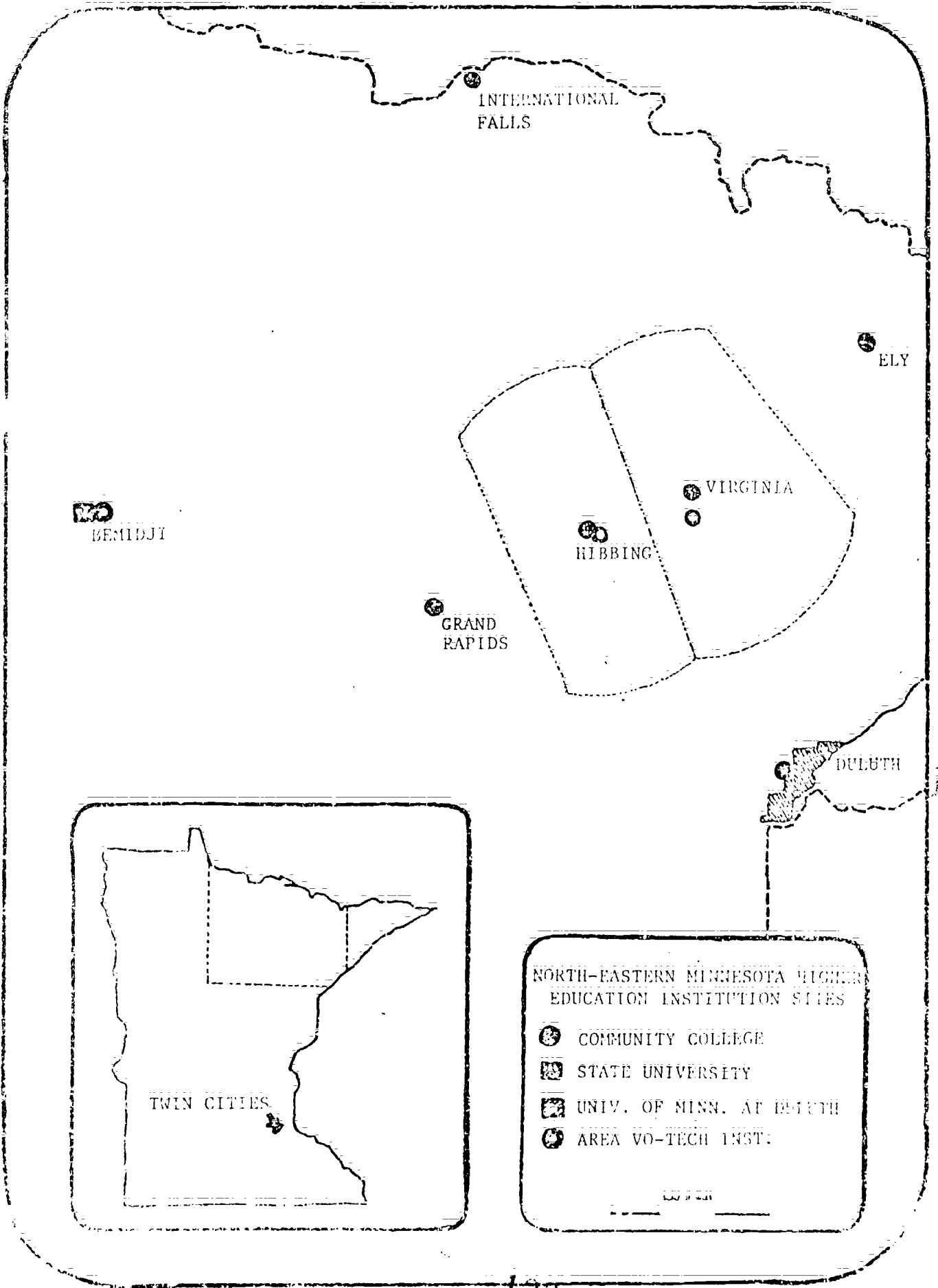


TABLE 1

ESTIMATED^a ENROLLMENTS OF HIBBING AND VIRGINIA AREA RESIDENTS CAUSED BY CLOSING
HIBBING OR VIRGINIA (MESABI) COMMUNITY COLLEGE WITH OR WITHOUT TRAVEL GRANTS

	Locations of Regional Higher Education Institutions							Total ^b
	Grand Rapids (Itasca)	Hibbing	Virginia (Mesabi)	Ely (Vermil- lion)	Bemidji	Duluth	Int'l Falls (Rainy River)	
I. Headcount Enrollment ^c Before Closing Hibbing or Virginia (Mesabi) Community College								
A. Hibbing Area Residents	16	589	100	13	55	9	0	782
B. Virginia Area Residents	16	36	677	0	18	113	5	865
II. Estimated Headcount Enrollments After Closing Hibbing								
A. Without Travel Grants								
1. Hibbing Area Residents								
Total	95	0	268	50	81	65	20	579
Change (from No Closing)	79	-589	168	37	26	57	20	-203
2. Virginia Area Residents								
Total	18	0	694	9	20	117	7	865
Change (from No Closing)	2	-36	17	9	2	4	2	0
3. Total Change	81	-625	185	46	28	61	22	-203
B. With Travel Grants								
1. Hibbing Area Residents								
Total	75	0	606	0	66	30	5	782
Change (from Closing - No Travel Grants)	-20	0	338	-50	-15	-35	-15	203
2. Virginia Area Residents								
Total	18	0	694	9	20	117	7	865
Change (from Closing - No Travel Grants)	0	0	0	0	0	0	0	0
3. Total Change - Both Areas (from Closing - No Travel Grants - II above)	-20	0	338	-50	-15	-35	-15	203
4. Total Change - Both Areas (from No Closing - I above)	65	-625	524	-2	13	26	7	0

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TABLE 1

ESTIMATED ENROLLMENTS OF HIBBING AND VIRGINIA AREA RESIDENTS CAUSED BY CLOSING
HIBBING OR VIRGINIA (MESABI) COMMUNITY COLLEGE WITH OR WITHOUT TRAVEL GRANTS
(continued)

Locations of Regional Higher Education Institutions

	Locations of Regional Higher Education Institutions							Total ^b
	Grand Duluth (Mesabi)	Hibbing	Virginia (Mesabi)	Vermilion	Bemidji	Duluth	Int'l Falls (Rainy River)	
III. Estimated Headcount Enrollment After Closing Virginia Community College								
A. Without Travel Grants								
1. Hibbing Area Residents								
Total	29	653	0	19	59	19	3	782
Change (from No Closing)	13	64	-100	6	4	10	3	0
2. Virginia Area Residents								
Total	56	273	0	171	48	184	35	767
Change (from No Closing)	40	237	-677	171	30	71	30	-98
3. Total Change	53	301	-777	177	34	81	33	-98
B. With Travel Grants								
1. Hibbing Area Residents								
Total	29	653	0	19	59	19	3	782
Change (from Closing - No Travel Grants)	0	0	0	0	0	0	0	0
2. Virginia Area Residents								
Total	35	429	0	161	41	169	30	665
Change (from Closing - No Travel Grants)	-21	156	0	-10	-7	-15	-5	98
3. Total Change - Both Areas (from Closing - No Travel Grants - I above)	-21	156	0	-10	-7	-15	-5	98
4. Total Change - Both Areas (from No Closing - II above)	32	459	-777	176	28	68	28	0

^a Standard errors of the estimates cannot be calculated analytically because the estimates are ratios of regression coefficients. However, virtually all the coefficients used are of the expected sign and statistically significant at the 95% level, and most are statistically significant at the 99% level.

^b In some cases sums are one student less than indicated because of rounding.

^c These enrollments were estimated for the Hibbing and Virginia areas based on actual 1979 headcount enrollment for all seven institutions.

the lesser of 30 miles and half the distance to another institution. These areas are shown on the map. With the exception of vo-tech institutes, the institutions shown in the rows represent virtually all of the alternative attendance choices of students currently attending the community colleges at Hibbing and Virginia. In the case illustrated here, the constraints for required levels of enrollments from each area after a community college campus is closed are defined in terms of enrollments at other community colleges or four-year institutions. It is possible, however, to allow specified portions of enrollments in vo-tech institutions to satisfy these constraints.

The estimated changes in enrollments are presented in two separate sets of columns that correspond to crucially different conditions. Under one of the conditions, institutions are closed with no policy to influence the attendance choices of students living near closed institutions. Thus, in these columns there are substantial decreases in estimated total enrollments. For example, if Hibbing is closed, we can see from the far right of the first row under IIA1 that a total of 579 students from this area would attend other remaining institutions. However, the far right of the next row shows that there would be a net decrease of 203 enrollments of students from the Hibbing area. This would be a 26 percent decrease from the Hibbing area's original total enrollment of 782. If Virginia were closed, the rows under IIIA2 show that a total of 767 students would attend other institutions, a decrease of 98 students from the Virginia area's original total of 865. This is a smaller numerical and percentage (11 percent) decrease than in the case of closing Hibbing.

Those students from the Virginia area currently attending Hibbing would be forced to make alternative attendance choices if Hibbing were closed. The resulting levels and changes in enrollments are shown in the two rows under IIA2. The rows under IIIA1 show the analogous estimated changes in enrollments from the Hibbing area if Virginia were closed. In neither of these cases do total estimated enrollments decrease. (See far right of the respective rows.) The plausibility of this result can be seen from the fact that these students originally selected an institution more distant than their closest alternative; this alternative, which is of approximately equal quality, remains available.

Rows IIA3 and IIIA3 show the combined changes in enrollments from the two areas if Hibbing or Virginia is closed, respectively. The combined enrollments in these rows will be useful below when we compare enrollment changes with those occurring under a policy of travel grants to influence the enrollment choices of those living near closed institutions.

Estimated enrollment changes under a policy of travel grants to maintain total enrollments from the area of a closed institution are presented in the rows under IIB and IIIB. The rows under IIB1-3 and IIIB1-3 are analogous to those under IIA1-3 and IIIA1-3. Under the policy, everyone from the Hibbing area is given a grant to attend Virginia if Hibbing is closed. Similarly, everyone from the Virginia area is given a grant to attend Hibbing if Virginia is closed. The size of this grant is solved from the enrollment demand equations as that amount at which total enrollments from the area of the closed institution would remain the same as before the institution is closed. These amounts (rounded to the nearest dollar) are \$402 for each student in the Hibbing area to attend Virginia if Hibbing closed and \$253 for each student in the Virginia area to attend Hibbing if Virginia is closed. The per student costs of these grants will form an important part of the cost-benefit calculation of whether and which institution to close. As a result of the grants, the total in the far right of the first row under IIB1 equals the total in the far right of row IA. Similarly, the total in the far right of the first row under IIIB2 equals the total in the far right of row IB.* Note in the other entries of the row that enrollments in other institutions than that for which the grant is given decrease as a result of the grants.

Recall that it is impossible to identify those who would not attend a community college or four year institution. For this reason, travel grants must be given to all those students from an area attending such an institution, even when their attendance choice without the grant would have satisfied the enrollment constraint. Thus if Hibbing were closed, grants would have to be given to a total of 606 (see the column for Virginia under IIB1) students attending Virginia from the Hibbing area, even though 258 (column for Virginia under IIA1) would attend Virginia without this grant and 135 (the sum of the negative figures in the second row of IIB1) of these students would, without the grant, attend institutions satisfying the enrollment constraint. In fact, only 203 out of the 606 grant recipients represent net increases in enrollment access, as defined. Thus, the cost per additional enrollment representing access is in this case approximately three times the unit cost of the grant. In the case of closing Virginia, only 98 enrollments representing additional access

*Because grants are given only to those living in the area of a closed campus, they do not affect enrollments in other areas as can be seen by comparing the rows under IIA2 with those under IIB2 and IIIA1 with those under IIIB1.

would be achieved through travel grants extended to 429 students (column for Hibbing under III B2). The cost per additional enrollment representing access would thus be more than four times the unit cost of the grant.

It should be noted that there are many other possibilities than that considered here for enrollment constraints, any of which could be calculated by the optimization model. For example, some percentage of additional enrollments in vo-tech institutes could be counted towards satisfying the enrollment constraints.

Changes in Costs at Campuses That Remain Open

Table 2 presents estimates of the changes in costs at campuses that remain open. Panel I shows existing costs for the 1979-80 academic year. Panels II and III show costs in the cases of closing Hibbing without travel grants and with travel grants, respectively. Panels IV and V analogously show costs when Virginia (Mesabi) is closed without travel grants and with grants. There are five separate presentations of costs. Each cost analysis takes separate account of faculty costs and support costs. Both categories of costs are functions of enrollments. As explained earlier, while faculty and administrative support increase with enrollments, increased enrollments are spread over core faculty sizes and fixed quantities of administrative support, which produces diminishing per student costs. These costs diminish rapidly as enrollments increase from relatively low levels, but they diminish more slowly as enrollments increase from higher levels. Full year equivalent enrollments are used in the cost analysis of Table 2. These figures are substantially different from most of the headcount figures of Table 1 because the community colleges in the analysis have large part-time enrollments.

The most important cost analyses are those of an expanded Virginia if Hibbing is closed (the column for Virginia in panels II and III) and of an expanded Hibbing if Virginia is closed (the column for Hibbing in panels IV and V). However, if either institution were closed without grants for students in its area to attend the other institution, there would be large expansions at Grand Rapids if Hibbing closed and at Ely and International Falls if Virginia closed.

The differences in costs under alternative policies and the breakdowns of the differences attributable to differences in faculty and support costs can be readily determined by comparing the totals. For example, if Hibbing were closed total institutional costs would decrease from \$33,584,940 to \$32,846,309 without grants and to \$33,061,115 with grants. The difference in costs of \$523,825 with grants is of particular interest. Because total enrollments remain constant (compare the total for enrollments

TABLE 2
ESTIMATED FACULTY AND SUPPORT COSTS AT INSTITUTIONS RECEIVING ADDITIONAL
ENROLLMENTS RESULTING FROM CLOSING HIBBING OR VIRGINIA (MESABI)

	Locations of Regional Higher Education Institutions							Total
	Grand Rapids (Itasca)	Hibbing	Virginia (Mesabi)	Ely (Vermillion)	Bemidji	Duluth	Int'l Falls (Rainy River)	
I. Before Closures								
A. FTE Students	568.0	464.4	601.0	412.0	4,194.0	6,080.0	332.0	12,651.4
B. FTE Faculty	30.9	30.3	28.7	19.1	180.5	314.6	19.5	623.6
C. Total Faculty Cost	\$675,389	\$590,558	\$642,051	\$363,900	\$3,736,639	\$7,016,459	\$378,374	\$13,403,370
D. Support Cost/FYE	\$1,381	\$1,532	\$1,305	\$1,656	\$1,894	\$1,433	\$1,687	
E. Total Support Cost ^b	\$784,238	\$711,507	\$784,485	\$682,231	\$7,944,694	\$8,714,464	\$559,951	\$20,181,571
F. Total Institutional Cost (Support & Faculty)	\$1,459,627	\$1,302,065	\$1,426,536	\$1,046,131	\$11,681,333	\$15,730,923	\$938,325	\$33,584,940
II. After Closing Hibbing - No Grants								
A. FTE Students	629.8	0	737.8	447.3	4,214.6	6,124.9	348.2	12,502.6
B. FTE Faculty	33.8	0	35.1	20.9	181.3	316.3	20.0	607.4
C. Total Faculty Cost	\$731,855	0	\$766,861	\$398,559	\$3,753,384	\$7,049,560	\$387,915	\$13,088,133
D. Support Cost/FYE	\$1,339	0	\$1,222	\$1,623	\$1,890	\$1,427	\$1,667	
E. Total Support Cost	\$843,113	0	\$901,518	\$725,744	\$7,966,437	\$8,740,845	\$580,519	\$19,758,176
F. Total Institutional Cost	\$1,574,968	0	\$1,668,378	\$1,124,303	\$11,719,821	\$15,790,405	\$968,434	\$32,846,309
III. After Closing Hibbing - With Grants to Virginia (Mesabi)								
A. FTE Students	615.1	0	986.4	410.6	4,202.9	6,099.2	337.2	12,651.4
B. FTE Faculty	33.1	0	46.2	19.1	180.8	315.4	19.4	614.0
C. Total Faculty Cost	\$718,225	0	\$982,794	\$363,519	\$3,743,259	\$7,031,652	\$376,435	\$13,215,684
D. Support Cost/FYE	\$1,348	0	\$1,104	\$1,657	\$1,893	\$1,431	\$1,680	
E. Total Support Cost	\$829,339	0	\$1,088,887	\$680,528	\$7,953,988	\$8,726,125	\$566,563	\$19,845,432
F. Total Institutional Cost	\$1,547,565	0	\$2,071,681	\$1,044,048	\$11,697,247	\$15,757,577	\$942,998	\$33,061,115
G. Cost of Grant								Travel Grants of \$402 for 606 People \$243,612
H. Total Cost With Grant								\$33,304,727

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TABLE 2

ESTIMATED FACULTY AND SUPPORT COSTS AT INSTITUTIONS RECEIVING ADDITIONAL ENROLLMENTS RESULTING FROM CLOSING HIBBING OR VIRGINIA (MESABI)
(continued)

	Locations of Regional Higher Education Institutions							Total
	Grand Rapids (Itasca)	Hibbing	Virginia (Mesabi)	Ely (Vermillion)	Bemidji	Duluth	Int'l Falls (Rainy River)	
IV. After Closing Virginia (Mesabi) - No Grants								
A. FTE Students	608.3	694.6	0	553.3	4,220.6	6,143.1	357.1	12,577.0
B. FTE Faculty	32.8	41.2	0	26.0	181.6	317.0	20.4	619.0
C. Total Faculty Cost	\$717,909	\$834,264	0	\$516,748	\$3,761,256	\$7,070,168	\$398,515	\$13,298,860
D. Support Cost/FYE	\$1,353	\$1,368	0	\$1,536	\$1,889	\$1,425	\$1,657	
E. Total Support Cost	\$822,908	\$950,491	0	\$849,869	\$7,972,713	\$8,752,075	\$591,679	\$19,939,735
F. Total Institutional Cost	\$1,540,817	\$1,784,755	0	\$1,366,616	\$11,733,969	\$15,822,243	\$990,194	\$33,238,594
V. After Closing Virginia - With Grants to Hibbing								
A. FTE Students	592.3	813.1	0	545.7	4,215.0	6,131.7	353.3	12,651.4
B. FTE Faculty	32.1	46.6	0	25.6	181.4	316.6	20.2	622.5
C. Total Faculty Cost	\$702,244	\$954,663	0	\$508,915	\$3,757,675	\$7,061,217	\$393,915	\$13,378,529
D. Support Cost/FYE	\$1,364	\$1,304	0	\$1,542	\$1,890	\$1,426	\$1,661	
E. Total Support Cost	\$807,660	\$1,060,526	0	\$841,251	\$7,967,339	\$8,744,417	\$586,937	\$20,008,131
F. Total Institutional	\$1,509,904	\$2,015,189	0	\$1,350,166	\$11,725,014	\$15,805,634	\$980,753	\$33,386,660
G. Cost of Grant								Travel Grants of \$253 for 429 People \$108,537
H. Total Cost with Grant								\$33,495,197

^a Data sources for enrollments, faculty, and institutional costs: Minnesota Higher Education Coordinating Board and University of Minnesota Administration; faculty salaries: HEGIS Reports. All data are for 1979-80 academic year. Unit cost data that were available only for earlier years were inflated to 1979-80.

^b There may be small discrepancies due to rounding error.

in I and III) this difference is attributable to more efficient scales of operation of those institutions remaining open. By breaking down the difference into that attributable to faculty, \$13,403,370 minus \$13,215,684 = \$187,686, and that contributed by administrative support, \$20,181,571 minus \$19,845,432 = \$336,139, we can see that administrative support savings make up most (64.2 percent) of the difference. By referring to the cost figures for individual institutions, we can determine the individual institutional sources of cost savings. In this case (with grants) the major source of savings is the expanded campus in Virginia. Similarly, if Virginia is closed, most cost savings would result from an expanded campus in Hibbing, and most of these savings derive from support cost. It should be kept in mind that the costs of travel grants must be weighed against these cost savings. For example, the total institutional cost savings from closing Hibbing of \$523,825 would be offset by \$243,612 for travel grants for a net annual cost savings of \$280,213. If Virginia were closed, the institutional cost savings of \$198,281 would be offset by travel grant costs of \$108,537 to yield a net annual savings of \$89,744.

That most cost savings derive from economies in administrative support is a desirable outcome. Many faculty are tenured, and faculty can be expected to form strong pressure groups against campus closings.* We can see in Table 2 that total faculty of 614 after closing Hibbing (with travel grants) and of 622.5 after closing Virginia (with grants) are losses of 9.6 and 1.1 FTE faculty positions, respectively. Thus, 20.7 or 68.3 percent of Hibbing's tenured and non-tenured faculty and 27.5 or 96 percent of Virginia's could be retained at other institutions after closure with travel grants. Under the assumption that expanded faculties would come from closed institutions, the dollar costs of incremental faculty are calculated on the basis of average salaries at closed institutions. These new total costs of faculty are additional faculty added at their old average (Hibbing or Virginia) salaries to the original total faculty outlay at each institution remaining open.

Conclusions

The estimated institutional cost savings of \$523,825 from closing Hibbing and of \$198,281 from closing Virginia compare favorably with the respective \$402 times 606 students = \$243,612 for attendance at Virginia if Hibbing is closed and \$253 times 429 students = \$108,537 for attending Hibbing if Virginia is closed.

*Within the Minnesota Community Colleges academic positions carrying rights similar to tenure are referred to as "unlimited employment positions." The contracts for these positions do contain provisions for layoffs after temporary positions have been eliminated first.

A number of factors have not been taken into account, however, in this case application of the optimization model. One important issue is that enrollments will decline substantially over the 1980s. If an institution were closed now, for example, there would be grant costs and institutional cost savings in each future year; these costs and savings should be determined for each year and discounted to the present. The undiscounted cost savings for individual years in the 1980s differ from those in Table 2 because of influence that tend to offset each other. Although unit cost savings from consolidation are larger when base enrollments are smaller and travel grant costs are also smaller, there also is a smaller number of additional enrollments by which the unit cost savings are multiplied. Ordinarily, cost savings increase somewhat as enrollments decline but in this particular case the cost savings in each year of the 1980s are not substantially different from those shown in Table 2 for 1979.

The results suggest that closing Hibbing would achieve larger cost savings than closing Virginia, even though the cost of grants would be higher if Hibbing were closed. This result derives from the greater institutional cost economies from expanding Virginia. It should be kept in mind, however, that the optimization model calculates results for all possible closings; a closing of one of a given two institutions may fail to produce lower cost savings than the closing of a third institution. (This is, however, not the case in the present calculation.)

The optimization model does not deal with another important issue, the one-time costs of closing a campus and transferring faculty to other institutions. These costs and any offsetting benefits from alternative uses of physical facilities must be analyzed separately. The optimization model identifies those cases where these costs and benefits should be intensively evaluated. Other relevant costs are the losses of business sales and personal income in the area of a closed institution. It is easy to exaggerate the costs related to a closed institution's physical facilities; the facilities themselves represent a sunk cost. Only the benefits from alternative uses of them and the continuing costs of maintaining them should enter the cost-benefit calculation. However, any expansion of facilities at the institutions with the largest enrollment expansions are newly incurred costs and should be taken into account. There would probably be no such costs in the case presented here; the FYE enrollment declines since 1979 of approximately 30 percent for Virginia and 40 percent for Hibbing plus further declines over the next couple of years before a closing would offset at least two-thirds of the increases due to consolidation. The data on various types of space at these institutions and at other community colleges in the state having comparable enrollments indicate that the remaining students could be readily accommodated with existing space during the temporary period before further enrollment declines bring total enrollments below the former peak at the campus remaining open.

Application of the optimization model is based on empirical analyses of costs and enrollment behavior that are subject to sampling and estimation error as well as errors resulting from analysts' incorrect judgments. For example, the required sizes of grants vary with the estimated effects of distances to institutions on enrollment choices and with judgments made about sizes of car pools and costs of running buses between towns. We deal with this problem by re-running the model under a wide variety of different assumptions.

The results of the optimization model can be readily interpreted and are intuitively plausible. Perhaps the model's most important use is its application to all possible campus closings in a state. The results could be explained to and understood by a state's higher-education community. Only a minority of institutions would have disadvantageous costs and enrollment demands that would make them candidates for closing. Thus, if it were widely believed that the model's results would influence public policy, most institutions, which have favorable costs and enrollment demands, would have little incentive to oppose campus closings. Depending on their potentials for expansion after other campuses are closed, many may favor closings. Note also that all institutions would have incentives to attempt to lower their costs and raise their enrollment demands; such incentives would be desirable overall. In regard to those institutions that might close, grants would create greatly diminished incentives for nearby students and families to oppose closing. Similarly, most faculty in closed institutions would be transferred to other institutions and would therefore have less incentive to be in opposition. We conclude that the optimization model can contribute to the political feasibility of closing those campuses that should be closed on economic grounds. While the optimization model does not alter any interests, it thus encourages self-interested actions that enhance the achievement of statewide objectives.

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Fear and Loathing Over Competition
In Postsecondary Education

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July 1980

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Fear and Loathing Over Competition In Postsecondary Education

Although experience differs from state to state, there is considerable grumbling and gnashing of teeth currently over the prospect and fact of increased institutional competition in postsecondary education. Competition for traditional college age students has increased markedly over the last decade. And, competition for non-traditional students, particularly for employed adult students seeking to attend courses in locations away from university campuses appears to provide considerable potential for conflict between institutions in an era of limited or declining resources.

Whether the grumbling and teeth gnashing escalates into fear, loathing and open warfare between institutions appears to depend on a number of factors including (a) the extent to which state higher-education governance procedures encourage, discourage, or ignore increased competition; (b) institutional proclivities to cooperate, coordinate, coopt, compete, mutually adjust, or to use other strategies in managing increased competition; (c) institutional traditions; (d) the experiences and inclinations of various postsecondary education policy makers, (e) state funding procedures for postsecondary education, (f) state policies toward private higher education, and others.

Given these understandings, we may ponder over the attitudes of institutional, state-level and other postsecondary education leaders towards competition between institutions. In fact, it would probably be relevant to expand our focus to inquire about attitudes toward increased competition in the public sector in general; but this task is beyond the scope of this paper.

Control as a Response to Fear and Loathing

In the past in many states, Oregon included, competition in postsecondary education has been regarded dubiously at best. Competition has been interpreted as duplication of services and, consequently, as a misuse of public resources. The notion has also persisted that increased competition in education would reduce

*This paper was presented at the 1980 National Conference of the American Society for Public Administration in San Francisco, April 15, 1980, as part of a panel entitled "Public Service Education: Are We Meeting the Needs of the In-Service Student?", chaired by Thomas J. Williams, Southwest Texas State University. Also, acknowledgement in part for the title must be given to Dr. H.L. Thompson. Appreciation is given to Bryan T. Downes, Wallace School, University of Oregon and William Zumeta, Graduate School of Management, UCLA for their comments on earlier drafts of this paper.

the quality of educational offerings; quality standards would be lowered in accommodating student preferences. In addition, competition between public and private institutions has been frowned upon as unfair to private institutions. Also, in an era of growth, the need for competition did not seem compelling. After all, there were plenty of students and enough opportunities for growth for everyone.

The logic supporting these assumptions appears to be challengeable on several grounds. If one subscribes to the economic theory of competition, and we assume that most Americans, at heart, believe in at least a few of the tenets upon which the mixed capitalist economy of most of the western world is based, then one might expect that increased competition would result in market segmentation and adjustment on the part of competitors rather than prolonged duplication of services. One might expect that competition would, therefore, result in a broader range of educational options for student consumers. One might also expect some new courses and programs offered under competition to be of "lower" quality in the traditional sense (e.g. as measured by the quality and amount of work required to earn three units of credits), while some options would be of the same or of "higher" quality than existing courses and programs. In addition, it might be expected that the quality of services offered would be reflected in differential prices charged to students, with price/quality tradeoffs becoming clearer to student consumers over time. Finally, supply and demand would be expected to assume some degree of equilibrium in the market over time. These effects might be anticipated for both on-campus and off-campus educational programs. However, one should not expect, nor do we find, general acceptance of market principles among public administrators in general, and especially among those in post-secondary education.

To illustrate this point we may review recent experience in Oregon where the University of Oregon attempted to offer a public affairs master's degree program in Salem, the state capital, located approximately 70 miles to the north of the University of Oregon campus in Eugene. The program to be offered was the same master's degree in public affairs offered on-campus, to be taught by regular university faculty and adjunct faculty hired specifically for the program. On-campus curricula, degree requirements, admission criteria, advising and other administrative procedures were to be employed in the off-campus program. Most importantly, the program was to be offered on a nearly self-support basis, with student tuition providing support for faculty salaries, release time for regular faculty teaching off-campus, and for compensation to the on-campus program for support resources employed. The program was not intended to generate additional state-aid producing FTE (full time student enrollments) for the University.

Testing the water with an initial proposal to offer the program produced considerable opposition to implementation on the part of a number of public and private higher education institutions despite the fact that, at the time, only one private institution offered even a marginally comparable (generic administration--public and private sector emphasis) master's degree program in

the capital. Opposition was based on the perception that greater need for examination of the impact of the proposed program on other institutions was needed, a point to which the University yielded in delaying program implementation. Opposition from a number of quarters, including other public institutions and the private institution based in the capital also rested upon the traditional arguments of duplication of services, and fears that increased competition would work to the detriment of both the private institution in question and the student population to be served.

While this reaction can be interpreted understandably as a strategic competitive response, it was not wholly viewed in this light by state-level and institutional decisionmakers. Rather, there is evidence that, faced with this and other instances of competition, Oregon postsecondary education decisionmakers have preferred to employ greater government regulatory control over (a) market entry by regional area, (b) the extent of institutional, and particularly public versus private, institutional competition and (c) other aspects of relations between institutions. This approach has been considered while, at the same time, the spectre of increased competition from institutions located outside the state became more visible.

In order to establish that demand existed, the University of Oregon conducted a market study of government employees in the Salem area and found considerable unmet demand for courses and a graduate degree program in public affairs (Jones 1980). Although the University sought only twenty students to begin its degree program, over eighty individuals expressed strong interest in applying for and attending courses. Based upon the survey response, it was estimated that the market for graduate public affairs instruction in the Salem area exceeded 1600 persons out of a population of approximately 18,000 state and local government and not-for-profit organization employees. In addition, the study found the Salem market to be segmented in terms of the (a) educational aspirations of prospective students, (b) professional roles, occupations, and employers of prospective students, (c) types of programs desired, and (d) willingness and ability to pay for graduate education.

Based upon these findings, the University has proposed to offer classes on a pilot basis in order to better assess demand, the impact of its program on other institutions, and other factors so as to determine whether a comprehensive program as originally proposed should be provided. We may note in passing that this strategy permits assessment of political feasibility at reduced risk.

While this seems like a reasonable market strategy, the extent of demand for a comprehensive program delivered on-site appears to warrant rapid implementation. However, the prevailing climate of opposition to institutional competition in the state capital and elsewhere in Oregon, supported to some extent by fears over the impact of competition on private and smaller public higher education institutions, is likely to cause unnecessary delay and perhaps even to prohibit entirely the provision of additional public affairs educational opportunities to government employees in Salem and to Oregon citizens in general.

In Oregon there is reason for optimism that fear will not produce loathing and that increased access to off-campus educational programs offered by public institutions, although delayed, will be provided eventually. However, increased government regulatory influence over off-campus postsecondary education program development may also result as a response to increased competition.

The results of increased regulatory presence may be anticipated based upon the experience of other states: (a) more staff and more resources would be employed at the state level for planning, budget monitoring, program review and other regulatory activities; (b) more staff and other resources would be employed in educational institutions to respond to increased state-level regulatory control and control staffs; (c) more public money would be expended in regulation and control and less in teaching students, conducting research, and engaging in public service activities.

In the past, Oregonians have been fortunate in not having to bear the costs of a high state-level regulatory posture in postsecondary education. By and large, the custom has been to settle inter- and intra-institutional conflicts through low-key conference and cooperation methods rather than through reliance on state-level intervention. A high degree of state-level regulation would thus represent a relatively significant change in the status-quo for Oregon.

In order to gain further insight into the circumstance in Oregon, and in other states by analogy, we may speculate briefly on the relevance of general models of government economic regulation of the private sector to the issue of competition in postsecondary education. Further, we may ponder over the implications of this inquiry for (a) state and institutional roles and spheres of authority in planning and adjudication of conflicts between institutions, and (b) fear and loathing over competition in postsecondary education.

Applicability of the Regulatory Model to Postsecondary Education

Some notable efforts have been made recently to analyze the applicability of regulatory models to higher education. Research in this area has concluded that state-level postsecondary education coordinating agencies in many states carry out a number of functions which may be characterized to fit the model of economic regulation of the private sector by government. Among these

functions are (i) control over new entry into the "industry", (ii) influence over the mix and distribution of services provided, (iii) control over new service offerings by existing institutions, (iv) control over implementation of technological change, (v) influence over how "inputs" and technologies are used to produce "outputs", (vi) effective control over prices charged to consumers and classes of consumers, (vii) control over the assumptions that help determine the size of the "industry", and (viii) other limitations (including "outlawing" of competition) (Thompson and Zumeta 1980). As noted by Cheit and others (1975, pp. 30-4, 60), "Observers of higher education in the U.S. have seen a kind of Parkinson's Law phenomenon at work as regulatory agency staff constantly generate requests for new information, which institutions must "staff up" to digest...the more regulatory staff the more requests for information grow (Thompson and Zumeta 1980)."

The real and opportunity costs of postsecondary-education regulation appear to be considerable. Whether the degree of regulation practiced in many states is appropriate in terms of its net effects (net benefits less costs) may be questioned. Careful scrutiny in this regard would appear to be especially appropriate for states where a heavy regulatory commitment does not yet exist, in Oregon for example.

Arguments for government intervention through regulation in postsecondary education have included the need to (a) prevent service duplication, as noted earlier, (b) exercise quality control over degree programs, curricula and advertising provided by institutions, (c) control capital planning, construction and institutional siting decisions, (d) establish and maintain state and institutional master plans and planning processes, (e) adjudicate disputes between segments and institutions, (f) influence resource allocation decision-making, (g) influence employment practices, hiring decisions (e.g., affirmative action) and the provision of special services to selected clientele groups.

These arguments have supported the creation of both economic regulation of the types previously cited, and social regulation, e.g., to assure affirmative action in admissions and employment, provision of services to handicapped students, etc. The problems addressed by social regulation are real, and in this area regulation appears to be highly justifiable in its application to education as it is to other industries and sectors of the economy. The types of regulation under question in this paper fall within the category of economic rather than social regulation.

In the field of industrial organization and in economic regulatory theory, economic regulation has traditionally been justified for industries facing declining marginal (marginal average) cost schedules. Declining marginal costs have been viewed to argue for monopolistic provision of services to take advantage of economies of scale, i.e., at the margin each unit of a service or commodity is cheaper to produce than the previous unit. This line of thinking has influenced public utility regulation for example. Where industries face increasing marginal costs, the traditional argument has been for provision of services by competing firms, employing competition to encourage provision of services and commodities in different price/quality mixes to meet consumer demand. The traditional argument holds that monopoly permits the monopolistic organization to take maximum advantage of scale economies. Economic regulation in this circumstance is supposed to prevent such likely abuses as monopolistic (unreasonably high) pricing policies, quality degradation, nonresponsiveness to consumers, etc.

Applying the conventional wisdom of industrial organization theory to the issue of regulation of postsecondary education, we are led to inquire into the nature of production cost functions exhibited by colleges and universities. Simplifying the question, do postsecondary education institutions face increasing or decreasing marginal costs in providing educational services to students? Thompson and Zumeta frame the critical issue as follows:

"If the production behavior of higher-education institutions is characterized by decreasing marginal costs...it is appropriate that the supply of educational services be organized along monopoly lines... if production behavior...is characterized by increasing marginal costs... educational services... (ought to be) organized along competitive lines (1980)."

It may be observed that the results of analysis on this issue are not entirely clear. Determining the nature of cost functions is a tricky and fraught with assumptions, data inconsistencies and all of the problems customarily faced in economic analysis (tirelessly and somewhat defensively cited by non-economic oriented social scientists). Nevertheless, believing that economists also may have their day in court, the results of economic analysis of postsecondary education are assumed here to merit some review.

With regard to the role of government in attempting to control the behavior of government agencies, postsecondary-education institutions in this case, Breton and Wintrobe note that, "The sponsor (the government monopsonist present in the form of an executive budget office) will (should) incur control expenses

up to the point at which marginal benefits...are equal to marginal costs (Breton and Wintrobe 1975, pp. 95-101)." Applying this notion, the circumstances of decreasing marginal costs would appear to argue for government regulation to control market entry and to determine how, where and what services should be provided by whom so that monopolistic institutions or cartels of institutions could satisfactorily accommodate students at the least cost to the public fisc. Government regulators would enhance economic efficiency in postsecondary education by encouraging monopolists to take advantage of economies of scale in meeting student demand. However, where increasing marginal costs exist, no such encouragement of monopoly by government is desired. Postsecondary-education institutions would be encouraged by government to compete, thus increasing the likelihood that additional educational services would be offered, and driving the price for services downward to the benefit of student consumers. In addition, absence of the need for government intervention would eventually reduce the cost of government regulation borne by taxpayers. Regulatory expenditures incurred by government under this latter circumstance would not increase institutional accommodation of student demand. Regulatory expenditures would, in fact, be almost entirely wasted. The two regulatory models which represent these views may be characterized as the central planning and control model versus the competitive incentive model.

Research on production and cost functions tends to support the proposition that under conditions of rising enrollments, postsecondary-education institutions face decreasing marginal cost schedules, whereas under stable or declining enrollments, institutions face increasing marginal costs (Carlson 1972; Radner and Miller 1970, pp. 326-34; Adams and Hankins 1977; Hoenack 1971, pp. 302-11; and Thompson and Zumeta 1980). Using a linear programming approach, Carlson found that attempting to hold type and mix of program, level and mix of students, public or private institutional status and other variables constant, institutions show increasing total costs and decreasing average costs as student enrollments increase (Carlson 1972). Radner and Miller (1970) through regression analysis, found that for groups of institutions of similar status and program, total faculty employed increases as enrollment increases, but at a decreasing rate. Employing enrollment as a proxy for student demand, both studies indicate that decreasing cost functions are produced as enrollments increase. Thompson and Zumeta (1980) also have found that, holding service levels constant, institutional costs decrease as enrollment increases.

With regard to conditions producing increasing institutional marginal cost schedules, Hoenack (1971), Radner and Miller (1970), Kohn, Manski, and Mundel (1975), Thompson and Zumeta (1979), and Bishop (1977) have substantiated the notion that college student enrollment varies relative to the types and levels of services provided (e.g., location of services, breadth and type of offering, institutional prestige, amount of money spent by level of student, etc.).

These findings are interpreted to explain student enrollment increases in the period 1960 to 1975 to result not merely from a demographic bulge but also from an expansion of services provided by institutions. Relating this conclusion to circumstances of declining enrollment, Thompson and Zumeta (1979) examined the experiences of the California State University and Colleges, and the California Community Colleges. They found that as service levels were reduced in the early 1970s due to budget restrictions, student enrollments decreased and "average marginal" institutional costs per student increased. In order to gain new enrollments after services had been cut, new services had to be added. To quote (Thompson and Zumeta 1980) "...where students' demand schedules are held constant, enrollment can only be increased by reducing the cost or increasing the benefit to the student of enrolling in college. Here, the law of diminishing returns should apply...an institution's marginal cost increases as enrollment increases. This proposition follows from the observation that, under the given conditions, an institution can increase enrollments only by offering more course titles or degree programs, better training, more stimulating interaction in the classroom or class laboratory, smaller class size...or better counseling to assist the student in matching his or her interests to the offerings of the institution. These additional services cost money, and other things equal, it can be concluded that an institution can increase enrollment only at an increased cost per student." This finding is consistent with Bishop's (1977) findings specific to higher education and the hypotheses of Shoup (1969), Breton and Wintrobe (1975, pp. 197-8), Niskanen (1971), and others with regard to the cost functions exhibited by government agencies:

A somewhat simplified explanation of the cost phenomenon identified is that economies of scale are experienced by institutions as they build to accommodate increasing numbers of students, but once student enrollments begin to decline institutions are not sufficiently flexible nor do they desire to cut back their programs; numbers of faculty and other services commensurate with enrollment losses. Such behavior can be clearly understood to produce increasing average costs per student and, on the basis of the findings cited above, increasing marginal costs as well.

We understand the concept of marginal cost to mean the cost to the institution for enrolling the next student beyond its current level of enrollment. And, we understand that even where overall student enrollments are declining, costs may be specified for enrolling one more student at the margin just as is the case where enrollments are increasing. An explanation for the increasing marginal costs phenomenon is simply that where overall enrollments are declining, the costs of enrolling one more student at the margin increases rather than decreases due, at least in part, to the necessity for providing additional services in order to attract the additional student. Whether this particular explanation of the increasing cost under

declining enrollment argument can serve as the primary explanatory variable is not clear. It is more clear, however, that empirical studies tend to find cost functions which support the hypothetical relationships between enrollment demand and marginal costs advanced here.

Student Demand as Critical Variable

The most important element in cost and production function determination thus appears to be the nature of student enrollment demand: whether it is increasing, stable or declining. Enrollment forecasts for the 1980s, like all forecasts, are subject to some degree of uncertainty, and this uncertainty is especially high with regard to off-campus enrollments. While it is highly probably that aggregate enrollments in the traditional college age cohort will decline, this does not necessarily hold equally for all states, nor for all types of institutions, all colleges and universities, or all programs. If we are to learn from experiences in a number of states, off-campus enrollment levels will depend considerably upon the incentives built into state funding formulas for postsecondary-education institutions. It remains to be determined in Oregon, as in many states, how institutions will be compensated for student enrollments earned in off-campus settings. Other things being equal, which they seldom are, it seems reasonable to assume that aggregate postsecondary-education enrollments (on and off-campus) in the 1980s will stabilize or perhaps decline slightly. Enrollment levels for many colleges and universities are likely to decline, unless institutions exhibit greater skill and intensity in their off-campus marketing strategies.

The implications for postsecondary-education program development of the findings reviewed here on cost and enrollment relationships are that where total postsecondary-education enrollments are stable or declining (a) a high state regulatory posture is inappropriate and, (b) centralized planning, stricter accountability and control measures, and attempts to eliminate "wasteful duplication" are not valid objectives for postsecondary-education governance. Under the comprehensive planning model, where enrollments are stable or declining, *the costs of duplication of services are the regulatory costs of attempting to avoid duplication. The problem with competition in this circumstance is to insure that it occurs.*

A counter-argument may still be made that there is need for some type of government regulation, if not economic regulation, to reduce the likelihood of nasty public disputes between postsecondary-education institutions, to require some planning of services to be provided by institutions, to prevent the formation of cartels and to maintain reasonable quality standards. This assumes, of course, that institutions cannot by themselves achieve an acceptable level of control over inappropriate competitive behavior such as false or misleading advertising or mail order degree sales. It is difficult to understand, for example, how the public interest will be served if mail order institutions are permitted de facto to sell degrees without requiring

student coursework, institutional residency, etc.. Proponents of the competitive model might argue that institutions that sell degrees be allowed to continue in this practice because a degree thus obtained would prove to be of no value over time (and also acknowledging the wisdom of caveat emptor). The opposite view would hold that government has the obligation of assuring minimum program quality standards for degree-oriented postsecondary education.

The argument appears persuasive in several areas, e.g., fraudulent advertising and sale of academic degrees, that there is an appropriate role to be played by government regulators. This role is, however, significantly less prominent and less costly than the comprehensive planning orientation evidenced by postsecondary-education regulatory agencies in many states. Thompson and Zumeta (1979) note "...competitive supply would be appropriate only if, in addition to short- and long run increasing or constant costs, three additional conditions could be met. These are:

- a. the services provided could be satisfactorily evaluated by users;
- b. public subsidy mechanisms could be designed (to) compensate for discrepancies between private and public benefits of the service;
- c. the public interest would not be damaged by the failure of one or a few service-providers."

We may observe that a judgment as to whether the public interest would be "damaged" by financial failure and termination of a college or university might be expected to be rendered by a postsecondary-education regulatory agency. However, it can also be argued that interaction among legislators, governors and other political participants could render this determination and implement it through budget subsidies as part of the normal political and budgetary process without assistance from a large educational regulatory structure.

Another seemingly relevant question is what should we do if we assume a lower-key regulatory posture and enrollment patterns change? What would be the appropriate regulatory response to another period of increasing enrollment demand and likely decreasing marginal institutional costs as might occur in the 1990s? Experience with a high regulatory posture in many states in the late 1960s and 1970s has taught us much about the benefits and costs of postsecondary-education regulation. Indeed, in this light the comprehensive style of planning evidenced in a succession of master plans for higher and postsecondary education in California and in other states appears to be entirely worth its costs. Under declining enrollments it seems equally reasonable that we would place ourselves in a position to learn about the costs and benefits of a lower-key regulatory posture.

Conclusions

Arguments for economic-type regulation of market entry, prices, program quality and requirements for comprehensive planning appear to be far less compelling in postsecondary education in the 1980's than in previous decades. Justification for regulation of this type appears to be particularly unwarranted during a period of resource scarcity in education where the tradeoff for adding an additional planner or regulator at the state level may be of the loss of two or more faculty positions in a public university or college. This is assuming that adding one state-level analyst requires adding one and probably more than one administrative staff person at the institutional level to respond to state information requests.

It seems likely over the next decade in Oregon, as in other states, that budget and management analysts in the Governor's Executive Office and in the Legislative Fiscal Office will be combing postsecondary-education budgets to find ways to cut, trim and squeeze resources. At the same time, both in Oregon and nationally, other analysts will be looking for ways to trim budgets in other areas of government, including regulatory agency budgets. The squeeze on regulatory agencies is likely to occur for a number of reasons, including public and private sector pressure to reduce the burden of regulatory administrative and compliance costs, and belief that much regulatory control is economically inefficient. The likelihood of these occurrences provides additional reason to question the utility of a high and costly regulatory posture in postsecondary education.

The perspectives rendered above have been considered, in part, to address the question whether institutions are meeting the educational "needs" or service preferences of in-service students.* The answer is probably that in-service student educational preferences are being met poorly in many geographical regions. The extent to which these preferences will be met depends to a great extent upon the incentives which are provided to institutions to meet these needs. Perhaps an even more realistic view in a circumstance of fiscal stress in the public sector is to speak less of positive incentives, but rather of the absence of regulatory and other disincentives to offer programs to satisfy consumer demand in competition with other institutions.

The argument for competitive provision of educational services is perhaps most persuasive from the point of view of the consumer--e.g., the in-service working professional desiring to increase his/her competence, to gain greater career mobility, and to achieve greater personal satisfaction. We might add

*"Needs" is a confusing word in this context because it is difficult to define as such. Perhaps educational service preferences is a better term by which to characterize student demand.

that this category includes a high proportion of professional women. In some cases, as in the Oregon example cited earlier, the choice currently afforded students in some geographical areas may be somewhat narrow. Under the competitive model, institutions would face incentives to increase the range of services available and consequent choice of working professional students. Institutions would profit financially from meeting new demands and would perhaps also be advantaged by increased prestige, visibility, and in other ways. And, in terms of grassroots political appeal, we may note that arguments for increased consumer choice are roughly as popular currently as those for reduced government regulation.

While there may be considerable fear over the prospect of increased competition in postsecondary education, especially in off-campus settings, we would hope that loathing may be avoided. One approach to the avoidance of the type of fear and loathing which produces conflict is to depend upon state governments or their designates to regulate and adjudicate disputes between institutions. A second method would be for institutional participants to acknowledge the benefits as well as costs, including the anxieties, produced by competition and to depend more on each other to set the boundaries of ethical competitive behavior.

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The Impact of Circular A-21 on Property Control
Systems of the One Hundred Institutions Leading in Federal
Sponsored Research Obligations

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Introduction

The Office of Management and Budget's Circular A-21 has produced a furor among college and university administrators during the months since its publication in March, 1979. College and university administrators have expressed concern over the possible dramatic impact compliance with A-21 will have on the structure of higher-education institutions, not to mention the high cost of implementation and maintenance of the necessary accounting and reporting procedures. The potential loss of substantial dollars in indirect cost recovery as a result of noncompliance has prompted some institutions to respond quickly and dramatically, changing their entire financial and accounting systems in response to A-21. Other institutions with less total dollars at stake, like Arizona State University, have exerted a great deal of effort in study of the cost-effectiveness of compliance vs noncompliance, resulting in major shifts in property accounting procedures.

While the focus of much of the A-21 compliance activity has been on the time and effort reporting requirements, the procedures that A-21 details for property accounting are no less demanding. Study revealed that comparative data on property systems of colleges and universities and the impact of the new Circular A-21 requirements on these systems did not exist. Thus, an institution could not measure objectively its response to Circular A-21 in this area. The purpose of this paper is to describe the findings of a national survey of institutions conducted by the Arizona State University Property Development Team to fill this comparative information void.

Analysis of this data and the conclusions drawn in this paper are designed to provide broad national information on the state of A-21 compliance efforts, as well as aid the administrator in comparing his/her institution's compliance efforts with those of other institutions. Comparisons drawn between several data factors in this survey should assist the administrator in more clearly understanding the possible organization and/or structural changes that may be called for in further institutional compliance efforts.

A-21 Background and Provisions

A-21 was published in an atmosphere of conflict between federal auditors and higher-education institutions. Throughout the 70s, higher-education institutions were the targets of severe, and often arbitrary, federal audit criticism. Often the press was no less critical, painting a grim picture of intentional misuse of public funds on the part of the

higher-education community. Against this tense background, A-21 arrived dramatically. In December of 1979, Max Buckley, representing the National Association of College and University Business Officer's (NACUBO) Council on Governmental Relations (COGR) (1979, pp. 21-3), expressed cautious optimism that, by at least providing the published A-21 guidelines and a fairly substantial adjustment period, the federal government was attempting to deal more straightforwardly with higher education in terms of research accountability. Yet, A-21, with its time and effort reporting requirements and other demanding provisions, has raised its own storm of controversy.

A-21 applies many requirements that have been established in other areas of federal research, such as defense development contracts, to the higher-education domain. At the heart of the A-21 property accounting requirements is the premise that institutions receiving federal research dollars must control their property. While this may sound easy, it is, in fact, a complex and potentially costly demand. A-21 dictates much of this control process through the following provisions.

1. The institution's equipment must be uniquely identified--i.e., tagged.
2. The institution must conduct physical inventories at least bi-annually. A listing of department equipment sent to the department chairperson for verification will not suffice. As stated in A-21, this inventory is to insure "that the assets exist and are usable, used and needed." Inventory records must capture this usage information.

Further, the inventory must serve to verify the exact location of the item. Location information is imperative in properly distributing equipment costs to one of the fundamental cost groupings.

While these inventory demands are heavy, A-21 does provide for some relief by allowing institutions the use of a sound statistical sampling method to be used in the inventory process in place of a complete inventory of all equipment. The results of this sample are then to be generalized for all equipment and indirect cost recovery would be on this basis:

3. The institution must maintain up-to-date space utilization information. Allocation of equipment costs to a particular functional cost grouping is to be made on the basis of the functional use of space and is, thus, dependent upon this space utilization information.
4. The institution must allocate space into one of the functional cost groupings on the basis of square footage.
5. Records must reflect acquisition costs of all equipment. Inclusion of all costs necessary to bring the item into use, including freight, handling, and tax costs, is allowable.

6. The property accounting system must account for funding sources so that the cost of property acquired with federal monies can be deleted from the other costs in each of the functional cost groupings.

While higher education institutions have concentrated efforts in the past few months on meeting these requirements of A-21, the results of this survey indicate that they may well have overlooked the more dynamic aspect of the A-21 provisions. A-21 allows several alternative property accounting procedures not previously available to higher-education institutions. These procedures provide an opportunity for institutions to claim a significantly larger amount of indirect costs immediately. These provisions center around three main alternative procedures:

1. Institutions may elect to utilize a component depreciation method, depreciating individual items on the basis of useful life. This allows the institution to recover the cost of particularly consumable items at a much faster rate than that under the use allowance procedure for moveable, fixed, or building equipment components. If an institution chooses to use the component depreciation method, A-21 requires that it do so for all of the institution's equipment and that the property accounting system include the useful life figures of each component for computation.
2. The institution can reclassify fixed building service equipment out of the building account and into the equipment account. This allows the institution to charge this large and expensive group of equipment at 6-2/3 percent if the use allowance procedure is used, or on the basis of the useful life if the institution is using the component depreciation method for the rest of its equipment account.
3. The institution may revise its definition of capital equipment, raising the dollar level to \$500 per unit. This should result in a significant reduction in the number of items controlled, with a concomitant reduction in paperwork and personnel in the property control function. Further, by adopting the higher limit, the institution can claim the entire acquisition cost of below limit items of a capital nature during the year of acquisition.

In contemplating these and other enhancements to its property accounting system, the Arizona State University Property Control Development Team was interested in knowing how other institutions were responding to the provisions of A-21.

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Description of the Survey

A two-page survey instrument was developed to gather information on three parameters of property accounting and Circular A-21 compliance:

1. Organization and structure of the property control department or section.
2. Characteristics of the property master file.
3. Characteristics of the property control systems.

Included in these three areas were questions dealing directly with A-21 provisions and requirements such as: the frequency of on-site inventory, plans for depreciation procedures, and capitalization level.

Questions asked concerning the organization and structure of the property control section included: the organizational line of control directing the property control department or section, and the number of full-time employees.

Questions dealing with the characteristics of the property master file included: the approximate number of items controlled, and the dollar value of items controlled. Included in this section are A-21 relevant questions concerning the capitalization level, and whether or not split funding sources and condition codes are recorded on the property master file.

Questions designed to obtain information on the characteristics of the property control system included: if the institution plans to begin utilizing a component depreciation method, how often on-site physical inventories have been conducted, if the institution has used a statistical sampling procedure in physical inventorying, what allocation base is used for cost recovery, and if the institution has reclassified the building account to identify building service equipment.

The survey was sent to the one hundred colleges and universities leading in federal sponsored obligations in fiscal year 1978 as compiled by the National Science Foundation (NSF) and published in the March 17, 1980 issue of the Chronicle for Higher Education. The listing ranged from Johns Hopkins University with \$212,866,000 to SUNY, Stony Brook with \$17,173,000. The response rate was 73% with three of the institutions unable to complete the questionnaire because of the incomplete status of their property control systems at this time.

Survey Results

Organization and Structure of the Property Control Department or Section. Response to those questions dealing with the organization and structure of the property control department or section is interesting

in several respects. For over sixty-four percent of the institutions responding, property control is under the direction of a business officer or the controller. In one way this finding is not surprising. Current accounting theory would maintain that a function such as property control should be close to the financial and business officer charged with the responsibility of safeguarding the institution's assets and maintaining subsidiary capital fund records. Yet, many higher-education administrators believe that financial and business officers are unfamiliar with, and at times, unresponsive to, the requirements imposed by various sponsoring governmental agencies. For this reason, some institutions have organized departments separate from the business officer or controller.

The results of this survey do not lend support to this position. Comparisons between survey questions relative to A-21 compliance and the organizational lines of authority of property accounting functions indicate that the organizational placement of property accounting does not have a significant relationship to the degree of compliance with A-21 provisions. The one exception is in the area of compliance with A-21 cost allocation basis. A-21 requires that property cost be allocated to one of the functional cost groupings on the basis of square footage. Seventy percent of those institutions with organizational lines of property control directly to a financial or business officer complied with the provision as compared to forty-six percent of those institutions with property accounting reporting to some other administrative officer. On this point, property control divisions reporting to a financial or business officer actually have a more significant degree of compliance with federal regulations than those reporting to other administrative officers. Results of these comparisons point to the conclusion that placement of property control under the direction of a financial or business officer was not detrimental to compliance with major A-21 provisions and may, in fact, enhance such compliance.

In the area of staff size, almost one half (forty-eight percent) of the institutions responding to the survey maintain a property control staff of three or less. This finding is surprising when considered in terms of the increasing operational complexity imposed by A-21.

For further clarification of the relation between operational complexity and staff size, a comparison was made between the size of the property master file (a measure of the relative work load in property control) and staffing size. Of those institutions with 50,000 or more records on the property master file, seventy-seven percent operate with staffs of three or less. Either these staffs are efficient, or they are involved in fewer areas of responsibility than the staffs of other property control divisions.

To test this conclusion, comparisons were made between those institutions with 50,000 or more items on the master file and staffs of three or less, with number of areas of work responsibility. These areas include: tagging,

disposal and reclamation, risk management, space utilization, inventory and stores, and on-site inventory. Analysis showed that there is no significant relationship. Thus, the point that these staffs are efficient is the more valid conclusion.

Characteristics of the Master File. Responses to the survey questions relating to the characteristics of the property master file provide an indication of the nature of the workload in property control and the level of detail maintained in the master file. Fifty-nine percent of the respondents maintain a master file containing 50,000 or more records, and fifty-eight percent reported that the value of the items listed exceeds \$50 million. This finding indicates that most institutions have a sizable investment in property resulting in a large population of items to control on the master file.

A-21 allows institutions to capitalize property at a cost of \$500. Prior to the implementation of the new A-21 guidelines, contract agencies specified a variety of capitalization levels, most of which were below \$500. Because of the increasing operational complexity that A-21 imposes and the large master files that institutions surveyed have to control, it would seem logical that many institutions would adopt the \$500 capitalization level. Instead, the data indicates that only twenty-eight percent of the respondents have adopted this level of capitalization. Sixty-three percent responded that they capitalize at a value less than \$300.

A second comparison was made to determine if this relationship changed for those institutions with large property master files. Only twenty-eight percent of the institutions with files listing 50,000 or more items capitalize at the higher level. This tends to substantiate the conclusion that there is no significant relationship between size of the master file and capitalization level.

One major requirement of A-21 is that federal funds be eliminated from the use allowance and/or depreciation base. To comply with the requirement institutions must record split funding sources in the property master file. Seventy-one percent of the institutions surveyed responded that they do so. This is an indication that most institutions in the sample are complying with at least one of the major provisions of A-21.

To further test the level of compliance with A-21 provisions, institutions surveyed were asked to indicate whether or not condition and use codes are also captured in the master file. While this provision is a relatively minor requirement of A-21, compliance with this minor provision by an institution would tend to indicate that more significant requirements of A-21 are also being met. Forty-seven percent of the respondents indicated that they are recording condition and use codes in the master file. This is a relatively high response rate for this level of detail and would tend to support the above supposition that most institutions are probably meeting the more important aspects of A-21 requirements for document on the property master file.

Characteristics of the Property Control System. The questions involving the characteristics of the property control system were designed to provide information on the degree of compliance with key A-21 provisions and to determine whether or not institutions are taking advantage of optional procedures which could further increase the indirect cost recovery.

In the first question, the respondents were asked to indicate the frequency of the institution's on-site physical inventory. A-21 requires that all records on the master file be supported by a physical inventory count at least once every two years. This may well be the most demanding of the A-21 property accounting requirements. The size of the master file, coupled with the nature of the collegial organization, operate to make a university-wide inventory of property a major undertaking. The survey data, however, indicates that seventy-six percent of the respondents have conducted on-site physical inventory counts during the last two years.

The validity of this data is questionable because of the incongruence of this response with earlier observations from the survey data. For example, forty-eight percent of the institutions reported property control staffs of three or less. Seventy-seven percent of those respondents also reported large property master files. It seems improbable that a small staff with a large master file would be able to meet the inventory requirement easily. To test this further, a comparison was made to determine the number of institutions with large master files and small staffs reporting that they had conducted on-site inventory counts. This resulted in eighty-seven percent of the institutions in this category responding that they had conducted physical inventories at least every two years. As it has already been noted that few institutions reported that they have used a statistical sampling method in inventorying, it must be concluded that what the institutions were reporting as on-site physical inventory counts was actually the procedure of sending property lists to the department heads for verification. If this conclusion is correct, it must be noted that these institutions are not in compliance with A-21 and may meet some severe criticism in upcoming audits.

Respondents were also asked to identify the basis utilized in allocation of indirect costs to the functional cost groupings. This is a major requirement of A-21. Allocation must be on the basis of square footage of space occupied by function. Sixty-six percent of the respondents indicated that they were complying with this provision; however, as noted earlier, a cross comparison indicates that this percentage is twenty percent lower for institutions with property control reporting to someone other than a financial or business officer.

A-21 has two provisions which enable institutions to increase their indirect cost recovery through adoption of certain new procedures. The most significant is the acceptance of component depreciation as a basis of

compensation. In general, depreciation will result in a higher cost recovery on property than will the use allowance. Of the institutions responding to the survey, only thirty percent indicated that they plan to depreciate in this manner within the next two years. This is a low rate considering the potential for increasing the indirect cost recovery. A cross comparison was performed to determine if the top twenty institutions in federal sponsored obligations were planning to adopt depreciation. Again, the rate was very low, only thirty-eight percent. It is interesting to note, at this point, that four of the leading five institutions in sponsored obligations did respond positively to this question.

The second provision in A-21 which allows an institution to increase indirect cost recovery is the reclassification of fixed building service equipment from the building account into the equipment account. In this manner, these items are subject to a 6-2/3 percent use allowance as opposed to a two percent allowance under the building account. Seventy percent of the respondents indicated that they had not reclassified this type of property to maximize the indirect cost recovery. This finding, in conjunction with the depreciation finding, would seem to indicate that the institutions surveyed are only, at this point, concerned with complying with the provisions of A-21 and not exploiting the provisional opportunities presented by the regulation.

Implications for the 80s

If A-21 is to have a dramatic impact on the property accounting procedures of higher-education institutions, the brunt of that impact will not be in the 80s. The results of this survey demonstrate that a large majority of institutions are already in compliance with the major requirements of A-21 relative to property accounting. This surprising result is the result of one of the following:

1. A-21 requirements are, simply an embodiment of existing practices already prevalent in institutions of higher education; or
2. Modifications in property accounting systems have already occurred between the publication of the circular and the point of this survey in April and May of 1980, or
3. The survey instrument is invalid and has either not tapped the real indicators of A-21 compliance problems or was not responded to seriously.

The second is the most reasonable conclusion. Correspondence received along with the questionnaires, as well as the high rate of return, indicates that the survey was taken seriously and that most of the questions were valid. The correspondence and side notes further support this conclusion by

indicating a large number of recent shifts and changes. In addition is the number of "stragglers," three institutions responding that their property accounting systems are currently in such a state a change due to A-21 compliance efforts that they were unable to complete the questionnaire at this time.

These points all support the conclusion that A-21 has been taken seriously by higher-education institutions. Institutions responded quickly to the new guidelines and have, with the help of COGR seminars, made adjustments based on a common perception of the meaning of the provisions. The true test of these compliance efforts and the sincerity of federal agency implementation should come within the next year as the auditors begin to issue their findings.

If A-21 is to have an impact in the 80s, it will be in those procedures that are considered allowables, but not requirements--i.e., component depreciation, reclassification of fixed building service equipment, and the \$500 capitalization level. This survey has indicated that institutions have not taken advantage of the higher capitalization limit. While A-21 allows the higher level, state statute and regulation may prohibit it, thus the institution may find itself in a Catch-22 of attempting to control large numbers of items and meet the reporting requirements of A-21, often with small staffs. This condition may preclude the implementation of depreciation methods because of the sheer logistics involved in handling such large numbers of low dollar value items on such a system.

Another major allowable is the reclassification of fixed building service equipment into the equipment account. Only twenty-nine percent of the respondent institutions have taken advantage of this provision. One possible explanation for this low number is that A-21 requires high standards of documentation in this reclassification process. Most institutions are not equipped to provide this expertise and would have to rely on professional appraisors to provide the necessary data. This requires a significant immediate outlay of both money and administrative time and effort. While in the long-run the option may prove cost-effective, institutions caught in a current tight money market may have been forced to delay implementation of this option.

The most significant allowable is component depreciation. Yet, only thirty-one percent of those institutions responding noted that they intend to make the shift to this method within the next two years. This may also be the result of deferred implementation because of tight budgets. Another possible explanation is that college and university financial officers have an almost natural predilection against depreciation accounting. Generally accepted accounting principles exclude higher-education institutions from depreciation accounting. Thus, if a college or university now decides to adopt depreciation accounting, a satellite system, separate from the main financial and accounting system, would need to be established. This would complicate the procedures already in place and would require the commitment of significant immediate resources to develop.

Conclusion

During the decade of the 80s, higher-education research institutions will face many significant challenges which threaten the basic nature of American higher education. One of these challenges will come from the provisions of A-21. This study has shown that the majority of institutions heavily involved in research have responded to meet the property accounting provisions of A-21; however, these institutions have not moved to maximize their indirect cost recovery by taking advantage of the dynamic allowable provisions of the circular.

Respondent Institutions

Auburn University	Oklahoma State University
Baylor College of Medicine	Oregon State University
California Institute of Technology	Pennsylvania State University
Carnegie-Mellon University	Princeton University
CUNY, Mount Sinai School of Medicine	Purdue University
Colorado State University	Rutgers, The State University
Columbia University, Main Division	SUNY, Stony Brook
Cornell University	Temple University
Duke University	Texas A&M
Florida State University	University of Alabama, Birmingham
Georgetown University	University of Alaska, Fairbanks
Georgia Institute of Technology	University of Arizona
Howard University	University of California, Berkeley
Indiana University, Bloomington	University of California, Irvine
Iowa State University of Science & Technology	University of California, San Diego
Johns Hopkins University	University of Cincinnati
Louisiana State University	University of Colorado
Michigan State University	University of Connecticut
Mississippi State University	University of Florida
New Mexico State University	University of Georgia
North Carolina State University, Raleigh	University of Hawaii, Manoa
	University of Illinois, Urbana
	University of Iowa

University of Kansas
University of Kentucky
University of Maryland Baltimore
Professional Schools
University of Massachusetts, Amherst
University of Miami
University of Michigan
University of Minnesota
University of Missouri, Columbia
University of North Carolina,
Chapel Hill
University of New Mexico
University of Pennsylvania
University of Pittsburgh
University of Rochester
University of South Carolina
University of Tennessee, Knoxville
University of Texas, Austin
University of Texas Health Science
Center, Dallas
University of Utah
University of Washington
University of Wisconsin, Madison
Vanderbilt University
Virginia Poly. Institute & State
University
Washington State University
Washington University
West Virginia University
Woods Hole Oceanographic Institute
Yale University

Results of Survey Questions

1. Organization and Structure of the Property Control Department or Section:

a. Line of administrative authority of property control:

Controller	41%
Purchasing	17%
Business Officer	22%
Research Officer	6%
Physical Facilities	6%
Other	9%

b. Number of full-time staff in property control:

1-3	40%
4-6	36%
7-10	15%
10 or more	10%
Missing values	1%

c. Number of areas of responsibility:

1	46%
2	25%
3	25%
4	19%
5	5%
5	2%

2. Characteristics of the Property Master File:

a. Number of items:

Less than 10,000	6%
10,000 to 29,999	21%
30,000 to 49,999	13%
Over 50,000	59%
Missing value	1%

b. Total Dollar Value:

Less than 10 million	1%
10 to 29 million	11%
30 to 49 million	27%
Over 50 million	58%
Missing value	1%

c. Dollar capitalization point:

Under \$100	19%
\$100 - \$299	44%
\$300 - \$499	9%
Over \$500	28%

d. Record split funding sources in the Master file:

Yes	71%
No	39%

e. Record condition codes in the Master file:

Yes	47%
No	51%
Missing value	2%

3. Characteristics of the Property Control System:

a. Depreciation within next two years:

Yes	30%
No	69%
Missing value	1%

b. Conducted an on-site physical inventory:

Annual	49%
2 years	27%
5 years	6%
Other	8%

c. Allocation basis:

Square footage	66%
Salary	10%
Other	23%
Missing value	1%

d. Reclassification of fixed building service equipment:

Yes	29%
No	70%
Missing value	1%

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The Business Officer (December 1979): 21-23.

Information Systems for State-Level
Decisions and the Budget:
or
California Gets Its Just DSIRts

by:

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July 1980

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Computers and Information Systems Research Program
Graduate School of Management
University of California
Los Angeles, California 90024

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Director, Computer and
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Information Systems for State-Level Decisions and the Budget:

or

California Gets Its Just DSIRts

We all know that information is not free or even inexpensive. This is a cautionary tale of information systems design and development, and wasted resources -- the story of the University of California's Data System of Instructional Resources (DSIR). It has been said that good judgment comes from experience, experience from bad judgment. The DSIR story is a tale of bad judgment -- told here by one of its participants, a state-level bureaucrat whose judgment was at least as bad as anyone else's. Hopefully, everyone concerned learned a lesson from this experience and, perhaps, others may learn from our example.

The University began to develop DSIR about ten years ago in response to state-level demands for more information about costs, faculty workload, and space utilization. The system was put into operation in 1972 and includes class enrollment (department, class type, class level, enrollment, etc.); instructional staff (department, rank, salary account, courses taught, class contact hours, etc.) and facilities (room type, location, utilization, etc.) data. Class and instructional staff data are collected from campuses at the department level.

DSIR has continued to have a number of operational problems. In the first place, it has always produced biased inaccurate reports. How could it otherwise? The people who collect the data do not use the system and have no interest in the information. If the data requested are not easily available, if they are in the wrong format or are aggregated according to definitions idiosyncratic to the department, it is unlikely that the time will be taken to collect, reformat, or reaggregate them. Some departments turn in what they have and ignore the rest, others make estimates, and still others make up numbers to satisfy what no doubt appears to be an arbitrary reporting requirement. Second, DSIR is costly to operate and use and is highly inflexible. Third, its existence has created political problems for the University -- the University must constantly choose between providing inaccurate and often irrelevant information to state-level authorities and creating the impression that it has something to hide. Given the diffusion of authority within the University's central administration, not to mention the difficulty of getting anything useful out of DSIR, the typical response to state-level data requests is to delay in providing the data, which also creates a bad impression. However, this paper is not concerned with DSIR's operational problems nor even the political problems they caused University administrators. If all the operational problems were solved, we would still have wasted millions of dollars. DSIR was designed to serve state-level interests that were wrong-headed to begin with.

It has been observed that a key source of failure of information systems is that they try to increase the quantity and quality of information available to the decisionmaker on the assumption that more information leads to better decisions. However, the real problem is seldom lack of data, but a lack of understanding of how to process data into information that can be used for decisionmaking (Gorry and Morton 1971, pp. 55-70). The moral of the DSIR story is that state-level demands for the kind of data this system was designed to supply are explained by a fundamental misunderstanding of the structure and functioning of the higher-education industry; student demand; and the production and cost behavior of institutions.

California's Postsecondary Education Commission has adopted what is a proper view of the financing issue, that in considering postsecondary-education financing matters the appropriate goal is to insure that state funds are allocated and employed in a manner which will provide for the optimum utilization of all postsecondary-education resources in the state. This implies that the University of California is part of a larger statewide system of postsecondary education which includes not only the California State University and Colleges system, but the 104 community colleges, the 254 independent colleges and universities, and the over 3000 independent non-degree-granting institutions as well. Moreover, it should be recognized that this larger system of postsecondary education is generally characterized by considerable competition--competition for students, both price and product competition; and thereby, for dollars. In this larger system state funding is assigned a special role as an instrument or lever by which the optimum utilization of resources in the state is to be achieved. This implies that the proper question to ask when considering alternative funding procedures is: which set of financing arrangements will result in the best match between institutional and student behavior and the public interest? To answer this question the same kind of information is required as would be required to regulate and manage any other competitive industry producing substantial external benefits.

However, the management of a complex, competitive market is a task which state-level fiscal authorities are unlikely to be prepared to handle, either by experience or inclination. Nothing in the professional career of a state-level budget analyst could be expected to provide him with the skills, understanding, or concepts required to carry out this task. (See Appendix) Greater reliance upon market mechanisms requires considerable understanding of the likely responses of institutions and students to changes in revenue schedules; tuitions policies; and direct student aid programs; hard work explaining the estimates which result from this understanding (estimates which even then are unlikely to be precise); and an attention to values which is contrary to the budgeteer's view of himself as a technician. Therefore, it is hardly surprising that individuals who are comfortable with and satisfied by standard budget planning and control practices are unenthusiastic about decentralized, market-oriented mechanisms. They are likely to reject them out of hand as open-ended and uncontrollable (Cothran forthcoming).

Because DSIR was designed to satisfy certain state-level requests (primarily from the State Department of Finance), a word ought to be said about budgeteers--about how they behave and how they think. This may seem extraneous to my story, but I think it goes a long way toward explaining both why budgeteers wanted what they wanted and why what they wanted was not what the state needed.

Some Thoughts on Budgets and Budgeteers*

Budgeting is the key process by which action is rationalized in bureaucratic organizations. Wherever we find bureaucrats, we also find budgeteers. Wiladvisky (1975) observes that there are constraints in budgeting that lead to regular patterns of behavior.

Administrative agencies act as advocates of increased expenditure, and central control organs [the budgeteers] function as guardians of the treasury. Each expects the other to do its job; agencies can advocate, knowing that the center can impose limits, and the center can exert control knowing that agencies will push expenditures as hard as they can. Thus roles serve as calculating mechanisms. The interaction between spending and cutting roles makes up the component elements of budgeting systems.

Most of the literature on budgeting concentrates on budget preparation and approval and emphasizes the making of decisions about the allocation of financial resources, which depends upon calculating which alternatives to consider and which to choose.

However, it is axiomatic that rational action requires processes for both rational calculation and effective control (Dahl and Lindblom 1953). Frequently students of budgeting either overlook the fact that no matter where budgeting is practiced, budgeteers spend far more time executing the budget through the administration of expenditure controls than they do in building it -- or they treat this fact as an aberration from the sound practice of public administration. This view seriously underestimates the importance of the control function in bureaucratic organizations.

Here, the problem of control may be seen as an example of the more general problem of insuring that subordinates act according to the preferences of their superiors. The problem of controlling the behavior of the bureau is the same as that of any manager where the subordinates' interests are not the same as the superior's (Breton and Wintrobe 1975).

*See Thompson and Zumei, forthcoming.

Budget execution is primarily concerned with the administration of two kinds of expenditure control: allotments and fund reports. Allotments are used to regulate the timing of expenditures during the year. Fund reports show what expenditures have been made and how they compare with what should have been made. Auditing, the last phase of budget execution, is carried out to insure that the reports are accurate. In addition, budgeteers oversee the operation of extensive, administrative expenditure controls. The immediate purpose of these controls is to insure that expenditures are made only in the amount and for the purposes specified in the budget. Their ultimate function is to prevent the bureau from distorting or concealing information which would increase the bargaining power of the bureau vis a vis the organizationally superior unit.

Recently, Niskanen (1971), Breton and Wintrobe (1975), and Thompson (1973) have made considerable progress toward a theory of bureaucratic behavior based upon the choice-theoretic, utility-maximizing, market-oriented assumptions of microeconomics in which the quantity of services provided and the price are simultaneously determined by the supply of and the demand for the service. Niskanen's view of bureaucratic supply throws considerable light upon the control function performed by the budgeteer--its abuse as well as its uses.

According to Niskanen the characteristic relationship between nominally superior and subordinate units in a bureaucratic organization is that of a bilateral monopoly. The bureau "sells" its services to the government sponsor, and the government sponsor "buys" the service only from the bureau. In this market, some "output" or quantity of services is exchanged for a budget rather than a per-unit price. However, both the demand behavior of the "buyer" and the supply behavior of the "seller" are assumed to be conventional. That is: the quantity of the service demanded by the governmental sponsor will vary directly with its price. Furthermore, the "buyer" is assumed to be interested in maximizing net benefit, in terms of its own preferences, or its consumer's surplus; while the "seller" is assumed to be concerned with maximizing its budget.

Given these assumptions, two cases can be specified in which "output" and price are determinate. Where the "buyer" can exercise full monopoly powers, marginal cost will be equated with marginal benefits. This corresponds to the perfectly hierarchical case in which the preferences of the nominal superior are exactly met by the nominal subordinate. Alternatively, if the bureau can fully exploit its monopoly position to maximize revenue, the equilibrium level of output will be where the marginal benefit resulting from the provision of additional quantities of the service will be zero. The equilibrium budget will be equal to the entire area under the demand schedule. Breton and Wintrobe (1975) observe that in this model the difference between the budget that the bureau succeeds in obtaining and the sponsor's net-benefit maximizing budget represents the degree of control-loss in the organization. In this second case, the nominal hierarchical relationships is turned on its head.

However, without some additional understanding of the circumstances affecting the relationship between the government sponsor, we are still some distance from being able to say what the level of output of the bureau or

the price of the service will be. What we have said is that the budget will be that which would be achieved under perfect hierarchical control or under complete loss of control--or somewhere in between. This is the indeterminacy problem of bilateral monopoly. It is tautological to say that the actual outcome in terms of both price and output will be determined by the relative bargaining power of the governmental sponsor *vis à vis* the bureau. However, in this case, power is understood in terms of information. Where the buyer in the bilateral monopoly relationship knows the seller's true cost schedule and the seller is ignorant of the buyer's true demand schedule, then the buyer can exploit the full benefit of its monopsonist position, and vice versa. That is to say that the relative bargaining power of the two parties will depend upon the quantity and quality of information available to each. Furthermore, the fundamental item of information required by the sponsoring government in order to obtain its preferred budget has to do with the bureau's true cost or supply schedule:

As Breton and Wintrobe (1975) have observed anti-distortion or control devices are available to the bureau's governmental sponsor--at a cost. These are the expenditure and administrative controls executed by the budgeteers. According to Breton and Wintrobe (1975):

Controls have many uses, including that of serving to control costs and as a deterrent against the distortion of information. Their value to politicians in all uses, however, is simply the reduction in the excess budget of bureaus which their use makes possible ...

The sponsor will incur control expenses up to the point at which marginal benefits [in terms of excess budget avoided]... are equal to marginal costs.

It must be stressed, however, that when these control costs (the costs of red tape) are added to the bureau's budget it turns out that the per-unit price paid for the bureau's services are considerably higher than they would have been if the same quantity of services had been supplied at the bureau's true supply cost. Or, for the same amount of money, the bureau could have supplied more services. But neither of these attractive options is a real choice given monopoly supply on the part of the bureau. Rather, these costs must be born, regrettable though this may be in order to avoid an even more unsatisfactory outcome.

This model also tells us that where the structure of the market is different from the bilateral monopoly relationship characteristic of bureaucratic organizations, the costs of control may be unnecessarily high. Indeed, where the service is provided by many competing bureaus or firms, price search permits the monopsonist to know the industry's true marginal cost schedule and, while the information has limited practical value, to know by inspection the marginal cost schedules of the market's individual firms. The monopsonist facing competitive supply, in this case the governmental sponsor, can easily obtain the information needed to maximize its consumer's surplus. In such a relationship the kinds of expenditure controls we are talking about here are a dead-weight loss. If they are applied to only a few of the suppliers of the service,

production will be shifted to the marginally less efficient suppliers; and the buyer in the relationship will purchase fewer services at a higher per-unit price--depending upon the slopes of the cost and demand schedules. Where the controls are equally applied, the buyer in the relationship will likely purchase even less at an even higher price.

Unfortunately, the implications of the distinction between monopoly and competitive supply are not immediately obvious to the budgeteer, who has internalized a role as well as certain prescriptive rules and standards. Competitive supply may produce contradictions and problems which lie outside his or her experience and he or she may perceive that the costs of control are prohibitive and the rigidity of certain control rules and standards are inappropriate. He or she may even adopt a more realistic approach to the situation and the problem it raises. But the mere fact that rules are successfully challenged, and shown to be arbitrary and unnecessarily rigid does not necessarily mean they will be changed. As Michael Crozier (1964) observed:

Centralization and impersonal rules are both ways to escape from otherwise necessary adjustments ... When one rule prevents adequate dealing with a case, its failure will not generate pressure to abandon the rule, but, on the contrary, will engender pressure to make it more complete, more precise and more binding.

It is my experience that budgeteers more often than not show the same kind of reverence toward "good budget procedures" that accountants give to "standard accounting practices." Accountants frequently cling to these practices even when it is apparent that they fail to provide information which is useful for management decisionmaking. (I do not think it is incidental at all to observe that most budgeteers are accountants by training.) "Good budget procedures" are valued because they have the weight and authority of training, habit, and tradition behind them, not because they necessarily provide adequate solutions to the problems they are intended to solve.

The point I am trying to make is that expenditure controls perform an important function in the typical relationship between sponsor and bureau. They provide information which is critical to the bargaining power of the sponsor, thereby permitting the behavior of the nominally subordinate bureau to be brought under control and the preferences of the sponsor to be met. Standards and rules also serve to avoid inconsistency in the dealings between the budgeteer and the bureau and to stabilize expectations on both sides about the ground rules for bargaining and the likely outcomes of the bargaining process as to avoid the costs of uncertainty to both sides (Breton and Wintrobe 1975). In certain clearly specifiable circumstances, however, expenditure controls serve no real purpose.

Some Historical Background

DSIR was designed to supply state-level authorities (the State Department of Finance (DOF), the Office of the Legislative Analyst (OLA), Assembly and Senate finance committees, and the Coordinating Council for Higher Education (CCHRE) with information that was supposed to aid them in reviewing the University's budget. Specifically, the purpose of DSIR was to aid state-level authorities, particularly in the Department of Finance, in relating the provision of resources systematically to the actual distribution of activities and costs within the University.

I have suggested that the budgeteer's response to the perception that something is not right is likely to be a demand for "more and better" information about costs and, therefore, tighter expenditure controls. This is precisely what happened. The interesting question is: what was the source of the feeling that something was not right, what was the problem that "more and better" information was supposed to solve? In order to answer this question, it is necessary to say something about the budget relationship in the years before 1970.

The key to this relationship was constitutional autonomy which Earl Cheit (1975) Dean of the School of Business Administration at UC Berkeley, has quite rightly called "the most sophisticated legislative procedure in democratic government, the self denying ordinance, by which States created and funded colleges but [retained] only limited powers of review or control." For years resource allocation to the University was governed by a few simple formulae and rules; expenditure and administration controls were practically nonexistent; and, although the University was required to show that it had met certain fiduciary and procedural standards in its handling of funds and accounts, auditing was carried out by independent CPA firms hired by the University Regents. The University budget review assignment in the State Department of Finance was generally regarded as one of the softest, a good place to retire "burned-out" budget examiners.

On the operating side, the budget formulae were especially simple, based initially upon a simple student-faculty ratio and later a weighted one. Given the University's administrative independence from State controls, this mechanism was, in practice, simply the provision of a per-unit subsidy. That is: each time the University enrolled a student, the State paid the price. Furthermore, the University was required to admit all eligible undergraduate applicants and to charge them the same nominal amount.

This mechanism provided the University with considerable incentive to respond to student demand and to operate efficiently, and permitted the University to take advantage of demographic changes to expand at an almost unheard-of rate. In addition, the prices paid by the State after 1960 were consistent with Master Plan objectives calling for an increase in the output of Ph.D.'s and a reduction in lower division enrollments at the University and the State Colleges, as they were then called.

Capital budgets were subjected to somewhat tighter control through the employment of a fairly comprehensive system of space use standards. These standards were generally recognized as arbitrary and as occasionally promoting over utilization of other inputs into the University's production process (Mathematica 1970). However, to the extent that their purpose was to avoid the worst kind of imbalance in the use of resources, these standards evidently worked fairly well. This judgment is based upon three observations. First, buildings are flexible. In most cases they can be used for many purposes for which they were not designed or intended. Second, institutional growth was rapid and stable. By stable, I mean that students were taking the same kind and mix of courses in the same campus settings at roughly the same times during the day regardless of the rate or level of enrollment growth. Even if a facility were overbuilt, enrollment would soon catch up with its capacity. If the application of the standards somehow resulted in underbuilding, this fact would easily be apparent to all concerned. Third, fixed plant represents a small component of the total cost of institutional operations. This fact is often obscured by the size of individual expenditure items, but it appears that fixed plant represents about ten to fifteen percent of total operating costs.

The situation started to change during the last years of the 1960's. Because budgeting is fundamentally a political process, many people have seen the changes in the University State-fiscal relationship as the result of an alliance between conservatives and liberals and a reaction to the student unrest at Berkeley and elsewhere. The conservatives "turned the fiscal screws" in order to influence University administrators "to whip the students into line." The liberals tended to see the student unrest as a symptom of the University's "failure to pay proper attention to the needs of students," particularly undergraduates. While the liberals were more concerned about "carrots than sticks", they went along with the conservatives' funding policy. I do not wish to gainsay the importance of Ronald Reagan's drive "to clean up the mess at Berkeley," but I would argue that, although it played a major part in holding State appropriations to the University at the same level for two years (it should be noted here that State funding of the State Colleges was similarly constrained) and may have served to legitimate the invasion of the University by DOF auditors in 1972 and 1973, it had very little to do with the content of the budgeting practices which were proposed or the information requested of the University.

By 1970 most States were beginning to see problems in the existing budget and control mechanisms as they were applied to higher education. Generally, they were the same problems from state to state and for the most part the same solutions were proposed. In the first place demographic changes made it more difficult to maintain high growth rates in enrollment. This meant that in some cases, where only a few years before the problem was simply to keep up with student demand, many institutions were faced with excess capacity at the same time that other institutions, because they were better located, more responsive to student preferences, or more flexible in reaching out for non-traditional students, continued to grow. In turn, this meant that when the budgeteer applied his ratios and standards to a group of institutions such as the University of California or the State Colleges, he or she could conclude

this satisfactory non-student services and facilities were being provided. At the same time individual campuses could use the same standards to make possible adjustments for non-faculty; more classrooms; or whatever. In the second place the changes taking place in the composition of the studentry meant enrollment estimation was becoming progressively more difficult. From the budgeteer's perspective the consequence of this was a cumulative discrepancy in the budget. In the third place it was not obvious that the new students being enrolled (for the most part older and parttime students) or the new methods of enrollment (enrollments (credit by examination; independent study; etc.) required less support as traditional students in traditional classrooms. In the fourth place it appeared that universities were training too many Ph.D.'s and, as a result, the job market worsened, graduate jobs for few of those enrolled. These were all the problems, and it was believed they could not be handled within the constraints of the existing budget (Lippman, *op. cit.* meta 1980).

At the same time, many continued to believe that the University was indifferent to the welfare of undergraduates and overly concerned with research and graduate education. The inconsistency between nominal State-level interests and actual preferences was indicated by the internal allocation of resources within the University as well as the University's system of incentives and penalties for faculty performance. Finally, serious concern was expressed in the literature and elsewhere that the University was being given preferential treatment in the budget vis à vis the State Colleges. The last two problems mentioned were not new; but as other budgeting and planning problems were being identified, they too were given increasing attention.

What was the solution?

The diagnosis was usually followed by the prescription of either of two alternative remedies: greater reliance upon market mechanisms or more centralized planning and control.

Advocates of greater reliance upon market mechanisms (Thompson and Fiske) specifically stressed the inefficiencies in the use of public subsidies under the present planning mechanisms. They claimed that if institutions were unresponsive to market forces, technologically backward, and inefficient, the fault lay with the system of allocating resources in higher education. The claim was made that institutions were unresponsive because the market mechanisms which regulate supply and demand in other sectors of the economy are suppressed in the higher education industry. As a remedy, adherents to this point of view proposed to bring competition to the higher education industry. While the specific content of their proposals varied, they usually included full cost tuition, combined with some form of financial aid, such as guaranteed loans (student vouchers or entitlements) to help pay the cost of institutional support, so that student dissatisfaction would be reduced and financial pressure to bear on institutions (Breton and Wintrobe

despite increased interest in and, in some cases, support for voucher and student entitlement plans, a major change of this kind was unlikely. In the first place, many of the advantages offered by these plans are contingent upon a thoroughgoing modification of financing mechanisms, the details of which are subject to considerable uncertainty. Many proponents of postsecondary education fear that the adoption of such a plan would result in a net reduction of public support for postsecondary education, as the burden of support was shifted from the public to students and their families. Indeed, it has been argued that movement in the direction of a voucher or student entitlement system would produce a downward spiral of public support that would ultimately destroy postsecondary education in California. The argument goes something like this: presently, public support for postsecondary education rests upon a stable coalition of interests. The middle class has supported expansion of access in return for a high level of direct institutional subsidies of which it is the principal beneficiary. If supporters of broader access were to participate in dismantling the present system of direct institutional subsidies, thus denying the middle class access to publicly subsidized institutions, they would look in vain for support when the time came to establish student assistance levels. Consequently, sufficient student aid would simply not be forthcoming.

I have no way of evaluating this argument. Empirical support is mixed and inconclusive (Thompson and Jones 1979). The evidence suggests that when tuition at California State Universities is at issue, the result has been a fairly straightforward shift of the burden of support from the public to the student and their families. However, overall increases in the share of the burden of support borne by students and their families appear to be associated with a rise in higher level total postsecondary-education expenditures per capita and higher participation levels (Williams, Huckfeldt, and Lip 1976). It seems, therefore, that the downward spiral argument is a bit extreme.

Radical reforms in practice seldom prove to be as beneficial as their proponents have promised they will be; but, on the other hand, it is rare that a policy realizes its opponents' predictions of calamity. However, even if one thought it unlikely that inadequate levels of assistance would be forthcoming from the State, under a system of direct student assistance, one might still be very reluctant to assume the risk.

In the second place, many institutions, especially the public ones, are not too keen about the prospect of greater competition. It appears to be that the institutional interests which have the most to lose from a major change of this kind are better organized politically than are those which stand to gain. While the advocates of voucher and student entitlement plans would likely disagree, it is my assessment that in this case the public interest is not necessarily inconsistent with institutional interests. Implicitly, advocates

of greater reliance upon direct student aid mechanisms assume that the total benefits accruing from postsecondary education are a function of the level and composition of student enrollments, degree and certificate completions, etc. This assumption denies the importance of the social, cultural and recreational benefits the presence of a college or university campus confers upon a community. These benefits might very easily justify a public preference as to where and how it buys educational services.

Furthermore, the public or spillover benefit that accrues from the student's decision to enroll in, persist in, and complete an educational program is contingent upon increasing the likelihood that he or she will thereby be a more effective member of the democratic polity, a more judicious consumer, a more productive worker, etc. If this likelihood is to be realized, at a minimum, the student must learn something. Linking funding directly to the student's decision to enroll in an institution may influence the institution to behave in certain ways which are in the best interests of neither the student nor the public. Such a mechanism may influence the institution to misinform students or reduce the effort expected of them. It is clear that one way to reduce the cost to the student of enrolling is by reducing the demands made upon him. When this outcome is achieved through greater effort on the part of the faculty, for example, there is no conflict between student and public interests. The student is better off and the public is no worse off. However, when this outcome results from reduced expectations of student achievement, the conflict between student and public interests is clear.

In the third place, adoption of a voucher or student entitlement system would complicate the task of State-level fiscal planning and control personnel. The fiscal uncertainty and dislocation of the transition period as both students and institutions adjust to the changed financing mechanisms could, perhaps, be reduced to manageable proportions by phasing implementation over a period of several years. But even if the major discontinuities of implementation were avoided, such a system would give budget analysts fits.

In the fourth place, advocates of voucher and entitlement plans underestimate the degree of competition which presently exists in the higher education "market-place". Moreover, they fail to recognize the degree to which the benefits of voucher plans, where State aid goes directly to the student, can be obtained via a mixed system of direct institutional subsidies and supplementary student aid. However, less drastic market-oriented alternatives were given little if any serious attention at that time.

Instead, state-level authorities almost instinctively opted for the alternative of greater centralized direction and control. The fact that the proposed solution had almost nothing to do with the diagnosed problem was overlooked or ignored. Nor were the implications of the University's legal status honestly faced. Budget techniques were undergoing comprehensive reform. In California, we were making the transition from a line-item, obligation-expenditure budget to an activity-oriented, performance budget. There is no doubt in my mind that state-level authorities simply assumed that what was good for the General Services Department was good for the University of California.

It should be noted that at most budget analysts would be surprised by my allegation that performance budgeting implied a later centralized direction and control. As Allen Schick (1964, pp. 97-106) has observed:

One immediate aim of performance budgeting was to divest central authorities of first instance control over inputs, such as personnel, supplies and equipment. As entire range of departmental actions would be freed of prior central scrutiny, control authorities would intervene only in special circumstances--when there was an over expenditure of funds, a fiscal emergency, evidence of misuse of spending authority--but day-to-day spending decisions would be made by the departments without central clearance. In place of input controls, central authorities would control outputs--the work and activities of departments.

Performance budgeting was seen as a means of decentralizing control functions, reducing the surveillance of central control agencies over departmental operations, and promoting managerial discretion within a department or agency. Of course, budgeteers would not have abandoned existing controls over allocations, mandated savings, positions, fund transfers, requisitions, and so on, unless satisfactory alternatives were available. Performance budgeting did not wholly free departments of central surveillance, but shifted the focus of attention from pre-control to post-control and narrowed the attention of the budgeteers to examination of "variances" from the budget document.

One of the key purposes of performance budgeting is the identification of repetitive activities; the determination of their lower cost; and the enforcement of these notions through the budget. This means that considerable effort is devoted to identifying standard costs and norms. The budgeteers then use these standards to project spending levels and to oversee agency performance. (Shick 1964, . . . In California, departments and agencies must report their expenditures and accomplishments quarterly. The Department of Finance audits these reports to determine whether or not actual expenditures and performance are at variance with the budget estimates. Again, according to Schick (1964):

The examination of variances replaces the blanket scrutiny of every spending action, with selective inspection of exceptions and deviations. Obviously variance controls cannot be exercised unless an accurate and current reporting procedure is in use.

Typically, variances which save money are automatically included in the agency's budget base. Variances which cost money are treated like any other new expenditure proposal and must be justified accordingly to be included in future budgets. This point is made quite explicitly by Schick (1969) in the "Governor's Survey on Efficiency and Cost Control":

... Money saved through improved effectiveness . . . is sent to the state treasury. Money lost through ineffectiveness . . . must be found in the state treasury. Money lost through ineffectiveness . . . don't succeed must be found in the state treasury.

money saved through improved efficiency is spent on something not specifically approved by the Legislature; the [department] is potentially in violation of the Legislative Intent section of the Budget Act (Shick 1971).

I believe that, for the most part, the shift from pre-control to post-control was in the direction of greater decentralization and greater operational flexibility for department and agency level administrators. However, the legislators of the University of California had previously exempted it from all controls. But, under a performance budget system, development of a satisfactory reporting system might have permitted the employment of extensive post-control via successive budgets.

Late in 1967, the CCHE adopted a series of recommendations directing the University and the State Colleges to prepare a schedule for implementing the State's new budgeting system. Further, the CCHE recommended that the University:

... develop operational definitions of its functional aims and of criteria relating to the curriculum, students, methods of instruction, and faculty by which efficient budgetary practices could be designated for instructional purposes;

... design and implement a program budget and cost accounting system;

... develop a system of faculty and staff time reporting for the reasonable allocation of payroll costs to programs or projects benefited by the work performed. (Coordinating Council for Higher Education, 1967)

The University initiated the development of DSIR shortly thereafter. At the same time it was recognized that the usefulness of the reporting and information system under development would be extremely limited if the information it produced could not be related to decisionmaking by means of some kind of theory of the educational process. Consequently, considerable time and effort was spent by the University and the CCHE to develop cost and budgeting models which would correctly reflect the needs of a complex research information system. These efforts served as the basis of many of the more complexly employed higher education management information systems, including the National Center for Higher Education Management Systems (NCHEMS) Resource Requirements Prediction Model (RRPM). These models, however, were never fully satisfactory to the University or the CCHE. Unfortunately, this dissatisfaction with the planning and budgeting models being developed did not stop DSIR.

The high water mark of the State's attempt to bring the University under a system of performance budget controls was reached in 1973, after DSIR was implemented in operations when the DOF formally committed itself to unit-cost funding of the University (Department of Finance; CSUC; UC; CCHE; and CAIR 1973). It replaced the then current NCHEMS approach to planning and budgeting for the University for reporting to state level authorities (Department of Finance 1974). As it happened, the DOF's ability to fund the University had run off more than it could chew and the University's budget for funding was never put into practice. Instead, the DOF was forced to continue the use of a simple student-faculty ratio. The problem was raised by non-traditional program

and students were solved by the simple expedient of not permitting students enrolled in innovative programs to be counted for budget purposes. The capital outlay problem was solved by the decision not to build any more buildings. In effect, the DOF, with the implicit agreement of the University, raised the "steady-state" from a prediction to a policy.

But why did the DOF back-off from its commitment to a unit-cost approach to formula budgeting? The answer is a bit complex. In the first place, the theoretical model upon which the budget model was based was false. This meant that if the budget model were to be used to meet the DOF's needs, it would have been necessary to force the University to be inefficient. Since the DOF did not have the authority to force the University to conform to the model, it was of no use to the DOF and it had the unfortunate drawback of committing the State to a number of things which were in the interest of neither the public nor the control agency. Consequently the commitment was dropped.

The important issue is the wrongness of the theoretical model upon which the budget model was based. Reading through the series of reports and the correspondence of the various committees concerned with the development of an activity-oriented budget model, one is struck by the consensus view that students through their program preferences determine resource requirements (Coordinating Council for Higher Education 1967; Department of Finance, CSUC; UC, OCHE; and the OLA 1973; Department of Finance 1974; and Mathematica 1979). This notion that resources are the dependent variable and student demand the independent variable runs through the literature like a truth handed down from heaven. Having accepted this notion, the authors of the various reports showed considerable sophistication and sensitivity to the problems of applying standard cost concepts to complex organizations like the University of California. It was recognized that student demand was not terribly stable and was becoming more unstable and that relative factor prices were constantly changing. Furthermore, the problem of joint supply was noted. However, there was no recognition that student demand varies from institution to institution and, therefore, that it is appropriate that each institution operate at a different scale, with a different mix of programs, employing different combinations of inputs. This was so because the initial assumption was wrong or, at least, incomplete. The actual choices students make are determined by the services provided by the institution, a function of institutional resources. That is, the choices made by students are simultaneously determined by the supply of services provided by the institution and the demand schedules of students for services.

Viewed from the standpoint of the DOF the advantage of the budget model was that it was supposed to provide a stable basis for analysis of variances from budget. However, because the theory behind the model was fundamentally wrong, it turned out that student behavior would have to be controlled. If the estimates, otherwise the actual relationship between inputs and outputs, should necessarily differ from the budgeted relationship. If, for example, students do not like high here and low there, the response is to redirect them there. Under such a relationship, some programs are assigned a higher support coefficient than others, they are, by definition, more expensive. A discrepancy between the price that must be paid and the actual price,

typically this leads to controls on the number of "high cost" programs. Not infrequently it leads to maximum enrollment quotas. In such a system student preferences do not determine resource requirements; instead, they are subordinated to the budget formula.

Furthermore, to provide the order and stability that is one of the main advantages of such a system, it is necessary for the central control agency to specify how, when, and where inputs can be employed and even how much the institution can pay for them. In practice, this is accomplished by setting minimum utilization standards somewhere near the enrollment-input ratio, i.e., minimum class size, minimum faculty workloads, minimum use and occupancy standards, etc. The institution, of course, responds by treating many of them as maximum standards, so they are fixed. In such a system, the institution cannot save money where it is less effectively being employed to spend it when and where it might better be employed; savings revert to the State. Otherwise the program could get "out of control." All kinds of unapproved activities might take place!

However, where the University was concerned, the DOF had neither the authority nor the means to control student behavior, or to specify how inputs would be used once money had been allocated to the Universities. This meant that what the DOF had done in endorsing the use of unit-costs in funding was to endorse the use of a set of prices for university enrollments which were consistent with neither State priorities nor the budgeteers' interest in controlling the size of the University's budget. As soon as these facts, generally known, the commitment made earlier was put aside as an embarrassment to all concerned.

Some Empirical Support for My Argument

Because what the state wanted was not what the state needed, I would conclude that the public would have been worse off if DSIR had not turned out a bit of a fiasco; if it had taken the way it was supposed to; and if University funding had been fully integrated into the State's performance budgeting system. So far, however, this argument has rested upon a theoretical foundation which many might question unless they happen to be predisposed to prefer competitive markets. The question which must come to mind is whether or not there is any empirical basis for my argument.

The answer to this question ought to come from a comparison of the University, which has successfully avoided post-controls with the State University and College system, (as it is now called) which has not. Here, perhaps, it would be useful to briefly explain State funding of the State University and College. First, the number of faculty positions funded is determined by applying faculty productivity standards for each level and

mode of instruction to a projected distribution of full-time equivalent (FTE) students by level and mode of instruction. The productivity characteristics ratios are based upon historical experience. Section 4, other support coefficients are applied and faculty and staff salaries are set in conformance with a rather rigid schedule.

I have suggested and Professor William Simpson of the Department of Economics at California State University, Los Angeles, has observed that under such a system as this there is a strong tendency for inefficiency to lead to additional support and for increased efficiency to lead to lesser support. Consequently, efficiency is unlikely to be pursued with vigor. According to Professor Simpson (1975, pp. 285-92):

... higher cost per student in one year or at one institution adds weight to the contention that the budgeted amount should be accordingly higher in the budget year or for that institution ... it is present also ... in the form of the weight so often attached to experienced cost.

The practices which have been noted circumscribe the range of faculty positions that will not lead to the loss of positions the next time around in the budget process. As a consequence, such inertia against change as may already exist is reinforced, and a department tends to limit its academic planning to the safe and known area of adding additional courses or sections whenever enrollment would justify another faculty position.

Of course, the failing of performance and the post-controls which accompany it is generally recognized; regrettably, say its proponents, a few butterflies must be sacrificed to stop the elephants.

The tricky question is what does this mean in terms of the State University and Colleges' relative performance? Unfortunately it is very difficult to evaluate the performance of large complex systems such as the State University and Colleges or the University of California. The evidence available may be interpreted as supporting my argument, but it is not overwhelming.

Perhaps the most sophisticated analysis of inter-sectoral cost of production behavior conducted to date is Daryl Carlson's (1972) application of computational algorithm originated by Farrell (1957) for measuring productive efficiency to institutions of higher education. The algorithm uses a linear programming methodology to find institutions that lie on the efficiency frontier. Institutions within various categories (public universities; private liberal arts colleges, etc.) are differentiated according to inputs (number of senior faculty, square footage allocated to various functions, etc.); student enrollment mix (number of full-time undergraduates, graduate students, etc.) and institutional characteristics (quality rating, number of degree-granting fields, growth rates, etc.). Frontier relationships among these variables are derived illustrating the highest level of outputs (i.e., enrollment levels) for a given set of inputs and institutional characteristics.

Marginal relationships are developed among the variables for the frontier institutions. In addition, least-cost methods of achieving given enrollment and institutional characteristics are presented. Carlson found that when California State University's, Colleges and Campuses were compared with institutions having similar characteristics and enrolling a similar mix of students, their operations were characterized by consistently higher input use and therefore higher cost (State of California 1967). Replicating this analysis so as to compare University of California campuses with institutions having similar characteristics, producing comparable outputs and enrolling a similar mix of students, the results were almost reversed. Their operations were characterized by consistently lower input use and lower cost. Furthermore, only two of the nineteen State University campuses were found to lie on the production frontier for their group, while six of the eight University campuses were (Thompson, Carter, Fiske, and Pillsbury 1976). More conventional statistical cost analyses, employing standard regression techniques, produced similar results (Thompson 1973 and Williams, Huckfeldt, Orwig, Thompson, and Wing 1976).

However, it should be noted that there are severe econometric problems which might prevent one from readily applying this methodology to institutions of higher education. It is my opinion that Carlson has, for the most part, managed successfully to overcome them, but it is important to remember that there is a very large jump from the geometry of input/output relationships to unbiased estimates of productive efficiency. The interpretation of these results, therefore, are wide open to questions. Certainly they are not sufficient or proper basis upon which to base state policy. The same point may be made with regard to standard cost estimating procedures. Heroic, not to say naive, assumptions must be made in their application and interpretation.

These problems are encountered in the evaluation of the efficiency or performance of any firm in any industry. In the private sector, we tend, therefore, to focus our attention upon signals of success or failure such as sales, profits, rates of return on investment, or market share. Colleges and Universities do not make profits. Rate of return on investment is not directly applicable to the performance of individual institutions. However, the State's commitment to increased access implies that market share may be, i.e., an efficient institution ought to be able to attract roughly the same proportion of the potential student population over a period of years as its competition, other things being equal. Here the two most important "other things" are the marginal or incremental per-student subsidies and the tuition charge faced by the student. If an institution suffered relative changes in either of these areas, then, of course, it could not compete on the same basis as before and, despite its efficiency, could not be expected to maintain its share of the market.

Here we have a rough measure of the State University and Colleges' efficiency and a natural experiment which permits evaluation vis a vis the University. High school graduates eligible to attend the University of California are also eligible to attend the State University and Colleges. They represent, therefore, the directly competitive portion of UC's and CSUC's

student market: During the ten years between 1966 and 1976, the marginal per student subsidy from the state was roughly equal or slightly favored CSUC (CSUC 1975, p. 7 and Thompson, Carter, Fiske, and Pillsbury 1976), and tuition at UC increased at least as fast as CSUC tuition. The question is fairly put: did CSUC manage to maintain its relative market share? According to the best evidence available, it did not.

In 1977, 59.6% of the high school graduates eligible to attend either UC or CSUC choosing to attend one of the four-year public universities selected in 1975; the proportion was only 33.3% (CCE 1967, p. 1-9, p. 1-10, p. B-3 and Fuller 1975).

Obviously, if it is true that CSUC was really inefficient, and this conclusion should not be taken as proven; there may be other explanations than the rigidity and inflexibility of the budget mechanism and state-level controls: When an organization's performance is sub-par, we typically look to its management for the explanation. However, this explanation would try the credulity of even the most casual observer of the California postsecondary education scene. The central administrative staff of the State University and Colleges are generally recognized to be among the best in the United States. If CSUC's performance was sub-par, it was not because the administrators cannot manage; but because the budget mechanism did not permit them to.

Why is it that administrative budget controls are such a common feature, nearly universally applied to most state agencies, when they have so many drawbacks? The answer is that in most cases they are justified and necessary. The relationship between most agencies and bureaus and the state administration, especially the Department of Finance, is that of monopolist and monopsonist. If the State did not exercise rigid control, the monopoly power of the agency could easily result in the generation of large factor and producer surpluses for the agency, and the complete loss of the public consumer's surplus. A certain amount of operational inefficiency is justified in order to avoid this outcome and the loss of all net benefit from the program. Where the same relationship holds between the State and some portion of postsecondary education, (e.g., the Veterinary Medical Program at UC Davis; a monopoly; and the State), the same rigid administrative and budget controls are fully justified.

For the most part, however, postsecondary education is fairly competitive and the State and students can engage in price trade controls are not unnecessary; but where they exist they tend to reduce the efficiency of the operation of the whole system. For example, efforts made to control the size of the total budget of a State by denying the opportunity to expand in alternative programs or procedures such as round operation of general education programs mean the people of the State often end up buying the same product somewhere else at a substantially higher per-student price.

A Simplified Approach to State Funding of Higher Education

Professors Burkhead and Mine (1971) have observed that: "An administrative matter center cannot be expected to respond to any but the most gross of regional needs. Gargantua by definition is insensitive." More financial approaches to level planning and budgeting recognize this fact and propose some kind of formula as a solution. The critical distinction between centralizing and decentralizing approaches to formula budgeting is that the former gives attention to the costs of activities and the latter permits relatively equal attention to goals and objectives. I would propose a formula approach to budgeting higher education in California, but I would argue that it is feasible and desirable to give far greater weight to outputs than is presently the case.

First, however, one should recognize that a public institution provides many public services which do not vary with its enrollment. Since it is difficult to identify many of these services, let alone measure the benefits they provide, I would argue that (in the absence of hard evidence as to the kind, amount, and incidence of these benefits) it makes sense to guarantee each public institution a budget base roughly equal to the current level of State support and to increase that base each year to reflect changes in prices and wages. This is a common budgeting practice and it seems appropriate to apply it to higher education.

Beyond the base, I would suggest that for each additional student enrolled the institution should earn from the State a fixed stipend or per-unit subsidy. Obviously, if the institution's enrollment dropped, the base should be reduced accordingly. Furthermore, I would suggest that all institutions should earn the same per-unit subsidy (or be paid the same price). If it were deemed desirable to increase participation in higher education on the part of some group in the population or to increase or reduce enrollment in some program or course of study, the subsidy should be adjusted accordingly. However, I would stress that all institutions should be paid at the same rate.

Such a funding mechanism could easily be extended to include the State's independent colleges and universities. There is no reason not to do so. The cost to the State of adding a student would be the same regardless of where the student decided to enroll. The student would be free to choose the institution and program most fully meeting his or her unique set of preferences and interests. This does not mean that the distinction between private and public institutions would be erased. Under the outline here, private institutions would receive no such guarantee; public institutions would be guaranteed their support base, but in return the State could retain the authority to establish a uniform tuition policy and the public institution would be obligated to admit all those who applied. This obligation should, wherever possible, be applied to individual programs and courses as well as to the institution as a whole. I am inclined to agree with Christopher Jencks (1972) that:

A public school is one that is open to any student who wants to attend. All other schools, regardless of formal control or financing, are to some degree 'private'.

The economic distinction between public and private institutions under such a financing mechanism as the one proposed here would be that in the public sector supply would be equated with student demand by varying the services provided per-student with the nominal price to the student fixed and in the private sector the educational service would be fixed and supply would be equated with demand by means of conventional price mechanisms.

Unfortunately, it is not possible to permit free access to all courses and programs. External constraints often make it necessary to ration enrollment places. For example, State Medical Board requirements specify that each time a student is enrolled in a medical school a large fixed expenditure will be incurred. Since this amount is very high, as long as medical students are charged the same nominal price as other students, student demand will continue to overrun the institution's or the State's capacity or desire to respond. This means that unless licensing boards can be persuaded to change their rules, places in medical schools must be rationed. One could apply Jencks' definition of a public institution and deduce that the appropriate response to the problem of rationing medical school spaces would be to charge medical school students the market clearing price. That is not likely to happen in the near future. Therefore, some other approach to rationing spaces in medical schools must be found and standard budget control devices applied to determine medical school budgets. The same conclusion will hold wherever extensive market failure is likely to be present.

Why do I propose the HF plan? The answer is simple. I have assumed that the proper objective of state financing policy is to insure that the optimal use of all the state's postsecondary education resources is obtained. This means that the state should intervene in the higher education market so as to insure that each institution operates where the total benefits produced by enrolling the last student (marginal benefits) are equal to the costs of enrolling him or her (marginal costs). Further, this rule is concerned with societal costs, defined as the sum of public and private costs, rather than external benefits or public costs alone. The plan proposed here guarantees this objective will be met. The point is obvious as far as public institutions are concerned. As long as artificial constraints do not exclude them, students will continue to enroll in institutions and programs until the last student entering the institution or program is practically indifferent as to whether he or she enrolls or not. That is to say, the net private benefit of enrolling is zero to one marginal student. Therefore, marginal private cost will equal marginal private benefit. Second, assuming the state establishes a per-student price or subsidy which is consistent with maximizing net public benefit, the same conclusion holds -- marginal public benefit equals marginal public cost. Summing benefits and costs, it is obvious that marginal social benefit will equal marginal social cost across public institutions and programs.

The same conclusion holds for private institutions as well, but the mechanism is somewhat different. If the cost of accommodating an additional student in a private institution happened to be higher than the per-student subsidy, someone would have to make up the difference. In most cases, that someone would be the student or his family. However, as long as the student is free to choose, he or she will not choose to pay a higher price to attend a private institution unless he or she thinks the benefits of attending that institution outweigh the additional cost. On the other hand, as long as the institution is free to choose, it will not admit the additional student unless it is thereby made better off or at least no worse off. Thus, if the student chooses to attend a private institution and is accepted, the rationalizing criterion is met.

In outlining this plan one further point must be made. A requirement for efficient operation under such a mechanism is that the institution must bear the cost of all the inputs employed in providing educational services. Otherwise there is no incentive to economize. This means that the revenue an institution earns should bear the burden of support for all the resources used to earn it. This includes buildings and equipment as well as faculty and staff. There is simply no justification for a separate funding mechanism for capital outlay. However, if we stopped providing funds to build buildings, leaving construction to be paid for out of current revenue, it would be necessary to make arrangements for public institutions to borrow money to add to their physical capacity. This is not a major problem. In California such a mechanism already exists to provide long-term, low-interest loans to private institutions for capital outlay purposes.

Several unconvincing objections to such a plan can be raised. To those who might argue that such a plan would unduly favor new institutions or cheap, low quality institutions, it should be emphasized that (a) we should not be particularly concerned about benefits to institutions; rather our concern is with benefits to students and society at large; institutions are only a means of satisfying these concerns; (b) older institutions have the advantages of an existing plant, endowment, staff, and reputation--these too are significant advantages; and (c) low-quality institutions would not be favored by such a program, unless quality is somehow independent of student benefits and costs, in which case I would ask what is meant by quality. If the answer is given in terms of student performance, I agree. Beyond that agreement I am not sure how to respond. This is a problem under any student-driven financing plan. It has no easy solution. Perhaps, some expectation of standardized student performance could be established which would have to be met before the institution would be eligible to earn enrollment revenue from the state.

Finally, the objection might be raised that such a program would be inequitable in that it would transfer funds from the average taxpayer to the "well-to-do" student. This is a valid observation. However, such a program would in no way increase the inequities of the present pattern of state subsidy for higher education, and, in fact, might reduce them somewhat, as the pattern of income distribution in California's independent colleges and universities better reflects that of the population of California as a whole, than does the income distribution at either of the two public segments (Fuller 1975).

What Kind of Information Would Be Needed Under This Plan

A decentralized, market-oriented funding plan such as the one outlined here is simple enough in concept. Under such a plan, the prices paid by the state for institutionally generated outcomes (per-student subsidies) provide the key information needed for rational choice on the part of the institutional administrator. They also provide a framework in which educational accountability can be made unambiguous. Furthermore, in determining the additional information required for making the system work to the limits of human and organizational capacity, there is an extensive body of theory in the literature on industrial organization and the theory of the firm to guide us.

Decentralization does not mean that state-level authorities would get out of the business of collecting information or monitoring institutional performance. At the very least, administrative controls would be necessary in certain areas: enrollment accounting; curriculum controls, etc. It would be neither cheap nor easy to verify that the public was getting what it was paying for. Furthermore, in addition to knowing how many students were enrolled, we should want to know something about the characteristics of those who have enrolled--their ages; field of study; family income, where they come from, etc. Enrollment information is necessary if we are to make reasoned choices about increasing or reducing subsidies for enrolling students from specific groups or in specific fields.

I would also argue that the state has an obligation to seek to improve the effectiveness of the market through the collection and distribution of certain kinds of information--information to student consumers to promote the effectiveness of student demand and information to institutions to increase the efficiency with which they respond to student demand. It ought to make an effort to provide students with information about the performance of degree or certificate winners from specific programs; time-to-degree attrition and so forth. This information is essential to students and potential students if they are to make rational choices about enrolling in specific programs and specific institutions. This information may also be employed by institutions as a source of information about their competition. Such information would be extremely helpful for making decisions about adding faculty or facilities, course locations, and adding or dropping degree or certificate programs. Even if the usefulness of such information cannot be questioned, the logic of making its collection and distribution a state responsibility might be. However, I would observe that the state has assumed the responsibility for protecting consumers against misinformation and misrepresentation. It makes sense to me that this responsibility should be extended to encompass higher education. Moreover, it appears that it would be cheaper to have this information centrally collected and distributed.

I could go on, but there is no point in doing so. This list of information needs is intended to be illustrative rather than comprehensive. The point is that what we need is very different from what we have asked for in the past. The problem is to make this point understood and to act upon it. Information

systems can be designed and implemented in such a way as to improve the consequences of public undertakings--but only if we know what kind of decisions are to be facilitated or influenced by the provision of information and who is going to make them.

Appendix*

Indeed, when budget analysts try to practice price search, their recommendations are often down right silly, or at least they would be if they were not frequently adopted. A case in point is the California Legislative Analyst's consistent misunderstanding of the relationship between the scale of institutional operations, enrollment, and cost. Since the scale of institutional operations is generally assumed to be related to cost, considerable analytical attention has been given to the identification of the optimal scale of institutional operations. The approach usually taken can be broken down to the following steps:

- (1) identification and measurement of the "output" of each program of expenditure;
- (2) determination of the cost patterns associated with the generation of each output; and
- (3) specification of the optimal scale of operations.

Output measurement is a critical problem. By far the most common measure of the instructional output of a college or university is the number of students enrolled per relevant time period. It is simple and easy to obtain, but in common with many simple, easily obtainable measures, this measure is often unsatisfactory.

The estimation of the relationship between the number of students and cost is usually accomplished by means of simple or multiple regression analysis, depending on the number of variables included in the analysis. This identifies the portion and magnitude of variation in cost which is explained by variations in enrollment and other variables included in the analysis and a residual portion which is unexplained.

Typically, the specification employed looks like:

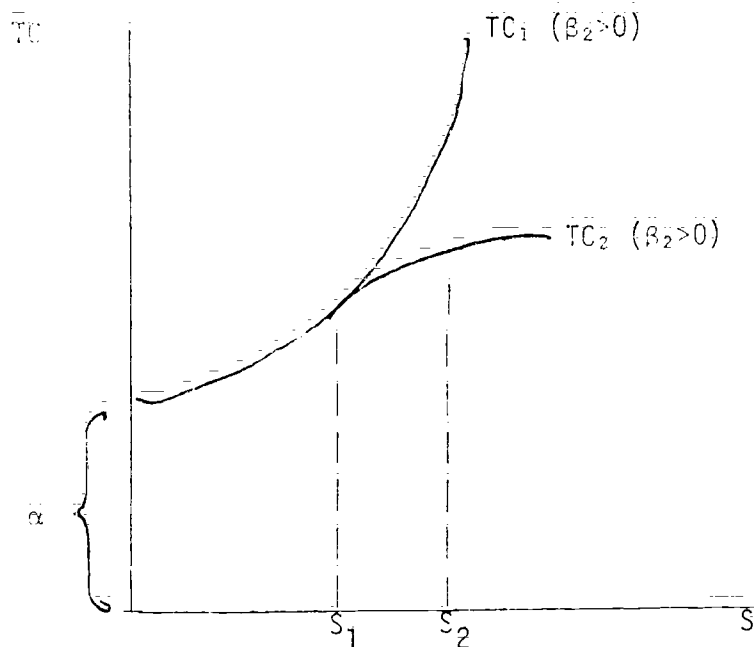
$$C = \alpha + \beta_1 S + \beta_2 S^2 \quad (1.1)$$

where

C = total cost
S = enrollment

*See Thompson and Zumeta 1980.

When linear regression analysis is employed to estimate this relationship, one of two general functions will be estimated. They are seen in (a).

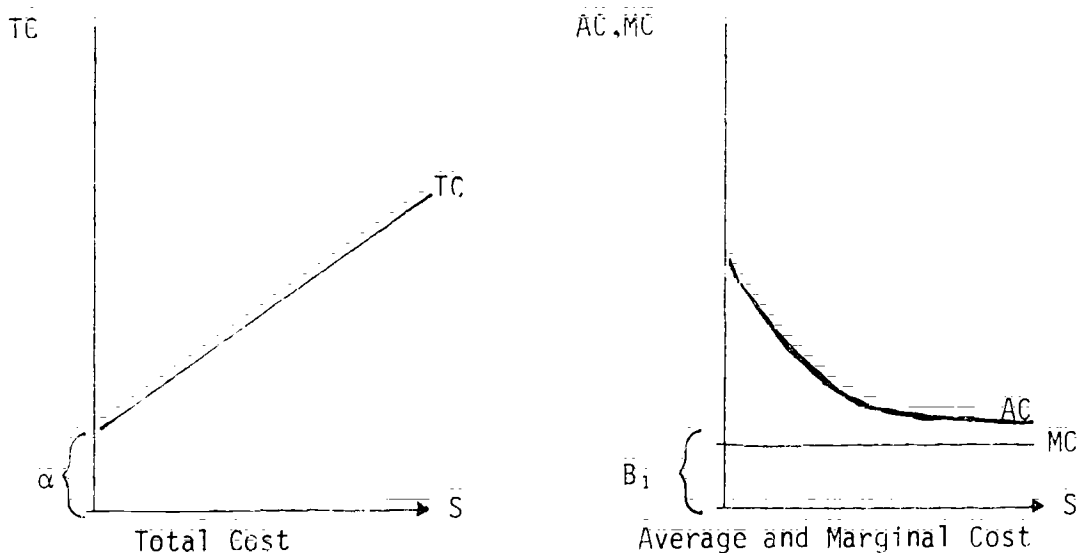


(a)

TC_1 corresponds to the conventional expectation of a "u"-shaped average cost curve and increasing marginal cost in the relevant range. If this represented the true relationship between cost and enrollment levels, then S_1 would be the optimal size for an institution (minimum average cost) and expansion should be concentrated in the smallest institution. TC_2 implies that there is no optimum size institution and that neither average or marginal costs ever rise no matter how large institutions grow. If this function represents the true relationship between cost and enrollment, then all expansion should be concentrated in the largest institution. Most studies which have dealt solely with institutional expenditures and enrollment, however, have found a somewhat simpler cost function to fit the data better than a quadratic function; that is:

$$C = \alpha + \beta_1 S \quad (1.2)$$

This corresponds to the function plotted in (b):

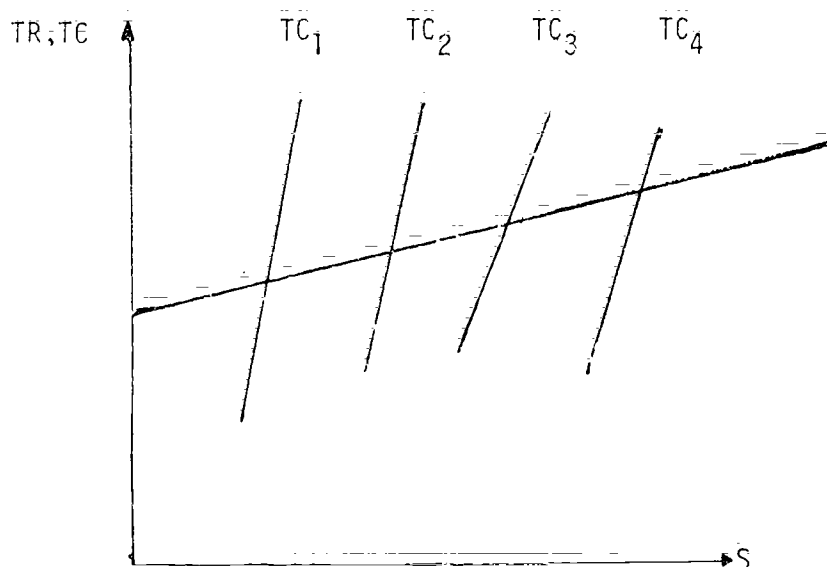


(b)

Again, this tells us that there is no optimal sized institution, but it does not tell us we should favor larger over smaller institutions in our expansion plans. Once a given number of institutions exist, the smallest is no more or less expensive than the largest in terms of the additional students it might accommodate.

However, that is not the Legislative Analyst's interpretation. Looking only at average cost he concluded that this pattern "is a graphic illustration of the desirability of increasing the size of the small campuses for more effective use of the teaching salary dollar expenditures (Office of the Legislative Analyst 1960)." Even if this specification properly stated the relationship between institutional scale and cost--and I do not think it does--the Legislative Analyst grossly misconstrued its implications.

In point of fact, this approach to cost analysis is flawed owing to its failure to deal with simultaneous equations bias (Zellner, Kmeta, and Dreze 1966). I would argue that this flaw is serious--so serious, in fact, that the typical cost analysis produces a view of institutional cost and production behavior which is almost the opposite of the truth. The kind of regression analysis we have described so far, ordinarily least squares (OLS), is appropriate only where all but one variable, the dependent variable, is pre-determined. This condition is not met for cost functions in a system where inputs and outputs are simultaneously determined. This problem is illustrated in (c).



(c)

In this illustration, $TC_1, 2, 3, 4$ represent the true cost curves of institutions 1 through 4, and TR the revenue schedule they all face. If each minimizes cost each would operate at the intersection of TC and TR . If not, each would operate below and to the left of the intersection. In either case, OLS cross-sectional analysis of the cost functions would produce the linear total-cost function identified above, despite the fact that this function bears no relationship to the true relationship between cost and size.

It is difficult to see how anyone could accept the standard view of the relationship between cost and institutional size. It is simply not realistic to believe that the most efficient way to provide educational services is to locate one huge institution in the center of a state, for instance, in Fresno, California, perhaps. Common sense tells us that although such an institution might achieve impressive "economies of scale," a far smaller number of students would be enrolled than is presently the case. The problem with this approach is that it ignores costs as well as benefits to students. This is a major error in a system which is responsive to student choices and preferences.

It is my considered opinion that reality is very much like the situation shown in (c). That is: a college's enrollment level, total revenues or budget, and programmatic offerings will be simultaneously determined by the demand for its services, its revenue schedule, and by its cost schedule. Furthermore, at any point in time the college's cost schedule is fixed by the preference of actual or potential students. Therefore, given that the college's level of operations is determined by supply and demand and that the supply schedule is fixed, demand for the college's services, its revenue schedule, may be said to determine its level of operations.

It is fairly common knowledge that institutional revenue schedules do, in fact, look like the one shown in (c). What do institution's cost schedules look like? I would argue that it is reasonable to assume that other things being equal, an institution increases enrollment by providing services which increase the benefit or reduce the cost to the student of enrolling in a program of course. That is: an institution may increase enrollments by offering more course titles, or degree or certificate programs which interest students, better training, more stimulating instruction in the classroom and class laboratory, smaller class size, more locations and times at which courses and degree programs are offered, better counselling to assist the student in matching his talents and interests to the institution's offerings, etc.

These things cost money and, beyond some point, I would conclude that a college or university could increase enrollment only at an increased cost per student. Furthermore, many kinds of institutions face substantial fixed costs. Therefore, where enrollments are the output we are concerned with and the relevant cost faced by the institution is the cost of enrolling additional students, we can posit cost curves which exhibit the properties usually assumed by economists: total cost is a cubic function of enrollment; average total cost, average variable cost, and marginal cost are all second degree curves which first decline and then increase as output is increased.

If this view is correct, we may conclude from the fact that all institutions facing the same revenue do not operate at the same enrollment level, that most institutions face increasing marginal costs (or choose not to maximize revenue). Furthermore, there is an optimal output level for each institution; but, this point will vary greatly from institution to institution depending upon the size of the potential student population, the location of the institution, the other activities performed by the institution, etc.

However, prior to this step there is the assumption that the problem of optimum input and output combinations has been solved. Some explanation of what we mean by this would seem in order. A supply curve of some kind of enrollments has been proposed. In breaking the institution's supply problem down to constituent enrollment generating processes, a whole set of such supply curves can be assumed. But for the sake of simplicity, assume an institution which supplies undergraduate enrollments and graduate enrollments. The undergraduate revenue-enrollment function is:

$$\bar{R}_e = \bar{a}_e N_e, \quad 0 \leq N_e \quad (1.3)$$

The graduate revenue-enrollment function is:

$$\bar{R}_g = \bar{a}_g N_g, \quad 0 \leq N_g \quad (1.4)$$

The undergraduate minimum total cost function is:

$$\bar{TC}_e = \bar{c}_e \bar{N}_e + d_e \bar{N}_e^2, \quad 0 \leq \bar{N}_e \quad (1.5)$$

and the graduate minimum total cost function is:

$$\bar{TC}_g = \bar{c}_g \bar{N}_g + d_g \bar{N}_g^2, \quad 0 \leq \bar{N}_g \quad (1.6)$$

Further, this institution faces a budget constraint represented by:

$$\bar{R}_e + \bar{R}_g \geq \bar{TC}_e + \bar{TC}_g \quad (1.7)$$

The output problem of this institution is to find the enrollment level in the two fields which maximizes revenue, $\bar{R}_e + \bar{R}_g$, subject to the budget constraint. This problem is best solved by the Lagrangian multiplier method, which translates a constrained maximization problem into an unconstrained maximization problem by formulating the function:

$$Z = \bar{a}_e \bar{N}_e + \bar{a}_g \bar{N}_g - \lambda [\bar{a}_e \bar{N}_e + \bar{a}_g \bar{N}_g - (\bar{c}_e \bar{N}_e + d_e \bar{N}_e^2 + \bar{c}_g \bar{N}_g + d_g \bar{N}_g^2)] \quad (1.8)$$

The derivatives of this function with respect to \bar{N}_e and \bar{N}_g are evaluated, and the equality of the two derivatives is solved by the combination of \bar{N}_e and \bar{N}_g . This yields the following budget-maximizing combination of \bar{N}_e and \bar{N}_g :

$$\bar{N}_e = \frac{\bar{a}_e \bar{c}_g - \bar{a}_g \bar{c}_e}{2\bar{a}_g d_e} + \frac{\bar{a}_e d_g}{\bar{a}_g d_e} \bar{N}_g \quad (1.9)$$

and for the special case in which $\bar{a}_e = \bar{a}_g$

$$\bar{N}_e = \frac{\bar{c}_g - \bar{c}_e}{2d_e} + \frac{d_g}{d_e} \bar{N}_g \quad (1.10)$$

At this combination of \bar{N}_e and \bar{N}_g , the ratio of the marginal increase in revenue over the marginal increase in total costs for a small increase in \bar{N}_e is equal to the marginal increase in revenue over the marginal increase in total costs for a small increase in \bar{N}_g . This conclusion can be generalized to the supply of enrollments in any number of levels or fields. For a college supplying n enrollment in n levels and fields, the necessary condition for the revenue-maximizing combination of enrollments is therefore:

$$\frac{\partial R_1 / \partial N_1}{\partial TC_1 / \partial N_1} = \frac{\partial R_2 / \partial N_2}{\partial TC_2 / \partial N_2} = \dots = \frac{\partial R_n / \partial N_n}{\partial TC_n / \partial N_n} \quad (1.11)$$

Returning to the two level institutions we should stress that the revenue-maximizing combination of N_1 and N_2 is likely to be different and, if different, more efficient than if each enrollment generating process were independent and supplying enrollments to the state. Perhaps this point can best be illustrated by a numerical example showing a constrained maximization problem:

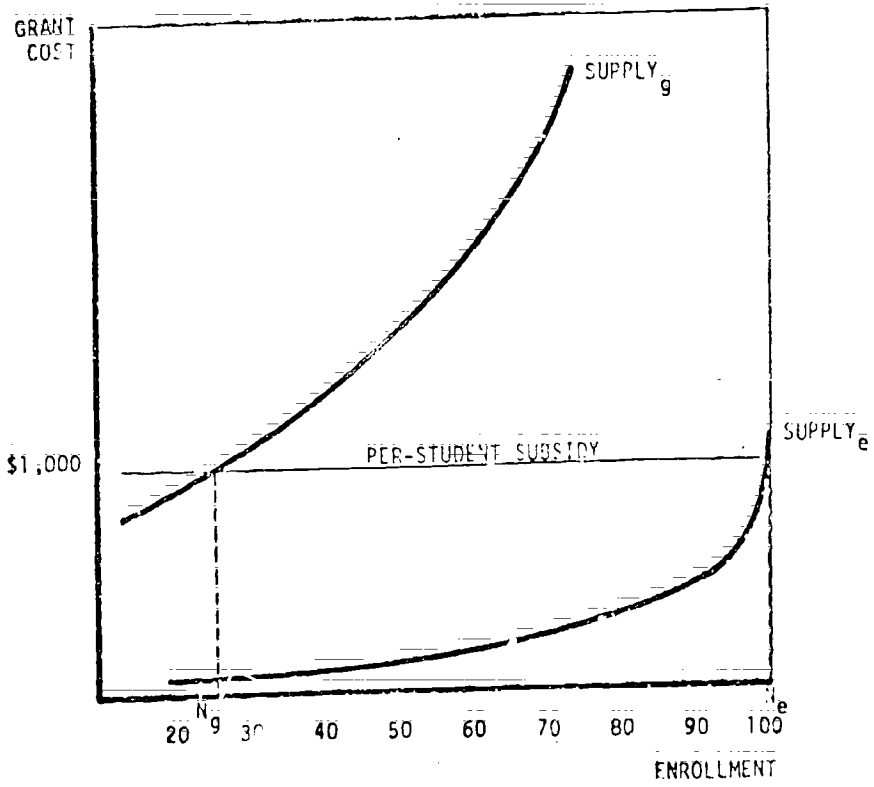
In figure (d), $Supply_1$ represents the undergraduate enrollment supply curve; $Supply_2$, the graduate enrollment supply curve; and R_1 a per-student grant. Here, the undergraduate and graduate enrollment generating process are independent and produce enrollments of 25 and 100 respectively, at an average total cost of \$1,000. Of course, average cost and average revenue are equal:

However, were they part of the same institution, a per-student grant of \$1,000 would eventuate in enrollments of 97 and 53. Average total cost would still equal \$1,000; but the average cost per graduate enrollment would be \$1,320, while average cost per undergraduate enrollment would be only \$825. Alternatively, if our objective were a combined enrollment of 125 as above, the institution producing both kinds of enrollments could achieve that goal at a per-student grant of approximately \$640, with average total cost per graduate enrollment of \$952 and undergraduate, \$445. These computations are illustrated in Figures (e) and (f).

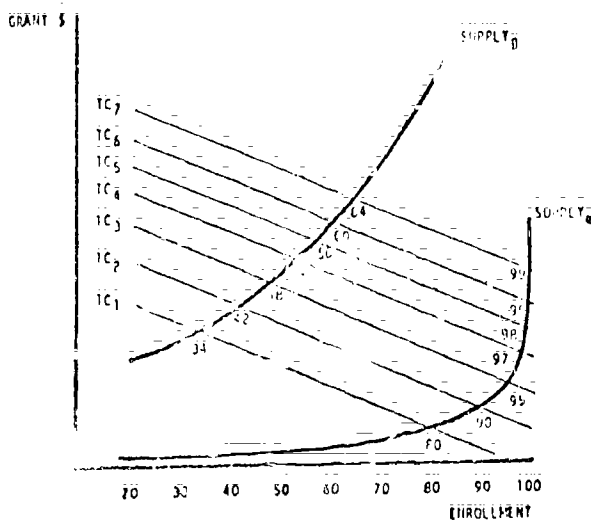
In the first of these, TC_1 through TC_7 , represent total cost combinations of per-student awards and enrollment which can be obtained at \$20,000 intervals from \$20,000 to \$140,000. At each TC a determinate number of enrollments of each type would be supplied; by summing equal combinations TC_i , we can produce the production possibilities frontier shown in Figure (f); at a combined total cost of \$160,000. The point on this curve tangent to a line representing combinations of per-student grants which sum to equal amounts (the price line) represents the optimal enrollment combination for the revenue-maximizing institution. In this case, there would be an infinite number of possible parallel price lines and a number of non-intersecting production possibilities frontiers, one at each combined total cost level. The solution at each per-student subsidy level is the point of tangency between the two lines.

If this view is correct, the consequences of changing the price paid for enrolling students or of changes in relative prices -- both in terms of the level of enrollments and average cost in various programs -- should be obvious. However, budgeteers with their attention focused squarely on average costs are unlikely to appreciate these consequences. Here an example is in order.

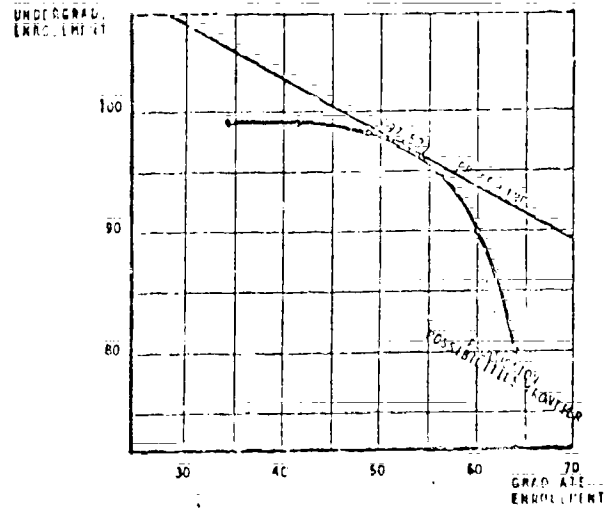
Prior to the publication of the California and Western Conference Cost and Statistical Study, usually referred to as the "California Big-Ten Study," the State allocated resources to the University of California on the basis of an unweighted student-faculty ratio; salary and support dollars were linked



Equilibrium Enrollment Production on the Part of Two Specializing Colleges
(d)



Equilibrium Enrollment in a Single Multi-Program College
(e)



Production Possibilities Frontier:
Two Programs and a Given Price
for Enrollment
(f)

in justifying State education and general support for the University. The "California Big-Ten Study" found that the actual pattern of costs inconsistent with the resource allocation pattern. In fact, major research institutions appeared on the average to spend about three and a half times as much money providing educational services to advanced graduate students as to lower division students--freshmen and sophomores. Therefore, it was recommended (Office of the Legislative Analyst 1960) that State resource allocation to the University of California be weighted to reflect "the actual distribution of students and the actual pattern of costs related to their education."

Consequently, throughout much of the 1960's, state funding of the University of California was determined by the following formula:

$$\text{FTE Faculty} = \frac{1.0 \text{ LD} + 1.5 \text{ UD} + 2.5 \text{ OG} + 3.5 \text{ AD}}{28} \quad (1.12)$$

where

LD = number of FTE lower division students

UD = number of FTE upper division students

OG = number of FTE master's and 1st year Ph.D. students

AD = number of FTE 2nd year plus Ph.D. students

As David Breneman has noted:

The weights were designed to account for the greater input of faculty time required by doctoral students as compared with lower division students. However, the weights also established exchange ratios or internal prices for different level students; while it took 28 lower division students to "earn" a faculty position, only 8 advanced doctoral students were thus "worth" 3.5 times as much as lower division. The drive on the part of the University of California campuses to expand graduate enrollment must be attributable, in part, to a rational response to these internal value signals (Breneman 1971).

Breneman's point is, since the university was more or less free to employ state funds as it saw fit once those funds were assigned to the university, the weights were simply prices. They told the university that the state was willing to pay three and one-half times as much for enrolling a doctoral candidate as for enrolling a freshman. He further suggests that this change in price and, therefore, the change in the university's revenue schedule influenced (permitted?) the university to enroll more graduate students. If Breneman is right, and everything I have said is consistent with his argument,

we would expect to find; using roughly similar cost accounting principles to those used in the "California Big-Ten Study," not only a change in university outputs, but a change in the pattern of per-student "cost" as well. We would expect to find that if the "cost" ratio was 3.5 to 1 when the state was paying the university the same price for enrolling graduate students as for enrolling freshmen and sophomores, the "cost" ratio would be higher after the state started paying a higher price for graduate students and a lower price for lower division students. That is precisely what we do find. A series of "cost" studies conducted during the late 1960's at the University of California and during the early 1970's at the state level found that an average cost per FTE student varied from the lowest student level to the highest by factors to between 6 and 12 (Bell 1972; CCHE 1974; and Thompson 1973):

The point is that the average cost of enrolling a given number of students is not fixed or certain under every circumstance. Where institutions have the flexibility to manage resources and where they are concerned about revenue, average costs will be determined not only by what it costs to perform certain activities, but by the price the institutions are paid and student preferences or demand. The institutions can be expected, and I think ought, to respond to the incentives implicit in the revenue schedule.

The important question is whether or not the prices established by the state funding mechanism are consistent with public preferences and needs. If the outcomes are consistent with those preferences and needs there is no problem, even if the state pay the university the same price for enrolling all kinds of students. That is, each time the university adds a student it gets the same amount of money regardless of the kind or level of the student --and if it is believed that the public benefits of enrolling all kinds of students are equal, the pattern of average costs within the university does not matter; the cost to the state is the same regardless. If the institutions are enrolling too many or too few of some kinds of students, if it is believed that the public benefits of enrolling one kind of student is greater or less than the others, the proper policy is easy to deduce--increase or decrease the price paid for them. This is not an arbitrary mechanism.

However, in this case the effects of reducing the price paid to the university for enrolling undergraduates and increasing the price paid for enrolling graduate students do not seem to have been what the Legislative Analyst had in mind. The three pages preceding the recommendation that funding be weighted by level of student were devoted to criticizing the university's emphasis on research and graduate education

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Indexing Tuition to Cost of Education:
Implications for State Policy

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Indexing Tuition to Cost of Education: Implications for State Policy

For a variety of reasons, state policies used to set tuition* levels at public higher education institutions are changing. The traditional "incremental pricing" method of determining tuition and fees is being reconsidered in favor of specific pricing formulas, especially an index to the cost of education. The attraction of this approach arises from a number of causes including the upward pressure on tuition created by changing demographic and fiscal conditions.

Impact of Declining Enrollments and Fiscal Constraints on Tuition

The demographic outlook for higher education is irrefutable. The size of the traditional college-age cohort is growing smaller. Nationally, the number of high school graduates is expected to decline by 18 percent by 1986 and 26 percent by 1991 (Western Interstate Commission for Higher Education 1979). Although a number of factors influence college enrollments, most projections forecast declining enrollments for higher education. The relationship of enrollment to tuition income is a positive one, and it is apparent that in order to maintain current levels of tuition income in a period of declining enrollments, student charges will have to increase. Further, at the same time enrollments decline, institutional costs will not. Costs for higher education institutions will rise not only due to inflation, increased maintenance, or higher energy prices, but also from the diseconomy of scale--a decreasing student population with rising fixed costs will result in increasing costs per student. Consequently, declining enrollments and increasing costs threaten a one-two punch on student charges--fewer students paying heftier fees.

Changing fiscal conditions within the states and the U.S. as a whole will also tend to increase tuition levels. The vulnerability of tuition to pressures of the economy is illustrated by three factors. First, public higher education is highly dependent upon state appropriations. In fiscal year 1977, tuition and fees accounted for only 16 percent of the educational and general revenues of public colleges and

*For the purpose of this paper tuition will be considered to be the basic comprehensive student charge used, along with state appropriations and other unrestricted institutional receipts, to fund activities relating to student instruction. These activities could include instruction, academic support, administration, student service, and plant operation. These charges may or may not be known as tuition and, in some states, may be general fund revenues. Other designations might include educational fee, incidental fee, registration fee or instructional fee. Required fees assessed for specific purposes (e.g., health, athletics, bond retirement) are not included.

universities; 59 percent of these revenues came from state and local appropriations. Second, higher education appropriations are a major component of total state appropriations, second only to elementary and secondary education in most states. Thus, cutbacks in state appropriations, even if distributed evenly among all state recipients, will have a sizable impact on higher education. Finally, tuition is usually viewed as the balance between operating budget requirements and state or local appropriations. As a result, when state or local government revenues are restricted, states will seek increased revenues from other sources, including tuition and fees for higher education.

Although both changing demographics and fiscal constraints point toward higher tuition, the latter is more ominous. The fact that higher education must now face a shrinking college-age cohort has been long anticipated and well-documented. Dismal fiscal conditions, in contrast, are more recent and more unexpected. Furthermore, it is the fiscal constraints that will be the more decisive in pushing up tuition. A research study by Rusk and Leslie (Rusk and Leslie 1978) describes this tendency. In a study of factors affecting tuition they found:

Tuition prices and price increases tend clearly to be higher where the state effort is insufficient to the financial obligations of the institutions. Indeed, of the manipulable variables studied, adjusting state appropriations seems to be the major way to affect tuition levels. State policymakers should be aware of this fact not only for the value of achieving desired outcomes, but also for the knowledge that appropriations shortfalls will raise tuition prices just as surely as if the prices had been raised by the legislators themselves (p. 544).

This pattern has become evident in the current recessionary period when temporary revenue shortfalls in several states have resulted in mid-year tuition increases to recover lost revenues.

In addition, recent surveys of American public opinion have revealed surprisingly strong sentiments to curtail public higher education budgets before other public services. (See table 1, which shows the results of the survey by the Advisory Commission on Intergovernmental Relations.)

Table 1

Supposing the Budgets of Your State and Local Governments Have to be Curtailed,
Which One of These Parts of the Budget Would You Limit Most Severely?

	U.S.	Northeast	North-Central	South	West
Public Safety (fire, police, criminal justice)	2%	1%	2%	3%	4%
Public Schools (kindergarten - 12th grade)	3	4	2	3	2
Tax-Supported Colleges and Universities	23	24	21	19	32
Aid to the Needy	8	3	9	11	6
Streets and Highways	11	15	10	7	16
Parks and Recreation	40	36	44	45	31
Don't Know	12	17	11	12	9
Total*	99%	100%	99%	100%	100%

*Percentages may not sum to 100% due to rounding.

Source: Advisory Commission on Intergovernmental Relations

Opposed to these forces, however, are others that work to keep tuition levels as low as possible. Included among these are historical commitments to low student charges, the political sensitivity of elected officials, and a recognition of the social benefits of higher education. In the absence of an explicit affirmation of these considerations, however, tuition setting is likely to be viewed purely as a fiscal matter--and thus clearly vulnerable to the demographic and fiscal pressures just discussed.

Current State Policies for Determining Tuition

In October 1980 the authors surveyed the state higher education executive officers (SHEEO) in each state to ascertain the policy (if any) currently being used to determine tuition levels. Table 2 presents a summary of the survey results.

*The appendix includes more information about the survey, including a tabulation of state responses.

Table 2
State Policies for Determining Tuition Levels

No established policy: 30 states

Established policy without specific formula: 3 states

Established policy with specific formula:

Indexed to:	Higher education price index:	1 state
	Cost of instruction:	1 state (nonresident tuition only)*
	Cost of education	14 states (nonresident tuition only in 2 states)*
	Charges at comparable institutions:	1 state

*In Montana nonresident tuition is set with reference to the cost of instruction. In Massachusetts and New Hampshire nonresident tuition is indexed to the cost of education. There is no established policy for determining resident tuition in these states.

Thirty of the states do not have an established policy for determining tuition. In most of these states tuition is determined in an ad hoc manner that might best be described as incremental pricing. By incremental pricing, we mean that current tuition levels are adjusted upward in light of inflation, traditional practices, enrollment changes, state appropriations, and whatever other factors are deemed relevant by the decision makers.

Three of the states have established policies, but use no particular formula to determine tuition. In these states, there is a written and formally approved statement of the factors to be considered in determining tuition levels, but no specific formula is used.

Seventeen states have established policies that index tuition to a specific measure. Kentucky indexes tuition to charges at comparable institutions in other states and Illinois uses the Higher Education Price Index as the indexing tool. In Montana nonresident tuition is referenced to cost of instruction. (Cost of instruction is defined as instruction and academic support costs; it is distinguished from cost of education, which includes these costs plus institutional support, student services, plant and other "educational" costs.)

The fourteen states that index tuition to the cost of education represent an increase since 1976, when the Washington State Council for Postsecondary Education identified six states that used this method (Council for Postsecondary Education January 1976). The six states identified in that study were Colorado, Florida, Kansas, New Hampshire (nonresident tuition only), Oregon, and Wisconsin. To these are now added the states of Arizona, Maine, New Jersey, Ohio, Oklahoma, Virginia, and Washington. In addition, the state of Massachusetts determines nonresident tuition by indexing it to educational costs although the state has no established policy for setting resident student charges.

The survey also asked the SHHEOs if their state was considering a change in the current policy and if so what was being considered as an alternative policy. These results are shown in table 3. Most states are not now considering a change in their tuition setting process. Of the 12 states that are considering a change, indexing tuition to educational costs was listed by five states as the alternative policy under consideration.

Table 3	
Is your state considering a change in the policy or procedures used to determine tuition:	
Yes: 12 states	No: 38 states

What is being considered as an alternative policy or procedure?	
Indexed to cost of education:	5 (Georgia, Massachusetts (resident tuition), Minnesota, Mississippi, Missouri)
Indexed to charges at comparable institutions:	1 (Montana)
Many alternatives are being considered at this time:	6 (Colorado, Idaho, Kentucky, Texas, West Virginia, Hawaii)

Appeal of the Index to Cost of Education Method

The survey results outlined in the previous section indicated that, increasingly, states are adopting indexing to cost of education as an established policy for determining tuition. Several explanations for this trend are possible.

Most obvious is the fact that relating tuition to educational costs rationalizes tuition policy. In states that do not have established policies for determining tuition there is little justification for why student charges are what they are. A state's adoption of an indexing policy and, even more importantly, the specification of the percentages to be used provides an explicit declaration of what portion of educational costs the student is expected to assume.

Expressing tuition as a share of educational costs also creates a tighter link between tuition and overall state support. The policy is likely to be legislatively determined, and the tuition received is likely to be considered state income rather than institutional income. The concepts involved in the use of a formula to determine tuition are consistent with those used in formula budgeting to establish state appropriations in many states. Indeed, most states that index tuition to education costs also use formula budgeting.

Indexing insures that a fixed portion of cost increases will be covered from student sources. This appeals to a number of constituencies: Legislators may like the fact that a formula for setting tuition passes along a specified portion of annual cost increases to the student. The attraction for educators is that increases in tuition revenue are gradual and planned rather than sudden and in response to short-term revenue shortfalls. In times of increasing fiscal constraints on state government, indexing also may be viewed as a method of "shielding" tuition from increases as state support slows. In inflationary times, indexing may appeal to students and parents as well. As Carol Van Alstyne (Van Alstyne 1977) has pointed out:

Relating tuition to costs could in effect put a ceiling on the share that students and their families are expected to bear because, in inflationary times, tuition shares of costs have often increased more than proportionately as other sources of support have lagged (p. 76).

Considerations in Establishing Indexing Formulas

Indexing tuition to the cost of education is a straightforward, technically objective process: The cost of education is determined according to set accounting practices, and the student is charged a set percentage of this cost. Developing the policy, however, requires making a number of subjective decisions. The following discussion examines some of the questions that must be addressed in order to initiate an indexing system.

What elements should be included in the computation of the cost of education or instruction? Cost of instruction computations usually include on-campus instruction, plus a percentage of academic support costs. Cost of education is a broader term that also includes all or major portions of student service expenditures, institutional support, and plant maintenance expenses. Expenditures for capital improvements, research, public service, off-campus instruction and auxiliary enterprises are usually excluded from both definitions. Most states that use the indexing method relate tuition to the cost of education with the justification that the additional costs do support instruction and, indeed, that the education being "purchased" includes these costs.

Should costs be determined at all institutions? In other words, are cost studies necessary at all institutions? The answer to this question is probably not. Above all cost determinations should be parsimonious. Smaller colleges usually lack the technical resources and expertise necessary to carry out the studies. As a result, a fairly common practice is to require major universities to complete the cost studies and tuition at smaller institutions is then scaled to some percentage of the resulting university tuition. Some states may want to avoid cost studies altogether and use some measure, such as authorized budget figures, which is less accurate but also much less expensive to calculate.

A related question is, should the cost of education be computed by student level? Because of the difficulty of allocating costs by level most states seem to have decided not to compute the cost differences by levels.

What percentage of costs should be passed on to students in the form of tuition? In 1973 the Carnegie Commission for Higher Education recommended that tuition be increased to equal one-third of educational costs (Carnegie Commission for Higher Education 1973; p. 10). In that same year, the Committee for Economic Development (Committee for Economic Development 1973; p. 69) recommended that one-half of educational costs be passed on to students. For the most part, it appears that these recommendations have had little national effect. There is no evidence that any state charges more than one-third of educational costs to its resident students. A recent study by the Western Interstate Commission for Higher Education (WICHE 1980) revealed that "tuition in the four western states with established indexing policies ranges from 20 to 25 percent of costs for resident undergraduates" (p. 10). The Washington State Council for Postsecondary Education (Washington State Council for Postsecondary Education May 1976), when establishing the indexing policy currently used in that state, wrote that, "in no case have we found a definitive, uniformly accepted philosophic basis indicating the proportion of total costs which should be borne by the student or the taxpayer" (p. 40). Even where attempts are made to base charges on such principles, technical problems complicate the effort, as MacDonald points out:

The rationale for tuition charges at a public institution is often based on the argument that individuals should pay for the portion of the benefits that accrue to each personally, while the public should pay for that portion which contributes to the social benefit of all. However, the art of defining, measuring, and allocating these benefits is not very advanced; given the complex nature of the products of educational endeavor, it is unlikely to ever be very precise (MacDonald 1977, p. 3).

Additionally, all involved in the process should recognize that although the use of an index relating tuition to a percentage of costs produces a uniform, and presumably reasonable, standard for annual or biennial tuition increases, those increases are likely to be reviewed and challenged by affected parties each year. States (Florida and Washington, for example) have sometimes lowered the dollar amount of tuition increases even when they were generated by use of an educational cost index. In Washington, the formula specifies that students be charged 25 percent of educational costs, but in the last legislative session tuition was established at a dollar figure that amounted to 18 percent of calculated costs.

Should the percentages charged vary by student level? Although conducting costs studies to yield data by student level is a technical problem, differentiating the actual percentages to be charged by level is a philosophical one. In Higher Education: Who Pays? Who Benefits? Who Should Pay?, the Carnegie Commission (Carnegie Commission 1973) recommended that "tuition should be more nearly proportional to costs, rather than regressive as against students at the lower levels" (p. 12). The Commission thus urged that graduate students be charged the same percentage of costs as undergraduates. But because graduate instructional costs are

greater, they recommended that the amount of tuition graduate students pay should be higher. This seems to be a position most policy makers embrace, but one which, as noted before, is difficult to implement because of the difficulty in separating undergraduate educational costs from graduate costs. Instead, some states have simply adopted a policy of determining undergraduate tuition and then charging graduate students at a specified, higher rate. Colorado, for example, sets graduate tuition at 105 percent of undergraduate charges, and in Washington graduate students are charged 115 percent of undergraduate tuition. The intent of the Carnegie Commission's recommendation is followed in such cases even if the recommended process is not.

The practice of charging different percentages of costs to upper and lower division undergraduates is uncommon. The pressure to reduce the percentage charged to lower division students could increase, however, as institutions adopt policies to encourage adult participation and to increase the access of economically disadvantaged groups because these groups are especially responsive to educational charges. Available evidence suggests that costs per student, by level, do not differ significantly across institutional types (Johnson 1979). Therefore, a uniform percentage of costs applied to different levels of undergraduate instruction would result in lower tuition for lower division students at both four-year and community colleges.

Should the percentage charged vary by student residency? Based on current practice, the answer to this question is clearly yes. In almost all states, whether indexing is used or not, nonresident students have traditionally been charged approximately 100 percent of the cost of education. Although this practice seems well entrenched, a period of increased competition for students might bring about some changes in this policy. Institutions, especially those experiencing enrollment losses, may be inclined to lower this percentage in order to attract additional out-of-state students. Clearly there is conflict between the desire to charge nonresidents the full cost of education and the desire to maintain current enrollment levels and diversity in the student body.

Should the percentage charged vary by type of institution? Although per student costs by level of instruction do not differ significantly across institutional types (e.g., two-year, four-year, university), there is a difference in the educational product being purchased. Thus, equity may not be served by charging a uniform percentage across all institutional types. Additionally, as certain institutions lose enrollments, officials may try to distribute students to those institutions by lowering tuition. Although previous attempts to redistribute students through such adjustments have been notoriously unsuccessful, political pressures might well lead some states to try this approach again in the future.

Implications

Adoption of an indexing system for setting tuition implies that certain principles will be better served through such a policy. Clearly, state policy goals should be the starting point for determining the proportions to be used in an indexing approach. Student access, support for graduate education, and diversity of student bodies are all affected by tuition levels, and indexing tuition to educational costs can be one way in which state financial policy is made explicit. The percentages chosen should reflect consideration of fundamental policy issues, such as the relative benefits of higher education to both society and the individual as well as the relative costs, including foregone personal income. Current practice, however, rarely matches the ideal. In most states, the percentage of costs chosen is more likely to be a product of historical patterns, interstate comparisons, or current charges rather than of clear policy decisions.

Adoption of a policy that sets tuition by use of an index involves implications for a number of different constituencies with respect to planning, budgeting and student enrollment:

State Budgeting. As total enrollments stabilize while costs continue to increase, will state appropriations make up the difference between tuition income and the requested budget? Or, will there be continued pressures to increase overall revenues from tuition? As we noted, the use of a constant percentage index to set tuition will assure that annual increases in tuition will not be arbitrary. However, the same pressures that would drive up tuition charges in the absence of a formula, could also work to change the formula to yield more revenue. An indexing arrangement could be undone by price increases that are unacceptable to students and politicians. We have already seen several states adopt tuition increases lower than those generated by indexing formulas.

Institutional Autonomy. It appears that using an index reinforces the notion that tuition revenues are state funds--either general revenues or offsets to appropriations. The practical effect of this view is a reduction in institutional autonomy. Indexing tends to curtail institutional control over the amount of money generated from tuition and also to decrease budgetary flexibility in the use of these revenues at the campus level.

Cost Containment. Will higher education institutions be able to contain their real dollar expenditures in light of declining enrollments in order to stabilize their per student costs? Elementary and secondary schools have been unable to do this; higher education, with its high fixed costs, will probably not be able to either. Higher per student costs in an indexing arrangement will obviously result in increasing student charges. If students are sufficiently sensitive to price, these higher charges may put pressure on administrators to contain costs. Cost containment, however, will require programmatic and staffing cutbacks as well and these have not been easy to achieve in the past.

Impact on Enrollment. It is possible that if tuition is indexed to costs that are rapidly increasing, the resulting tuition increases may contribute to enrollment declines.

Cost Study Requirements. If states require extensive documentation, administrators will be burdened with the need to conduct annual studies to determine per student instructional or educational costs. As part of this process, they may be called upon to justify or explain differences among institutions. This would serve to politicize the process rather than to rationalize it.

Cost Behavior. Regardless of the procedures used, budget officials should be cognizant of the fact that the behavior of costs usually results in what we earlier called incremental pricing even in states that set tuition as a percentage of educational costs. Because costs are essentially a function of the dollars available to an institution in any given year, and because annual changes in educational costs tend to result from marginal additions, tuition changes generated by formula-driven computations turn out in the end to be incremental too.

Equity. If costing is to be used as a basis for setting tuition rates, how is equity for students at different institutions to be achieved? To set tuition at 25 percent of costs at one class of institutions and 20 percent of costs at another class for the purpose of creating price differences is to treat one group of students unequally based on their enrollment preferences. Policy makers should address these questions openly in enacting such policies.

Access. These considerations also bear heavily on issues relating to access for the economically disadvantaged, adult students, and those traditional students whose attendance patterns are influenced more by price than by curricula or selectivity. Unless financial aid is adjusted accordingly, these students may be deterred from enrolling at higher-priced campuses, which might impede efforts by those schools to increase their enrollment of minorities, adults and other affected classes.

To summarize, the use of a tuition index should be tied to a firm educational and social policy. The simplicity of using a tuition formula is illusory, because it encompasses a wide range of issues and principles. State policy makers need to move beyond the view of tuition setting as only a fiscal matter to address some of these issues. If a tuition index results from a careful discussion of its broad implications for finance and access, then it can become a highly appropriate vehicle for implementing state policy.

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APPENDIX

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State Policies for Determining Tuition

State	Established Policy for Determining Tuition Levels?	If Yes; It is	Considering a Change?	If Yes, to What?
Alabama	No	--	No	--
Alaska	No	--	No	--
Arizona	Yes	Indexed to cost of education	No	--
Arkansas	No	--	No	--
California	No	--	No	--
Colorado	Yes	Indexed to cost of education	Yes	Many alternatives are being considered at this time, especially a voucher system.
Connecticut	No	--	No	--
Delaware	No	--	No	--
Florida	Yes	Indexed to cost of education ¹	No	--
Georgia	No	--	Yes	Indexed to cost of education or instruction.
Hawaii	No	--	Yes	Many alternatives are being considered at this time, especially indexed to cost of instruction.
Idaho	No	--	Yes	Many alternatives are being considered at this time.
Illinois	Yes	Indexed to higher education price index	No	--
Indiana	No	--	No	--
Iowa	Yes	Specified considerations ²	No	--
Kansas	Yes	Indexed to cost of education	No	--
Kentucky	Yes	Indexed to charges at comparable institutions	Yes	Many alternatives are being considered at this time.
Louisiana	No	--	No	--
Maine	Yes	Indexed to cost of education	No	--

State	Established Policy for Determining Tuition Levels?	If Yes, It Is	Considering a Change?	If Yes, to What?
Maryland	No	--	No	--
Massachusetts	No	--	Yes	Indexed to cost of education.
Resident	Yes	Indexed to cost of education	No	--
Nonresident				
Michigan	No	--	No	--
Minnesota	No	--	Yes	Indexed to cost of education.
Mississippi	No	--	Yes	Indexed to cost of education.
Missouri	No	--	Yes	Indexed to cost of education. ³
Montana	No	--	Yes	Indexed to charges at comparable institutions.
Resident	Yes	Referenced to cost of instruction		
Nonresident				
Nebraska	No	--	No	--
Nevada	No	--	No	--
New Hampshire	No	--	No	--
Resident	Yes	Indexed to cost of education		
Nonresident				
New Jersey	Yes	Indexed to cost of education	No	--
New Mexico	No	--	No	--
New York	No	--	No	--
North Carolina	No	--	No	--
North Dakota	No	--	No	--
Ohio	Yes	Indexed to cost of education ⁴	No	--
Oklahoma	Yes	Indexed to cost of education	No	--
Oregon	Yes	Indexed to cost of education	No	--
Pennsylvania	No	--	No	--
Rhode Island	Yes	Specified considerations ²	No	--
South Carolina	No	--	No	--

State	Established Policy for Determining Tuition Levels?	If Yes, It Is	Considering a Change?	If Yes, to What?
South Dakota	No	--	No	--
Tennessee	No	--	No	--
Texas	No	--	Yes	Many alternatives are being considered at this time.
Utah	Yes	Specified considerations ²	No	--
Vermont	No	--	No	--
Virginia	Yes	Indexed to cost of education	No	--
Washington	Yes	Indexed to cost of education	No	--
West Virginia	No	--	Yes	Many alternatives are being considered at this time.
Wisconsin	Yes	Indexed to cost of education	No	--
Wyoming	No	--	No	--

¹This policy was established in 1975 but has not always been followed. Tuition and fee levels in Florida have remained the same for the past few years.

²No specific formula is used. Rather there is a written and formally approved policy statement which specifies considerations to be made in adjustment of tuition.

³In Missouri the tuition levels are established by the governing boards. The coordinating board, through the appropriation process, is encouraging tuition be indexed to cost of education.

⁴In Ohio the tuition levels are established by the governing boards. In the appropriations process, however, a tuition figure indexed to educational costs is calculated and is generally adopted by the institutions.

Questionnaire
STATE POLICIES FOR DETERMINING TUITION

The tuition policy described below should be applicable to all public four-year institutions in your state. If, however, there are significant policy differences within the state (e.g., a university system and a state college system), please complete additional forms as required.

Please use the following definitions when completing this form.

TUITION: the basic comprehensive student charge used, along with state appropriations and other unrestricted institutional receipts, to fund activities relating to student instruction. These activities could include instruction, academic support, administration, student services, and plant operation. These charges may or may not be known as tuition and, in some states, may be general fund revenues. Other designations might include educational fee, incidental fee, registration fee, or instructional fee. Required fees assessed for specific purposes (e.g., health, athletics, bond retirement) are not included.

ESTABLISHED POLICY: either formally approved or a traditional practice such that the effect is the same.

If you have any questions, please contact Dennis Viehland or Norman Kaufman at (303) 497-0223 or 0221.

State _____ Institutions included: All public four-year institutions
 Other _____

1. Does your state have an established policy for determining tuition levels?
 Yes: Formally approved Traditional practice (Please answer 2a)
 No (Please answer 2b)

- 2a. If YES, is it:
 Indexed to: _____ Other method, please describe: _____
 Consumer price index _____
 Higher education price index _____
 Cost of instruction (instructional and academic support costs) _____
 Cost of education (instructional costs plus administration, student services, plant and other "educational" costs) _____
 Charges at comparable institutions _____

- 2b. If NO, can your state's procedures be described as "ad hoc," that is, no specific formula is used as described in 2a. Rather, charges are adjusted each year after considering a number of factors such as state appropriations, enrollment changes, etc.
 Yes No, please describe briefly: _____

- 3a. Is your state considering a change in the policy or procedures currently used to determine tuition:
 Yes No

- 3b. If YES, what is being considered as an alternative policy or procedure:
 Indexed to: _____ Other method, please describe: _____
 Consumer price index _____
 Higher education price index _____
 Cost of instruction _____
 Cost of education _____
 Charges at comparable institutions Many alternatives are being considered at this time.

Person completing this questionnaire and order form for Tuition and Fees in Public Higher Education in the West: Practices, Trends, Policy Considerations.

Name: _____ Position: _____

Agency: _____ Phone: _____

Address: _____
(Street/P.O. Box, City, State, Zip Code)

STUDENT PAPER

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Program Review and the Enrollment Crisis

by:

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October 1980

This work was supported by grants from
The Exxon Education Foundation and the
Spencer Foundation to the Higher Education
Research Institute

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Program Review and the Enrollment Crisis

The state role in higher education has changed considerably during the last 15 years: from passive provider to concerned underwriter. Similarly, the role of the program review process has also changed in response to a number of developments: increased financial and political pressures for the efficient use of resources, the proliferation of degree programs at all levels, the changing job market for degree-holders, and most recently, the enrollment crisis. Although other purposes are attributed to the review process (e.g., to eliminate unnecessary program duplication, to assure quality), the term "accountability" not only best describes its rationale but also subsumes the other purposes attributed to it (Barak and Berdahl 1978).

Writing in 1971, Lee and Bowen identified two "distinct but interrelated" goals of the state program review process: (1) an assessment of the appropriateness of a proposed new program, given the mission of a particular campus; and (2) an assessment of the readiness of a campus to mount new degree programs, given existing resources. Four years later, however, they identified a broader scope for the review process: Whereas in 1971 concern centered on proposed programs, by 1975 the focus had expanded to include existing programs as well (Lee and Bowen 1975).

Traumatic and often unanticipated changes in funding, enrollments, clientele, and the employment prospects of college graduates during the past 15 years have imposed demands for educational and fiscal accountability on the heretofore highly autonomous academy. Howard Bowen observes that the accountability movement reflects "in part a failure of confidence in many of our institutions and in part frustration over rapidly rising costs" (1974, p. xi). Retrenchment, accountability's companion during the past decade, is generally viewed as a threat to institutional quality: College administrators believe that stabilizing or declining enrollments and funding, which may lead to reductions in faculty, course offerings, and services (e.g., library and laboratory purchases) have a detrimental impact on quality (Glenny et al. 1976). But as Barak and Berdahl note, in spite of diminished resources, few institutions have "seriously reordered priorities or undertaken any kind of extensive program evaluation" (1978, pp. 2-3); the most frequent response to retrenchment pressure has been to make across-the-board cuts (Barak and Berdahl 1978; Bowen and Glenny 1976).

Ironically, program expansion may be another institutional response to retrenchment: the establishment of new degree programs that cater to the credentialing and training needs of an increasingly professionalized work force. Nathan Glazer observes that "science and higher education have become indispensable to the dignity of these (professional) occupations which deal with social tasks (e.g., allied health; education)" (Glazer 1974, p. 346).

Because of their special responsibility to develop human resources which service public needs, public institutions have been very active in this area (Callan 1978). These new programs can be promoted to state coordinating agencies on the grounds that they make use of existing facilities and personnel and require no new institutional resources. Their purpose from the standpoint of the institution, is to increase enrollments and, therefore, funding (i.e., tuition and operating subsidy) without directly increasing actual operating costs. Faced with requests for support of these new, professionally-oriented programs (many of them at the graduate level) and uncertain about the viability of many existing programs, the states--through their higher-education coordinating agencies (Barak and Berdahl 1978), their budget office (Peterson, Erwin and Wilson 1977), and their legislative committees (Berdahl 1977)--have undertaken the task of evaluating academic programs, a responsibility that was previously almost exclusively reserved to the academic community (Folger 1977, p. viii).

The Enrollment Crisis

Each decade brings its own special problems--the "once and future crisis" (Finn 1978). In the 1960s, rapid expansion created problems as institutions competed with one another for the "always insufficient" numbers of young PhDs to fill newly funded faculty positions. In the 1970s, the "New Depression" (Cheit 1971) signaled slower growth and growing financial pressures. And in the 1980s, the end of the postwar baby boom marks the beginning of an enrollment crisis as the size of traditional-aged college student cohort experiences significant decline.

The demographic details are rather clear: By 1990, the traditional college-aged cohort will have declined from a late 1970s peak of nearly 18 million persons to roughly 14 million--the same level as in 1970; the drop is particularly steep in the first half of the current decade as the estimated size of the age-cohort will be 2 million persons smaller in 1985 than it was in 1980 (Centra 1980). The racial and ethnic composition of the age-cohort will also shift during this period as the numbers decline occurs mainly among whites: The number of minorities remains relatively constant, but the proportion of minorities increases from 14.2 to 19.3 percent of the cohort (Breneman and Nelson 1980).

The proportion of high school graduates attending college is also declining. NIE has reported two discouraging trends which will further aggravate enrollment problems: The proportion of female high school graduates going on to college has leveled off and is not likely to increase and the proportion of male high school graduates going on to college will decline, continuing the trend of the last decade (Abramowitz and Rosenfield 1978). Taken together, the demographic and matriculation data lead to grim conclusions about decreased enrollments--and point to financial problems for institutions and to intense competition for students.

Regulating Competition

Discussions about regulation generally elicit strong defensive responses from the academic community. Yet what is curious about the academic community's outcry against regulation is its focus. The literature is dominated by references to and discussions of the regulation of institutional processes: that is, of workplace and social behaviors on such issues as employment practices, health and safety, and institutional responsibility to clients. Very little is said about economic--as opposed to social--regulation: that is, regulation of the marketplace as opposed to regulation of the workplace.

Thompson and Zumeta (1980) identify eight regulatory functions performed by state coordinating boards: (1) control over the entry of new institutions into the market; (2) influence over the mix and distribution of courses and degree programs; (3) control over new programs offered by existing institutions; (4) control over the implementation of changes; (5) influence over the use of inputs and technologies to produce outputs; (6) effective control over prices (tuition and related costs); (7) control over the assumptions that determine the size of the "industry" (i.e., eligibility and financing); and (8) control over competition in the marketplace. During the 1960s, the coordinating and governing boards focused their activities on proposals for new programs in response to the seemingly insatiable demand for services. More recently, however, in the face of reduced growth rates and the need for financial retrenchment, these boards have turned their attention to managing the marketplace: i.e., managing existing as well as new programs (Lee and Bowen 1975). Because of their regulatory activities, serious competition within sectors and among institutions in the same geographical area has generally been avoided. Discussing the competitive tensions which exist within sectors and among institutions, Millard suggests that whatever the alleged detrimental impact of retrenchment and statewide coordination, few states and few institutions would really prefer, or could afford, to tough it out in an unregulated higher-education marketplace:

While these tensions increase the difficulties in statewide coordination and planning, they also increase its importance. In spite of what has been a federal thrust toward a "free market" concept--based in part on the assumption that the structure of higher and postsecondary education should be determined primarily by the students and where they take their money--few if any states are willing to go back to an institutional *laissez faire*. Because of restricted funds and the need for maintaining institutional diversity to meet a variety of student needs, such a *laissez faire* approach is neither fiscally nor educationally feasible (Millard 1976, p. 57).

Yet what worked in the past may not be successful in the future. The enrollment crisis promises to incite competition across sectors and among institutions--and particularly among public institutions; if state funding formulas continue to focus on FTE enrollments and are not sensitive to the

demographic changes that will affect higher education over the next ten years.

Too, this suggests that despite the concerns expressed about quality--and let there be no doubt that these are real concerns--the program review process is really propelled by regulatory issues and financial concerns. Considerable evidence supports this conclusion: Of the major issues mentioned in the annual reports of state higher-education agencies, appropriations and comprehensive planning top the list, while quality-related issues are cited only about a third as often (Millard 1976). Barak and Berdahl's 1978 survey of state program review practices also indicates that economic issues have priority over academic issues in the review process: Program quality ranks fifth, after four cost and productivity measures, as a criterion in the review process of the individual states.

Not surprisingly, institutional leaders have resisted the efforts of coordinating and governing boards to use productivity measures in the review process. The experience in Florida, in which the Regents sought to use market and productivity measures as initial measures of program quality and met strong campus resistance (described by Barak and Berdahl 1978) suggests that institutional leaders find it hard to adapt to changing demand cycles and unchanging funding formulas: They seek increased funding during periods of high demand for educational services but have difficulty responding to the financial consequences of diminished demand and reduced growth (Cartter and Solmon 1976; Breneman and Nelson 1980; Finn 1978). In general, the states appear willing to leave academic management and quality questions to the individual institutions, provided the institutions operate within the economic confines and contexts established by the states.

Future Prospects

The 1980s will be marked by intense institutional competition for increasingly scarce resources: students, state subsidy dollars and federal institutional support (Breneman and Nelson 1980). Program review is a fact of life for many public and some private institutions. The enrollment crisis has already begun to affect some institutions, while others are acting to minimize its impacts.

State planners and institutional representatives will invariably view these issues from different perspectives. For state officials, the major issues will focus on concerns for efficiency, equality, and quality: efficient use of resources, equality of educational opportunity, and quality of educational programs (Green, in press). Because they have a more global, system-wide perspective, state officials will view program review and the enrollment crisis as issues which involve internal tradeoffs, changing patterns of resource allocation, and perhaps some good old fashioned political compromising (see Callan 1980). Yet, what the state planners see globally

from afar, institutions experience "up close and personal". Conditioned to a crisis mentality by the changing financial environment of the past decade, budget cuts resulting from program discontinuance and enrollment declines are not perceived to involve a systematic or system-wide reallocation of institutional resources but rather are perceived to pose a severe threat to program and institutional quality.

Program review may be an effective mechanism for regulating the higher-education marketplace and certain aspects of institutional competition. Yet regardless of state efforts to coordinate program offerings and reduce competition across sectors and among institutions, the enrollment crisis will incite competition as institutions seek to hold their own in the midst of a changing--and threatening--environment for higher education.

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