AN ANALYSIS OF HIGHER EDUCATION

FINANCIAL SUPPORT MEASURES

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PREFACE

This research focuses on the use of financial support ratios in comparing states' efforts in providing for public higher education. In particular, an attempt is made to determine which of these measures are most meaningful in assessing the adequacy of such support. The study is based on the author's professional and academic experience over the past five years at the Oklahoma State University. Therefore, a relatively large number of individuals have played an important role in the formulation of this project. Although space limitations prohibit the listing of names of all of those who have influenced the project, several individuals are deserving of special mention.

First, the author would like to acknowledge the assistance of Mack Usher, James Boggs, and Carter Bradley. Each of these men did much to introduce the significance of the topic to the author and encouraged him to develop a better understanding of the use of support ratios.

George Pinches and Kent Mingo have provided valuable instruction to the author in the application of factor analysis techniques through their direction of the master's report and their cooperation on subsequent articles. The contributions made by Professor Mingo through his service on the doctoral committee and his continuing guidance are particularly appreciated.

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The author is especially indebted to Kenneth St. Clair, the chairman of the advisory committee. Professor St. Clair's counsel was extremely valuable in providing direction to both the program and the dissertation, and his encouragement throughout the program is appreciated.

Finally, the author wishes to express his gratitude to all of the members of his family. Their understanding of the demands placed on a graduate student and their encouragement throughout the graduate program will always be appreciated.

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CHAPTER I

INTRODUCTION

Proponents of higher education have long relied upon comparative financial statistics to assess the success of the various American colleges and universities.[1] To those familiar with organizational assessment, such an occurrence is hardly surprising. To quote Thompson, when an organization lacks

> absolute criteria of fitness, and being unable to assume that improvement over its past capability is a reflection of its future, the complex organization then turns to social references to demonstrate that it is doing as well as or better than others in its league.[2]

He further asserted that "when outcomes are beyond the organization's control, assessment in terms of outcomes is resisted."[3] Therefore, higher education officials have frequently relied upon the use of financial data of a comparative nature to argue the fitness of their institutions. Not surprisingly, such comparative data often seem to be self-contradictory when both parties to an issue advance their positions with such information.

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[1]The term "comparative financial statistics" refers to such variables as dollars per student, growth rate in state appropriations, appropriations per capita, and appropriations per thousand dollars of personal income. A complete list of the variables studied can be found in Chapter III, p. 44.

[2]James D. Thompson, Organizations in Action (New York: McGraw-Hill Book Company, 1967), p. 89.

[3]Thompson, Organizations in Action, p. 92.

The Use of Comparative Data in Higher Education Finance

In the past several years, comparative data have played an increasingly important role in legislative battles for additional funding for higher education. In fact, many universities and professional organizations, as well as regulatory agencies and various other governmental groups, have employed full-time statisticians to monitor the effects of various legislative acts upon education.[4] Further, goals of many institutions and/or systems are now stated with respect to a desired ranking in one or more of these statistical comparisons.[5]

Although the utilization of comparative data has played a major role in the financing of higher education in the past decade, its impact is likely to increase significantly in the next several years. This greater importance should stem from three distinct sources. First, the type of utilization of the past several years is likely to expand to both new geographical areas and also to more types of institutions as data become available. Second, the expected federal involvement in funding of higher education should generate even more interest in this area since such programs will likely call for financial equalization. Finally, the collective bargaining trend of

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[4]For example, the number of Offices of Institutional Research has increased more than twelve times in the past decade.

[5]An example of such a goal appeared in A Plan for the 70's (Oklahoma City: Oklahoma State Regents for Higher Education, 1971). In the twenty-first guideline listed, the report recommended that "Oklahoma should strive to provide higher education resources.... at a level not less than the average for states in the geographical region..."

the past several years on the part of the faculty should eventually call for the comparison of institutions or bargaining units.

While recent federal plans for funding of American higher education did not specifically rely upon comparative financial data, several of the alternative plans that were considered during the floor debate stage of legislation did call for such information.[6] Further, it is entirely conceivable that as federal participation increases in this area, a greater emphasis will be made to equalize financial support of educational programs.[7] Should this latter emphasis become a central goal of future federal programs, it can be expected that a heavy reliance will be placed on comparative data.

For the most part, collective bargaining by college faculty members is a relatively recent phenomenon. Initial contractual requests have tended to center on only one of the data elements that can be compared--namely, salaries.[8] However, if faculty negotiations follow the precedent of public school teachers' negotiations and industrial negotiations, many other fields of financial support data--as well as such issues as academic freedom--are likely to be compared.[9]

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[6]For more information concerning the alternative proposals, see "Circular Letter No. 20," Office of the Executive Director, National Association of State Universities and Land-Grant Colleges, October 27, 1971.

[7]One approach to funding equalization based on comparative data (the Bowen model) is described in General Federal Support for Higher Education (Washington, D. C.: American Council on Education, 1968).

[8]A survey by the North Central Association for the 1970-71 school year shows that all contracts negotiated by the American Federation of Teachers contained basic salary schedules.

[9]Robert L. Jacobson, "Collective Bargaining is Expected to Get Formal Endorsement of Professors' Association," The Chronicle of Higher Education, May 1, 1972, pp. 1, 5.

It is not difficult to foresee the comparison of institutions or states on matters such as student-faculty ratio, the proportion of the budget spent in various functional categories, the dollars available per student, or the share of the state's budget devoted to higher education. Certainly, the items to be compared will be limited only by the ability of economic statisticians and analysts to produce truly comparable statistics.

While the present and potential utility of comparative financial data for higher education can be readily established, several problem areas in their use exist. The next section will consider some of these difficulties and discuss how they serve as drawbacks to further utilization of such information.

Validity of Data Comparisons

Despite the widespread use of comparative techniques in evaluating institutions of higher education, there are several difficulties with respect to the validity of such usage. Although few deny that such problems exist, they feel compelled to operate with what they regard to be the best data available. Generally, these problems can be said to fall into two major categories: construct validity and predictive validity.

Construct Validity

To date, many of those who have used comparative financial data to assess the adequacy of funding for an institution of higher education seem to accept unquestioningly the validity of such an application of the data. However, there seems to be reason to question whether such

data have much significance in assessing quality. In other words, does it necessarily follow that an institution with twenty per cent more income per student than a similar institution provides a twenty per cent better education? If the former institution provides a better education at all is subject to debate, and the question of the nature of the function between increased funding and program quality has scarcely beem empirically considered in higher education.[10] While it is not the intent of this paper to explore the problems of construct validity, the most noteworthy efforts in approaching this question need to be reviewed.

Measurement of Outcomes. The Western Interstate Commission for Higher Education, a regional compact of thirteen western states, has created a separate operating division known as the National Center for Higher Education Management Systems (NCHEMS). Along with its primary goal of developing management information systems for use in institutions of higher education, NCHEMS has sought to identify the "outputs of higher education."[11] While its efforts in this latter area are far from being operational, the NCHEMS staff-along with others-are making progress in the development of a conceptual framework for measuring outcomes. When they, or other researchers in this field,

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[10] Mort and others discuss this question in the public school context in Public School Finance (3rd ed.; New York: McGraw-Hill Book Company, Inc., 1960).

[11] Two publications by NCHEMS on this topic include Ben Lawrence, George Weathersby, and Virginia W. Patterson, Outputs of Higher Education: Their Identification, Measurement, and Evaluation (Boulder: Western Interstate Commission for Higher Education, 1970), and Robert A. Huff, Inventory of Educational Outcomes and Activities (Boulder: Western Interstate Commission for Higher Education, 1971).

have successfully identified such outputs the problem of construct validity can be considered by relating financial inputs to qualitative outputs. At the present time, it is beyond the scope of this paper to explicitly consider problems of construct validity in the use of input criteria for evaluation.

Perhaps the only other major attempt at assessing the quality of products of higher education has been the examination of graduate faculty and graduate programs by the American Council on Education.[12] These particular attempts have not considered the aspect of financing, but rather they have attempted to rank the top programs in some thirty disciplines. Due to the format of the data reported in these studies, it is not feasible to incorporate these assessments in the present study. However, there does appear to exist a strong positive correlation between the level of funding and the quality ranking upon casual observation.

Predictive Validity

The problems associated with predictive validity will be considered in greater detail in this research endeavor than those of construct validity. More specifically, this study will focus on the difficulties related to the multitude of data definitions available and in use, the various (and sometimes incompatible) sources of information, the incongruent time periods used in reporting data, the sometimes lengthy delay in reporting data, and the various techniques employed in

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[12] The most recent ACE report on this topic is Kenneth D. Roose and Charles J. Anderson, A Rating of Graduate Programs, (Washington: American Council on Education, 1970).

obtaining the financial information. A further problem to be considered is the appropriateness of comparing data for states with different socio-economic backgrounds and varying needs for higher education.

The problem of uniformity of data definitions plagues the work of any researcher who attempts to use information obtained from government surveys. Not only do definitions change subtly over time, but there are frequently several equally defensible, but contradictory, sources from which to choose the information. For example, there are at least twenty ways to calculate "dollars per student" from government information alone. This problem is further complicated by the variety of reputable non-government sources available for data selection.

The element of time also is of significance in measuring the validity of such financial data in at least two respects. The first time-related problem concerns the reporting interval. For example, enrollment is typically reported at the time of fall enrollment on a single semester basis, financial data is reported for an entire year at its conclusion, and socio-economic data is reported in various patterns, usually for some point in time. The second problem refers to the time lag encountered in the reporting of data. For evaluative purposes, the analyst naturally prefers the most current data. However, government agencies are often delayed by several years in releasing information. The impact of decision-making with dated information is unclear at this point.

A final predictive validity problem concerns the suitability of making comparisons between states with widely divergent abilities to support higher education and equally divergent demands. It is conceivable that single comparative measures as now employed are

inappropriate across the entire spectrum of states. Perhaps a more desirable alternative would be the comparison of groupings of states, with such groups based on common socio-economic bases.[13]

Statement of Problem to be Studied

The main theme of this project revolved around the practice of using financial support information to assess the adequacy of funding for public higher education in the United States. The central topic considered included the identification of patterns of support measures and the selection of the "best" measure to fit each pattern. A further analysis determined the extent to which various states influence the composition of these patterns. Factor analysis was employed as the principal technique for the study of the problem.

More specifically, this study focused primarily on the following question:

> Which, if any, of the financial support indices are most useful in describing the adequacy of financial support for public higher education?

In other words, this project attempted to identify those ratios of the many that are used to argue the level of financial support that have the greatest explanatory value in assessing the support situation. To reach an answer to such a question, several intermediate questions also had to be considered.

A question that had to be answered initially concerned the proper interpretation to be given to financial support indices, i.e.,

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[13] An interesting approach for handling this problem developed by John Oliver Wilson will be discussed in the next chapter.

> Are financial support measures appropriate for measuring the adequacy of funding for higher education on the state level?

Although the response to such a question had to be based to a large extent on subjective reasoning except for a cursory examination for stability, it was a question that nevertheless called for explicit consideration.

Another intermediate question related to the identification of the principal categories of the information used to describe financial support for higher education. Factor analysis was utilized to determine if there were any natural groupings of variables within the data. Phrased another way, this question would read:

> What are the principal dimensions, or underlying empirical structures, that best describe the extensive data on financial support?

From such dimensions as these, those indices that are most meaningful in support assessment were also ascertained.

As the chapter covering the review of relevant literature will indicate, there is relatively little in the way of empirically-based findings to answer such questions at this time. It is the purpose of this research to provide a framework from which more systematic evaluations of the adequacy of financing for public higher education can be based.

Organization of Research

The initial sections of this research have served to introduce the broad topical area and to focus on the specific subjects to be studied. Subsequent chapters describe the process of the research and relate

the findings and conclusions of the study. The next few paragraphs will outline each of the remaining chapters.

Chapter II is primarily concerned with the literature of higher education finance. Of particular importance is the identification of the available sources of information for comparative financial data for public higher education, with each accompanied by a description of the limitations entailed with its use. Also, literature concerning various attempts at rankings states' efforts in support of higher education is considered. A concluding section discusses the literature on factor analysis, with special emphasis on previous research in administration, economics, and finance which employed the tool.

The third chapter describes the selection and definition of the variables to be studied (i.e., financial support measures) and the selection of various time periods to be studied. Several of the key considerations in the use of factor analysis are discussed. Finally, details of how the various factor analysis techniques are applied to answer the study questions are considered.

Chapter IV relates the findings of the analysis. The first section discusses the principal dimensions of the financial support data in each of two time periods selected. Also, this chapter includes an examination of those states which had the greatest effect in determining these dimensions. Finally, the stability of the patterns between the two time periods is considered.

The last chapter first summarizes the main findings of the study. Then, conclusions are drawn from those findings and a framework for further reference is developed. Perhaps the most significant aspect of the concluding chapter is the discussion of implications for future

study, particularly in the development of propositions relating forthcoming qualitative assessments to the findings of this study.

While the primary purpose of this research paper was to study the questions posed, a secondary purpose of nearly equal merit was the utilization of factor analysis to attempt to find answers for important political policy-making problems. In the words of Rummel, the "heuristic value of the design and findings are significant in domains that have not had the benefit of much multivariate research."[14] Hopefully, this study will stimulate additional inquiry applying new techniques of analysis in this neglected area.

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[14] R. J. Rummel, Applied Factor Analysis (Evanston: Northwestern University Press, 1970), p. 516.

CHAPTER II

A REVIEW OF RELATED LITERATURE

In order to bring the present study into better focus, the review of other scholarly works in the field is important. Such an examination of the literature helps one to identify variables worthy of further study, to avoid and resolve problems encountered in earlier efforts, and to select an appropriate method for the research. Further, such a background enables one to determine the potential relevance of his findings in the current body of knowledge on the subject.

Although the available research is primarily concerned with the analysis of the various ratios used in the measurement of a state's abilities, needs, efforts, and attainments in supporting public higher education, the initial section in this chapter reviews the more classical and typical writings in the area of higher education finance. This section evolves from the early and traditional works through the systems analysis movement in the last decade to the more recent essays on current public policy considerations in the support of higher education. An orientation to other works such as these should assist one in visualizing the contribution of this current study to the literature.

The next section examines the related literature in the area of public school finance. In particular, attention is directed toward those works which reflected the efforts at establishing data

bases, analyzing the cost-quality relationship, and measuring economic ability to pay for educational services. Then attention will be further limited to similar efforts in higher education finance. Finally, the first half of the chapter will conclude with examples of the application of the study findings.

The latter portion of the chapter is restricted to methodological literature. Since factor analysis is employed as the principal analytical technique in this study, the initial section will outline the background of the method and will reference the more widely used texts on the subject. Then, several examples of the employment of the technique will be discussed with attention directed to other studies in economics and finance. Finally, the contribution of the current study to the literature is summarized.

Background Literature in Higher Education Finance

Since an understanding of the historical development of the finance function in higher education administration is important in gaining an insight into the problems related to the analysis of economic support measures, the early writings and more recent literature need to be considered.

Historical Development

Perhaps the first book to have a noticeable impact in higher education finance was College and University Finance written by

Trevor Arnett in 1922.[1] In this book, he listed what he considered to be good financial management practices for colleges and universities and made recommendations for institutional budgeting and endowment control. Several books might be considered as successors to this work, including College and University Business Administration.[2]

John Dale Russell, considered by many to be the foremost higher educational finance authority of his time, wrote perhaps the most comprehensive book in the area, The Finance of Higher Education,[3] the most recent edition being published in 1954. In this work, Russell extended earlier efforts to include sections on the classification and analysis of expenditures, financial reporting, student aid, development activities, and the financing of special projects. His works on expenditures analysis led to the development of the "Russell norms," which serve as the basis of many allocation formulae today.

This type of study was continued by Walter Fly in his development of uniform accounting procedures for junior colleges.[4] Although his effort was directed toward problems in the state of Texas, the results

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[1]Trevor Arnett, College and University Finance (New York: General Education Board, 1922).

[2]American Council on Education, College and University Business Administration (Washington, D. C.: American Council on Education, 1952).

[3]John Dale Russell, The Finance of Higher Education (rev. ed.; Chicago: University of Chicago Press, 1954).

[4]Walter Lamar Fly, "A Critical Analysis of the Budgeting, Accounting, and Reporting Procedures of the Public Junior Colleges of Texas with a Projection of Practices Designed to Promote Uniformity" (unpublished Ph.D. dissertation, University of Texas, 1964).

apply equally well to other states. In particular, Fly proposed to use uniform accounting data in the decision-making and planning process.

Another work describing the state of the art of financial management was Williams' "The Preparation of Requests for Legislative Appropriations."[5] As the name of the monograph implies, it was a review of the processes and procedures used in preparation of budget requests. Williams outlined the information flow steps that are common in such activity.

Formula Budgeting. An area of higher education finance that has exhibited increasing interest over the past two decades is budgeting at the state level through the use of formulae. James Miller's work on this topic was the first definitive study of state budgeting for higher education.[6] His formulae were based on cost analyses developed by nine statewide coordinating agencies. His concern was primarily in the history of the formula development and in the uses, limitations, and the effects of the procedures employed.

In 1970, Wayne Stumph--in an attempt to go beyond the Miller basis--compared and evaluated the various formulae in use.[7] He classified all such formulae into two groups known as "de novo" and "base period plus." As a part of his conclusions, Stumph determined that the

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[5]Robert L. Williams, The Preparation of Requests for Legislative Appropriations for Operations in Midwestern State Universities (Chicago: The Council of State Governments, 1966).

[6]James L. Miller, Jr., State Budgeting for Higher Education (Ann Arbor: University of Michigan Institute of Public Administration, 1964).

[7]Wayne Julis Stumph, "A Comparative Study of Statewide Operating Budget Formulas Administered by Statewide Coordinating Agencies for Higher Education in Selected States" (unpublished Ph.D. dissertation, Southern Illinois University, 1970).

"de novo" approach was best able to produce a request for financial support which was a reasonable indicator of need.

The Period of Rapid Expansion. Much of the financial literature of higher education in the twenty year period following World War II was concerned with the financing problems created by rapid increases in enrollment. Among the more notable writers of this period was Seymour Harris, an economist-educator. Among his earlier works in this area was How Shall We Pay for Education, in which he identified inflation as a threat, expressed concern over the prospect of too many educated people, discussed likely new sources of revenue, and presented a few statistical facts on financial matters in higher education.[8]

A more complete listing of college financial data was presented by Millett in 1952.[9] This publication resulted from Millett's direction of the massive studies by the Commission on Financing Higher Education. He reported data for 1930, 1940, and 1950 on matters such as cost analysis, sources of income, student-faculty ratios, and dollars per student. Many of these measures were adopted in the current study.

Several other notable publications in this period were edited by Harris with the help of several others. Two of these books represented a compilation of essays from the seminar series sponsored by the

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[8]Seymour E. Harris, How Shall We Pay for Education (New York: Harper & Brothers, 1948).

[9]John D. Millett, Financing Higher Education in the United States (New York: Columbia University Press, 1952).

Harvard University Graduate School of Public Administration.[10] In these two editions, a total of sixty-eight essays were published on such topics as state investment in education, academic quality and financial aid, and the challenge of growth to university management.

A similar effort during this period was Financing Higher Education 1960-1970 edited by Keezer.[11] This book contained twelve essays on various facets of financing higher education, with primary concern toward projecting needs to 1970. The secondary theme was to identify probable ways to fund these needs.

Perhaps the most complete book of economically-oriented essays published during this period was supported by the U.S. Office of Education under the editorship of Selma Mushkin.[12] Among the many topics covered by these essays were investigations of the supply and demand for college-trained personnel, higher education as an investment in people, and financial resources available for higher education.

Among the dissertations which analyzed revenue needs was the study by Carovano, who examined the problems related to revenue for institutions of higher learning (e.g., the dramatic changes in

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[10]Seymour E. Harris, Kenneth M. Deitch, and Alan Levensohn, eds., Challenge and Change in American Education (Berkeley: McCutchan Publishing Corporation, 1962).

Seymour E. Harris and Alan Levensohn, eds., Education and Public Policy (Berkeley: McCutchan Publishing Corporation, 1965).

[11]Dexter M. Keezer, ed., Financing Higher Education 1960-1970 (New York: McGraw-Hill Book Company, Inc., 1959).

[12]Selma J. Mushkin, ed., Economic of Higher Education (Washington: U.S. Office of Education, 1962).

enrollment).[13] Based upon a tentative conclusion that the state would be called upon for a larger share of support, he also studied state revenue sources and potentials for growth.

Crises and the Current State. Among the more widely circulated works on the current state of finances for higher education is the work of M. M. Chambers. His 1968 text on the general financing of higher education included sections on such diverse areas as capital improvements, operating budgets, accounting practices, endowment management, tuition, philanthropy, state support and federal aid.[14] Two years later, this work was followed by a survey of financial practices in each of the fifty states.[15] With a chapter devoted to each state, he gave a tabulation of appropriations, several relevant statistics reported in a unit basis, an analysis of the state revenue structure, an analysis of the degree of political control of higher education, and a description of the statewide top echelon structure.

As anticipated in the earlier writings (e.g., Harris), the large increases in enrollments created a kind of financial crisis for institutions of higher education. As a result, much of the literature in the late 1960's dealt with this problem. For example, in 1965 Freeman discussed the plans to support the "tidal wave" of

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[13] John Martin Carovano, "Financing the Publicly Controlled Institutions of Higher Education, 1949-50 to 1969-70 (unpublished Ph.D. dissertation, University of California, Berkeley, 1965).

[14] M. M. Chambers, Higher Education: Who Pays? Who Gains? (Danville, Illinois: The Interstate Printers & Publishers, Inc., 1968).

[15] M. M. Chambers, Higher Education in the Fifty States (Danville, Illinois: The Interstate Printers & Publishers, Inc., 1970).

students due to come to college.[16] As a partial solution to the problem of who should pay, he suggested an increasingly larger role for the federal government.

Several of the earlier studies sponsored by the Carnegie Commission also focused on this crisis. In 1968, William Bowen analyzed the economic pressures on the major private universities and attempted to indicate the nature and the magnitude of the financial problems they faced.[17] He attributed the rising costs to increased responsibilities borne by private institutions and to the growing technology of education while asserting that costs were rising more rapidly in the private sector than in the public.

Cheit made a case study of financial problems facing forty-one institutions of higher learning.[18] His study, which included all types of institutions, concluded that over one-fourth were in financial trouble, that nearly a half were headed for trouble, and that this depression knew no bounds with respect to control or institutional function. He listed program cuts, postponements of plans, increased private solicitation, and more attention devoted to financial planning as responses to the situation.

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[16]Roger A. Freeman, Crisis in College Finance? (Washington: The Institute for Social Science Research, 1965).

[17]William G. Bowen, The Economics of Major Private Universities (Berkeley: Carnegie Commission on the Future of Higher Education, 1968).

[18]Earl F. Cheit, The New Depression in Higher Education (New York: McGraw-Hill Book Company, 1971).

Systems Analysis in Higher Education Finance

As suggested by Cheit above, the latter sixties comprised a period characterized by an increased interest in planning, particularly for the type of planning known as systems analysis, program budgeting, and a variety of other names. As could be expected, the financial literature of higher education during this period reflected that interest. Among the directions that this research took was the determination of unit costs, the estimation of benefits accrued from participation in higher education, the development of planning models, and the proposals for more efficient resource utilization in higher education.

Robert Cope has pointed out that formula budgeting alone is insufficient to utilize adequately the resources available to higher education.[19] In lieu of formulae, he proposed the use of simulation models which could integrate discrete and unconnected formulas. This technique, he felt, would avoid reliance on the superficial validity of the formulae.

In order to employ systems analysis effectively to the problems of financing higher education, accurate unit costs had to be developed. Among the several efforts in this regard, perhaps the work of O'Neill has seen the widest circulation.[20] After recounting difficulties in measuring outputs, O'Neill used the measure student-credit-hour as a

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[19]Robert G. Cope, "Simulation Models Should Replace Formulas for State Budget Requests," College and University Business, XLVI (March, 1969).

[20]June O'Neill, Resource Use in Higher Education (Berkeley: Carnegie Commission on Higher Education, 1971).

base and determined that there had been no increase in productivity in forty years.

Two dissertations in 1963 also approached the problem of measuring costs for use in models. Calkins suggested the consideration of class size, program differences, quality differences, and differences in educational outcomes to explain cost variances among one hundred and forty-five liberal arts colleges.[21] Anderson, in a similar study of Kansas institutions, further identified faculty rank, level of instruction, and instructional mode as important variables.[22]

Use of Cost Information. Unit cost information can be utilized in several ways. Daniere has suggested that higher education could be priced at cost.[23] Further, such information can be used to study the effects of curriculum proliferation.

The Carnegie Commission on Higher Education published recommendations in June 1972 which should lead to a more effective use of the resources available to higher education.[24] Many of their suggestions were based on the availability of accurate cost information, or on procedures to provide better understanding of institutional operations.

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[21]Ralph Nelson Calkins, "The Unit Cost of Programs in Higher Education" (unpublished Ph.D. dissertation, Columbia University, 1963).

[22]Waldo Keith Anderson, "Factors Associated with Instructional Costs in Kansas Public Higher Education, 1958-1959" (unpublished Ph.D. dissertation, University of Minnesota, 1963).

[23]Andre Daniere, Higher Education in the American Economy (New York: Random House, Inc., 1964).

[24]Carnegie Commission on Higher Education, The More Effective Use of Resources (New York: McGraw-Hill Book Company, 1972).

Hansen and Weisbrod have used unit cost data in a programming-planning-budgeting systems analysis of California higher education.[25] By associating benefits received from higher education (both individual and societal) with the costs, they proposed that legislative policy for support of higher education could be established. Further, they suggested that this data could be used to determine who should bear the cost of higher education, how it should be priced, and how it can be made more equitably accessible.

Somewhat along the same lines, Innes and others have devoted considerable effort to measuring the economic returns to education.[26] After discussing the concept and measurement of human capital, they studied the relationship of educational attainment and earnings and derived a rate of return on investments in education. From this base, they then estimated the contributions of education to economic growth.

Along with all of the attention directed to program budgeting, a companion interest in more efficient operations has developed. Bowen and Douglass have suggested improvements in the greatest area of expense-the curriculum.[27] They reviewed previous attempts of streamlining costs in the curriculum, such as the Ruml plan, and then proposed their own eclectic approach. These various arrangements

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[25] W. Lee Hansen and Burton A. Weisbrod, Benefits, Costs, and Finance of Public Higher Education (Chicago: Markham Publishing Company, 1969).

[26] Jon T. Innes, Paul B. Jacobson, and Roland J. Pellegrin, The Economic Returns to Education (Eugene, Oregon: The Center for the Advanced Study of Educational Administration, University of Oregon, 1965).

[27] Howard R. Bowen and Gordon K. Douglass, Efficiency in Liberal Education (New York: McGraw-Hill Book Company, 1971).

served to identify the most efficient ways to handle the teaching needs of particular courses.

Current Public Policy Considerations

Much of the recent literature has been at the policy level, particularly with respect to equity considerations. These concerns have taken the form of essays on who should pay for education, how it could be financed by those who should pay, and how such programs could be administered. A large portion of this body of literature is devoted to the role of the federal government.

The Carnegie Commission has recommended that the states continue to be the primary supporters of public higher education.[28] The Commission suggested that the United States should be careful not to move in the direction of a single national system of higher education, but the states should broaden the scope of their responsibility to encompass the whole range of postsecondary education.

Schultz has proposed a technique to help in the determination of who should pay for higher education.[29] Since he indicates that education is an investment in human capital, the central economic concept in planning and financing it should be the rate of return to the various investors.

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[28]Carnegie Commission on Higher Education, The Capitol and the Campus (New York: McGraw-Hill Book Company, 1971).

[29]Theodore W. Schultz, "Resources for Higher Education: An Economist's View," Journal of Political Economy, Volume 76, No. 3 (May/June 1968), pp. 327-47.

Leslie has analyzed the problem in a similar fashion.[30] After comparing the individual benefits theories and plans with the societal benefits theories and approaches, he called for a larger federal role in the support of higher education. This argument was based on his measurements establishing that the individual is already paying more than two-thirds of the total bill although societal benefits approximately equal those for the individual.

Jahn has called for a greater federal role in financing higher education.[31] He also argued that the financing for colleges and universities should be such that price (i.e., tuition) competition should be eliminated and that tuition should be based on ability to pay.

Federal Plans. Of the many plans proposed to distribute federal money to higher education, the more widely circulated efforts were either prepared or sponsored by the Carnegie Commission. The first of the Carnegie-sponsored efforts was Wolk's Alternative Methods, in which he outlined the different approaches the Congress might adopt, including categorical aid, student aid, institutional grants, tax relief to parents, and revenue sharing.[32] He also reviewed several of the major legislative attempts to channel federal funds into education.

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[30]Larry L. Leslie, The Rationale for Various Plans for Funding American Higher Education (University Park: The Pennsylvania State University, June 1972).

[31]Harrison Richard Kurt Jahn, "The Consideration of a New Approach to the Financing of Higher Education" (unpublished Ph.D. dissertation, Cornell University, 1968).

[32]Ronald A. Wolk, Alternative Methods of Federal Funding for Higher Education (Berkeley: Carnegie Commission on Higher Education, 1968).

In the same year, the Commission published its own recommendations under the premise that further federal support was necessary to achieve the goals of quality and equality.[33] Two years later, the Commission revised its recommendations somewhat, but the general theme remained that the federal government should assist higher education through a multi-faceted approach.[34] Among these approaches were grants based on need, a national student loan program, and aid to able graduate students.

Another Carnegie-sponsored study was conducted by Howard Bowen.[35] In this work, he outlined a long-range plan for the financing of students and institutions of higher education that would allow the institutions to progress, would open opportunities for attendance, and would provide equity in finance. His plan included grants to students based on need, student loans, and institutional unrestricted grants.

As an alternative to the call for more federal funding to relieve the financial crisis, Millett has developed a plan which would also allow greater access to higher education.[36] His plan called for a

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[33]Carnegie Commission on Higher Education, Quality and Equality: New Levels of Federal Responsibility for Higher Education (New York: McGraw-Hill Book Company, 1968).

[34]Carnegie Commission on Higher Education, Quality and Equality: Revised Recommendations, New Levels of Federal Responsibility for Higher Education (New York: McGraw-Hill Book Company, 1970).

[35]Howard R. Bowen, The Finance of Higher Education (Berkeley: Carnegie Commission on Higher Education, 1968).

[36]Robert T. Sandin, "The Millett Plan for Financing Higher Education in Ohio" (unpublished administrative report, University of Toledo, 1972).

lowered tuition at two-year campuses, income contingent loans, higher loans for institutions with higher tuition, and a reduction in the gap between tuitions of public and private universities.

Related Public School Finance

Several studies in the area of public school finance are related to the current study. These studies have been directed toward developing data bases for comparative studies, examples of cost-quality relationships, and the determination of the economic ability to pay for educational services.

Data Base Development. Burkhead has examined characteristics of the revenue structure of public school systems.[37] The particular focus of his study was on property taxes. Another volume in the Syracuse series by Miner went a step further and described an economic analysis of factors that influence expenditures by local public school systems.[38] He identified six categories of factors that affect spending: (1) the number of pupils; (2) sociological characteristics; (3) economic characteristics; (4) the variety, scope, and quality of educational services; (5) the productivity of schools; and (6) government response. He also formulated an empirical model to describe spending patterns.

Perhaps the broadest non-government collection of educational data has been compiled by the National Education Association. In its

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[37] Jesse Burkhead, State and Local Taxes for Public Education (Syracuse: Syracuse University Press, 1963).

[38] Jerry Miner, Social and Economic Factors in Spending for Public Education (Syracuse: Syracuse University Press, 1963).

annual report, it illustrates how states rank in support of education with the focus at the public school level.[39] Over one hundred and twenty measures are reported in the current edition.

Wright has approached the problem with an historical orientation.[40] Besides considering data itself, he has traced the events and activity which have impacted educational support in Oklahoma, thereby adding a new dimension to the information.

Another dissertation examined the information flow between lobbyists and legislators in regard to educational finance.[41] In Dodson's study, the attitude of legislators toward comparative information was explored as well as their confidence in the validity of such use.

Cost-Quality Relationships. Of the many studies that have been conducted to assess the relationship between the cost and the quality of education, each has suffered from a failure to provide an adequate definition of quality. However, the problem has been of interest for a considerable length of time, with studies appearing as early as the 1920's.[42]

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[39]Research Divison, National Education Association, Rankings of the States (Washington: National Education Association, various years).

[40]Clare B. Wright, "A History of Financial Support of Public Education in Oklahoma from 1907 to 1961" (unpublished Ed.D. dissertation, Oklahoma State University, 1963).

[41]Edwin Stanton Dodson, "A Study of the Communication Between Nevada Legislators and Certain Lobbyists When Related to Financing Public Education" (unpublished Ed.D. dissertation, University of California - Berkeley, 1967).

[42]For several examples of early efforts, see Paul R. Mort, Walter C. Reusser, and John W. Polley, Public School Finance (3rd ed.; New York: McGraw-Hill Book Company, Inc., 1960).

Among the more recent attempts to study this relationship is the work of Clark.[43] Although he admitted that the question was difficult to study, he presented several alternative measures of quality. The general findings of his research indicated, however, that "better" schools do spend more money than the "poorer" schools.

Several recent dissertations have also considered this type of question. Finch found a strong positive relationship between expenditures and a quality-related composite score.[44] This composite included staffing adequacy, teacher preparation, teacher salaries, and the availability of instructional materials. Martin, using a multiple regression approach, studied socio-economic measures, educational process variables, and quality indicators.[45] He reported a significant correlation between the quality grades and both economic level and money available. Although all cost-quality studies appear to be inconclusive, there may well be a relationship between money expended and the educational product received.

Economic Effort and Ability. An extension of the cost-quality studies has been developed by Wilson who compared educational outputs

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[43]Harold F. Clark, Cost and Quality in Public Education (Syracuse: Syracuse University Press, 1963).

[44]James Nellis Finch, "An Analysis of Financial Measures as Related to Certain Measures of School Quality" (unpublished Ed.D. dissertation, Columbia University, 1967).

[45]Charles Franklin Martin, Sr., "The Kentucky Quality Education Study: An Analysis of the Relationships Between Certain Criteria of Quality and Education and Socio-Economic, Cultural, and Educational Dimensions of Local Communities of Kentucky" (unpublished Ph.D. dissertation, University of Kentucky, 1967).

and needs.[46] Wilson first developed an educational output indicator composed of six factors. Then a second indicator was constructed which assessed state differences in educational needs and relative effort. Through such indices, Wilson was able to estimate how well each of the states was supporting education in relation to its needs.

A large number of dissertations have been prepared which have attempted to measure the abilities of various school districts to support their programs. Magoun, who was one of the first to study this question, developed an index of ability to finance public education.[47] Fox developed an index to be utilized in the state budget formula for public schools in Michigan.[48] His index of ability was based on retail sales collections, business activity tax receipts, intangible property value, motor vehicle registration, and the value of farm products. Using this index as an ability basis, he found that there would have been a substantial change in the allocation of state funds to school districts.

In 1959, Wetherington attempted a similar study to find a measure on which to base the Arkansas foundation program.[49] By applying

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[46]John Oliver Wilson, Quality of Life In the United States (Kansas City: Midwest Research Institute, 1969).

[47]Creighton Thomas Magoun, "A Measure of the Ability of Certain Selected Connecticut Communities to Support Public Education" (unpublished Ph.D. dissertation, University of Connecticut, 1954).

[48]Willard Fox, "An Economic Index of County Ability to Support Education in Michigan" (unpublished Ed.D. dissertation, Wayne State University, 1959).

[49]Allen Barton Wetherington, "Measures of Local Fiscal Ability to Support Public Schools" (unpublished Ed.D. dissertation, North Texas State College, 1959).

content analysis, integrative research, and a statistical appraisal technique, he determined that the sales ratio was a more equitable measure on which to base the program than was the previously-used ability index or a measure of effective buying income. A year later, Aquila conducted a similar study for Connecticut.[50] He concluded that although Connecticut is very wealthy and had a relatively small education load, its attainment as a state was mediocre.

Thompson was one of the first to incorporate non-educational characteristics of a state in his design on the premise that certain states were not comparable with most other states on every measure. He included a measure of population density, rural to urban migration, and expenditures for other state services in an attempt to understand the rank of South Dakota on various educational measures.[51] Other dissertations in this general area have been prepared by Turck, Martin, and Jordon.[52]

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[50]Thomas Anthony Aqila, "Relevance of Connecticut's Financial Ability to Its Fiscal Effort for the Support of Public Education" (unpublished Ph.D. dissertation, University of Connecticut, 1960).

[51]John Eldon Thompson, "Financing Public Education in South Dakota" (unpublished Ph.D. dissertation, University of Wisconsin, 1960).

[52]Merton James Turck, Jr., "A Study of the Relationship Among the Factors of Financial Need, Effort, and Ability in 581 High School Districts in Michigan" (unpublished Ed.D. dissertation, Michigan State University, 1960); Charles Edward Martin, "The Relationship of Social and Economic Characteristics of Local Initiative in the Financial Support of Public Schools in Mississippi" (unpublished Ed.D. dissertation, University of Mississippi, 1962); James Lamar Jordon, Sr., "A Study of Financial Effort, Financial Ability and Financial Needs for the Support of Public Education in Twelve Selected Southern States" (unpublished Ed.D. dissertation, University of Tennessee, 1964).

Comparative Studies in Higher Education

With the widespread and growing concern about the financing of higher education, many attempts have been made to establish appropriate statistical data bases from which to develop policy considerations. Hungate was one of the first to publish measures comparing the states.[53] He was already concerned at that time with comparability of data from government sources. Allen followed in this effort in 1952 and extended the analysis to include trends in data, expenditures by the states for non-higher education purposes, and state tax systems.[54]

In 1960 Seymour Harris published the first of several data books on finance of higher education.[55] His particular contribution at this stage of development was the refinement of various concepts and definitions in use. Two years later, he authored another sourcebook which included an examination of the differential in support of higher education among the states.[56] He considered some of the difficulties involved in interstate comparisons. A decade later, the Carnegie Commission called upon Harris to author another book in this area

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[53]Thad Lewis Hungate, Financing the Future of Higher Education (New York: Columbia University, 1946).

[54]H. K. Allen, State Public Finance and State Institutions of Higher Education in the United States (New York: Columbia University Press, 1952).

[55]Seymour E. Harris, More Resources for Education (New York: Harper & Brothers, 1960).

[56]Seymour E. Harris, Higher Education: Resources and Finance (New York: McGraw-Hill Book Company, 1962).

under its sponsorship. His A Statistical Portrait of Higher Education was primarily a revision of his 1962 effort.[57]

The Carnegie Commission issued another book on the subject in its report and recommendation series.[58] Although the report dealt primarily with recommendations for the state's role in support of higher education, a chapter was devoted to the comparisons of states' efforts. Among the measures employed, were indices of access and tuition rates.

As evidence of the growing importance and interest in such data, a Chronicle of Higher Education news story describing a study by Weld and Burke generated great interest as measured by response to the editor.[59] This study compared expenditures on current operations on both a per capita and a per student basis. The follow up letters and reply revealed that their measures of funds included tuition and gifts as well as state funds, although it excluded local revenue.

Undoubtedly the best known, and perhaps the most respected, information on appropriations to higher education has been prepared by Chambers. His most recent book, A Record of Progress, includes thirteen years of history of state appropriations for operating

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[57]Seymour E. Harris, A Statistical Portrait of Higher Education (New York: McGraw-Hill Book Company, 1972).

[58]Carnegie Commission on Higher Education, The Capitol and the Campus (New York: McGraw-Hill Book Company, 1971).

[59]"Spending by States for Public 4-Year Colleges, 1969-70," The Chronicle of Higher Education, October 4, 1971.

expenses of institutions of higher education.[60] This effort is largely a reproduction of his private monthly newsletter, Grapevine.

Analytical Studies. With a data base starting to take form, analytical studies employing these data began to appear in the past decade. Gregory conducted an exploratory analysis of factors associated with differences among states in state and local support using multiple regression analysis.[61] He hypothesized and found that the dependent variable, appropriations per capita, could be explained by three sets of independent variables which he labeled demand, non-government support, and constraints.

Thrash made a study with specific application to Louisiana a year later.[62] He analyzed financial resources and expenditures and then projected the state's needs until 1970 using measures such as state revenue share and dollars expended on both per capita and ability bases. Shanker conducted a study in the late sixties that was similar in scale to the present study.[63] He concluded that the states' efforts to support higher education could be partially explained by geographic location.

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[60] M. M. Chambers, Three Years of State Tax Support of Higher Education, 1969-70 Through 1971-72.

[61] Karl Dwight Gregory, "Variations in State and Local Appropriations for Publicly Supported Institutions of Higher Education, by State, in 1955-56" (unpublished Ph.D. dissertation, University of Michigan, 1962).

[62] Edsel Earl Thrash, "Financing Public Higher Education in Louisiana" (unpublished Ph.D. dissertation, Louisiana State University, 1963).

[63] Joseph Shanker, "A National Comparative Study of the Patterns of State and Local Governmental Financing of Higher Education" (unpublished Ed.D. dissertation, Columbia University, 1969).

A new method for measuring the burden of states was suggested by Timm.[64] He proposed an index to determine ability which was an extension of the Frank index used for measuring tax burdens. A Journal of Higher Education article on the subject appeared a year later. In this 1972 study, Weld listed many comparative measures which ranked the states, as did his earlier Chronicle article.[65] However, this later effort also compared various sources of data for consistency.

Since so many studies were beginning to appear which were seemingly comparable yet reported different findings, many became concerned over the validity of such data. For instance, Robinson attempted to describe the differences in data used in a political debate in Oklahoma in 1969.[66] This concern has also been expressed by the Chancellor of the Oklahoma State Regents for Higher Education.[67]

As this concern over the interpretation of comparative data grows, it is appropriate to examine what the various measures mean. For example, the question of how two opposing arguments can be developed from the same data base needs to be considered. It is the intent of this study to analyze the various dimensions of information

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[64]Neil H. Timm, "A New Method of Measuring States' Higher Education Burden," Journal of Higher Education, XLII (January, 1971), pp. 27-33.

[65]Edric A. Weld, Jr., "Expenditures for Public Institutions of Higher Education, 1969-70," Journal of Higher Education, XLIII (June, 1972), pp. 417-440.

[66]Jack L. Robinson, "Higher Education--Is It Adequately Financed?" Oklahoma Business Bulletin, XXXVII (November 1969), pp. 11-13.

[67]Faculty Alumni Newsletter (Oklahoma City: Higher Education Alumni Council of Oklahoma, September, 1972).

that are being described and to suggest a common base for future comparisons.

Factor Analysis Applications

Factor analysis can be considered as a tool which enables the social scientist to study phenomena of great complexity and diversity and to mold his findings into a scientific theory. Although it was originally developed for psychological study, nearly all areas of the social science literature now contain studies employing the technique. This brief section will highlight the development and some of the applications of factor analysis, the principal empirical technique utilized in this study.

Background and Framework

Several different textbooks have been prepared for the study of factor analysis as a technique, with each designed for a specific purpose. Applied Factor Analysis by Rummel is particularly valuable for those without a strong quantitative orientation.[68] Other recommended texts on the topic have been written by Cattell, Fruchter,

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[68] R. J. Rummel, Applied Factor Analysis (Evanston: Northwestern University Press, 1970).

Guilford, Harmon, Nunally, and Thurstone.[69] The reader is encouraged to refer to these texts for further study in the area.

Administrative Applications

Factor analysis applications in the administrative sciences are appearing with increasing regularity. Perhaps the best known application is the work of Hemphill and Coons in describing leader behavior.[70] Stogdill has also used the technique in analyzing organizational behavior.[71] More recently, several studies in marketing have used the tool.[72]

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[69]Raymond B. Cattell, Factor Analysis: An Introduction and Manual for the Psychologist and Social Scientist (New York: Harper & Brothers, 1952); Benjamin Fruchter, Introduction to Factor Analysis (New York: D. Van Nostrand Company, Inc., 1954); J. P. Guilford, Psychometric Methods, second edition, (New York: McGraw-Hill Book Company, 1954); Harry H. Harman, Modern Factor Analysis, second edition, revised (Chicago: University of Chicago Press, 1967); Jum C. Nunally, Psychometric Theory (New York: McGraw-Hill Book Company, 1967); and L. L. Thurstone, Multiple-Factor Analysis (Chicago: University of Chicago Press, 1947).

[70]John K. Hemphill and Alvin E. Coons, Leader Behavior Description (Columbus: Ohio State University, 1950).

[71]Ralph M. Stogdill, "The Structure of Organizational Behavior," Multivariate Behavioral Research, II (1967), pp. 47-61.

[72]For example, the following two articles were among several that appeared in David A. Aaker, ed., Multivariate Analysis in Marketing: Theory and Application (Belmont, California: Wadsworth Publishing Company, 1971):

Theodore Clevenger, Jr., Gilbert A. Lazier, and Margaret Leitner Clark, "Measurement of Corporate Images by the Semantic Differential," and William D. Wells and Jagdish N. Sheth, "Factor Analysis in Marketing Research."

Economic and Educational Applications

Several studies have been published which are more similar to the current problem under investigation. Hagood attempted to delineate regions from agricultural and demographic data using the principal components method.[73] In 1946, Hammond applied the technique to social and economic data.[74]

Schultz attempted to describe the dimensions of educational development of the United States to 1956 using factor analysis as one of the early educational applications.[75] Several years ago, Elsner conducted a study similar in intent to the current investigation. He factor analyzed forty-eight variables for one hundred and seventy Oklahoma school districts.[76] These variables represented 1967-68 data from the expenditures report, personnel report, the annual statistical report, the estimates of needs, and the applications for accreditation. He concluded that five factors could more parsimoniously describe the forty-eight variables.

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[73]Margaret J. Hagood, "Statistical Methods for Delineation of Regions Applied to Data on Agriculture and Population," Social Forces, XXI (March, 1943), pp. 287-297.

[74]W. H. Hammond, "Factor Analysis as Applied to Social and Economic Data," British Journal of Educational Psychology, XVI (1946), p. 178 (abstract).

[75]Richard E. Schultz, "A Factor Analysis of Educational Development in the United States," Educational and Psychological Measurement, XVI (Autumn 1956), pp. 324-332.

[76]Kenneth Eugene Elsner, "The Application of Factor Analysis in Identifying Relationships Among Selected Educational Data" (unpublished Ed.D. dissertation, University of Oklahoma, 1969).

Factor analysis, although subject to some misunderstanding by skeptics, has proven to be a reliable research tool. For data reduction and description applications as required in the current project, factor analysis has been an extremely effective tool.

CHAPTER III

THE METHODOLOGY OF THE STUDY

This chapter provides the details of the design and the execution of this study of financial support measures for public higher education. Initially, the data requirements and the selection of variables relevant to the research are described. Then emphasis will be directed toward defining these variables in operational terms. The latter portion of the chapter is devoted to a discussion of operationalization of the factor analysis models and a description of several methodological problems to be considered in their implementation.

Data Requirements and Selection

Any factor analysis research question requires a specification of the cases and the variables to be analyzed. Consideration must also be given to a three dimensional selection problem of choosing the entities, their characteristics, and the occasions in time to be studied. The choice of which pair of the three possible combinations of these three dimensions to investigate (while holding the third constant), as well as the assignment of these pairs of dimensions as cases and variables, determines the form of factor analysis to be employed.

The Data Cube

The concept of a data cube has been suggested by Cattell, Rummel, and others to describe a generalized body of data.[1] According to Rummel, "a phenomena can be described along three dimensions."[2] These three dimensions of the data cube are the entities, the characteristics of the entities, and the occasion(s) to be studied. An illustration of a data cube is shown in Figure 1.

Generally, entities can be considered as any separable phenomena which can be described, such as individuals, governmental units, business organizations, or physical items. In this particular study, the governmental units known as states in the United States will be treated as the entities. The second dimension defines characteristics attributes, or behavior of these entities, such as attitudes, abilities, and physical size of individuals, or population, power, and wealth of nations. The entities (i.e., states) in this study will be described by measures of supply and demand for public higher education as well as by other economic, sociological, and demographic attributes. Occasions, as the name implies, are the temporal aspect of the data cube. In this study, occasions will be aggregated into years. For reasons to be described below, two particular years were selected for study.

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[1] For a more detailed discussion of the data cube concept, see R. B. Cattell, Factor Analysis: An Introduction and Manual for the Psychologist and Social Scientist (New York: Harper and Row, 1952), pp. 35-37.
R. J. Rummel, Applied Factor Analysis (Evanston, Illinois: Northwestern University Press, 1970), p. 192-93.

[2] Rummel, Applied Factor Analysis, p. 192.

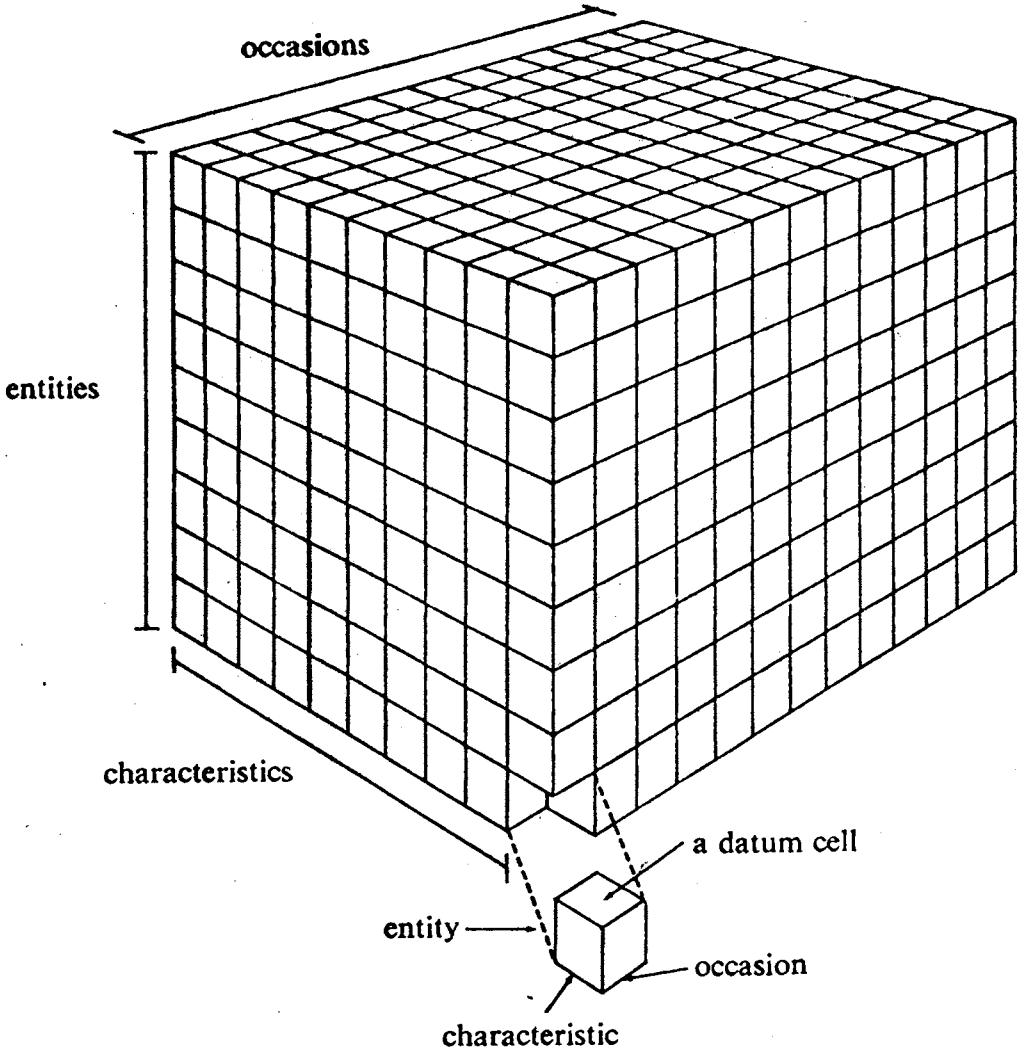

Figure 1. The Data Cube

Selection of Entities

As discussed above, the entities to be used in this study are the fifty states compromising the United States of America. Depending on the particular data elements being described, the term "state" will apply either to a geographical area circumscribed by political boundaries, the major governmental unit within these boundaries, or an aggregation of all smaller governmental or administrative units within the political boundaries. Other geographical areas under the United States (e.g., the District of Columbia, The Virgin Islands) will be excluded even though they possess many of the characteristics of states.

Selection of Characteristics

Any attribute, which could be assigned to a state and which described (1) the level of financial support for public higher education; (2) the demands for the services of colleges and universities; (3) the ability to pay for such services; or (4) other socio-economic characteristics that might illustrate significant activity within a state were the relevant characteristics for this study. Generally, these characteristics have been expressed in terms of ratios between items in various groups of characteristics (e.g., expenditures per student).

Two criteria were employed in selecting the characteristics to be included in this study from an infinite set of possibilities. First, related literature was studied (see Chapter II above), and all measures that had been previously proposed for comparing states on their ability and effort to support public higher education or the socio-economic

character of a state were recorded. After an initial screening to eliminate obvious duplications of measures, a second criteria of data availability was applied. Only measures for which comparable data was available for all states in each of the two time periods were retained for study.

Using these two criteria, twenty-four measures, or characteristics, were defined. Table I lists the measures that are included in this study using a shortened reference name. Appendices A and B list the complete support names, their definitions, the sources from which the necessary statistical information was collected, as well as indicating what aspect of higher education finance each measure purports to illustrate. Appendix C lists the computed values for each state for each of the time periods discussed in the following section.

Selection of Occasions

Data for the years 1960 and 1970 were used for analyses of the research questions. These two periods were selected for several reasons. First, data from two years separated by an adequate amount of time were necessary to examine questions of stability and reliability. Also, the latter year was the most recent period for which data on some of the characteristics were available. Finally, these two time periods coincide with the years that the Bureau of the Census conducted decennial censuses, thus providing much more information about the entities than is normally available.

Since each of the components of the measures studied was not available at the same time within a year, it was necessary to define how components were assigned to years. The concept of a governmental

TABLE I

MEASURES OF SUPPLY, DEMAND, AND ABILITY TO SUPPORT PUBLIC HIGHER EDUCATION AND OTHER KEY ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS

1. Expenditures/Public Enrollment
2. Expenditures/College Age Population
3. Expenditures/Population
4. Expenditures/Personal Income
5. Expenditures/Tax Revenues
6. Appropriations/Public Enrollment
7. Appropriations/College Age Population
8. Appropriations/Population
9. Appropriations/Personal Income
10. Appropriations/Tax Revenues
11. Public Enrollment/Total Enrollment
12. Public Enrollment/Population
13. College Age Population/Population
14. Institutions/Population
15. Personal Income/Population
16. Personal Income/Public Enrollment
17. Personal Income/College Age Population
18. Public Enrollment/Faculty
19. Faculty Salary
20. Educational Level
21. Nonagricultural Employment/Population
22. Urban Population/Population
23. Deposits
24. Highway Mileage

fiscal year was found to be appropriate to describe time intervals. Thus, data reported for any point from the first day of July through the last day of June were assigned to the fiscal year labeled the same as that June's calendar year. (For instance, enrollment as of September 15, 1969, would be reported as that for the fiscal year 1970).

Operationalization of Factor Analysis

Factor analysis can be described as a multivariate statistical technique which was developed to study the interrelationships among a total set of observed variables. Whereas multiple regression explicity treats one variable as dependent with all others being independent, factor analysis considers all of the variables simultaneously. It has thus been suggested that "each of the observed variables is considered as a dependent variable that is a function of some underlying, latent and hypothetical set of factors."[3] In this study, factor analysis was employed to identify fundamental and meaningful dimensions of a multivariate domain.

Given the definition of the three dimensional data cube (see an earlier section of this chapter), it is possible to describe the various factor analytic techniques that were used. The techniques are defined by the pair of dimensions under consideration (only two dimensions at a time are factor analyzed) and the assignment of the

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[3]George E. Pinches and others, "Financial Ratio Dimensions of Industrial Firms," (unpublished paper read before the Midwest Finance Association, St. Louis, Missouri, April 21, 1972) p. 2.

dimensions as variables and cases. Two techniques employed in this research were the r-technique and the q-technique.[4]

r-Factor Analysis

The factor analysis technique most commonly reported in research articles has been the r-technique (alternatively referred to as r-factor analysis or r-analysis). Using this method, the entities (i.e., states) are the cases and the characteristics become the variables. All data are for the same occasion (i.e., year). By factor analyzing the resulting 24 x 50 matrix, one can obtain groupings of the variables (i.e., support measures) in terms of the cases (i.e., states). Each of these derived groupings represents a factor composed of several variables with a high degree of interrelationship. Thus, in effect, factor analysis creates a more parsimonious set of data which still describes the same cases. For example, one might expect that the twenty-four measures in this study might reduce into five or six factors. An r-analysis was performed for each of the two years under study.

q-Factor Analysis

The q-technique is the complement to the r-technique with time (i.e., occasions) held constant. Using this technique, entities are expressed in terms of characteristics. Groupings derived from q-analysis describe the extent to which various sets of states have

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[4]Only the r- and the q-techniques are discussed below. Four other techniques (o-, p-, s-, and t-) are discussed in Rummel, Applied Factor Analysis, pp. 193-202.

common data variance and perhaps suggest new arrangements of states better suited for comparative purposes. A q-analysis was performed for both fiscal years under study.

Rotation of Factor Matrix

It has been customary in applied factor analysis to alter the initial factor solution to one which has more desirable properties, such as one resulting with a maximization of the number of high loadings for each factor, thereby affording a clearer resolution of the dimensions. In this study, both an orthogonal (i.e., varimax) and an oblique (i.e., oblimin bi-quartimin) rotation were performed. Unless otherwise specified, data will be reported from the reference structure oblique rotations. Generally, the factor loading matrices yielded by the various rotation techniques were highly similar, although the reference structure of the oblique rotations better defines the clusters of variables. Further, the oblique rotation enabled a higher order analysis to be performed.

Factor Loadings, Factor Scores,
and Cumulative Variance

Associated with each factor are factor loadings, factor scores, and a measure of the total variance described (see Table II). A factor loading coefficient is a numerical weight reflecting the degree of involvement that a variable has in a particular pattern. A higher loading shows a greater degree of involvement; and when two or more variables each have high loadings in the same factor pattern, this indicates that these variables are closely related to each other

and to the pattern. According to Rummel, "matrix loadings are best understood as regression coefficients of the variables on the factors."[5] These loadings have many of the characteristics of correlation coefficients, including the property that the square of the loading coefficient can be considered as the coefficient of determination.[6] For purposes of screening for the important variables in a factor, a criterion score ± 0.65 for the factor loading was used.

While the factor loading indicates the degree of involvement of a variable in a factor, the factor score illustrates the relationship of each case in that factor. For example, in an r-analysis an extreme factor score would indicate that a particular state (in this study) had a major influence in determining a factor. The factor score is similar to a standard "z" score since it reflects the number of standard deviations that a particular case is from the mean value of the factor. A factor score of ± 2.00 was typically used to identify those cases having a significant role in factor creation.

Also associated with each factor is a measure of the total variance explained by that factor. Such a figure measures the amount of data variation in the original data matrix that can be reproduced by the factor, thus measuring a factor's comprehensiveness and strength. Illustrated in Table II is the cumulative variance, the sum of the variances explained by each factor up through the factor under consideration.

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[5] Rummel, Applied Factor Analysis, p. 147 (n).

[6] With respect to oblique reference structure matrix loadings, such a relationship is only approximate. See Rummel, Applied Factor Analysis, p. 148.

TABLE II

SAMPLE FACTOR MATRIX

Factor Loadings

	Factor One	Factor Two	Factor Three
Variable 01	.74	.43	.22
Variable 02	.34	.67	.44
Variable 03	.58	.85	.19
Variable 04	.96	.37	.56
Variable 05	.46	.51	.79
Variable 06	.83	.56	.47
Variable 07	.35	.29	.81
Variable 08	.59	.77	.53
Variable 09	.62	.54	.39
Variable 10	.71	.37	.48
Variable 11	.45	.70	.66
Variable 12	.49	.27	.69
Cumulative Variance	.75	.84	.89

Factor Scores

Case 01	.55	-.78	.34
Case 02	1.05	.65	-.57
Case 03	-.23	.34	.86
Case 04	-1.57	1.89	-.96
Case 05	.05	-.76	.42
Case 06	2.43	.16	1.74
Case 07	-.89	1.32	.24
Case 08	.09	-.38	-1.45
Case 09	.65	.46	.09
Case 10	-.33	-2.34	.00

Higher Order Analysis

Higher order analysis was employed in order to examine the underlying structure of the supply, demand, and support dimensions. In many instances, higher order patterns are more substantively interesting than those of the first order. The need for a higher order analysis can be determined by examination of the factor correlation matrix. The higher order analysis was derived from factoring the correlations of the oblique factor patterns resulting from the first order oblique factor analysis of the data matrix. The factors of a higher order analysis "reflect macro-dimensions from which cause and effect relationships between first order dimensions can be inferred."[7]

Stability of Support Patterns

A major purpose of the study was to determine the stability (or lack thereof) of the various measures proposed for comparisons of states on the supply, demand, and support of public higher education. As stated previously, similar factor analyses were made for both the fiscal year 1960 and fiscal year 1970. Stability was measured by comparing the results of the two sets of analyses separated by ten years.[8]

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[7] Pinches and others, "Financial Ratio Dimensions," p. 21.

[8] Although two observations of the same phenomena separated by ten years do not provide enough evidence to make firm conclusions concerning stability, they are adequate to make inferences ascertaining whether patterns occurred by chance.

Pattern Comparison

Several techniques were employed to determine the degree of stability over the time span. First, a visual comparison was made to examine similarities between the types of patterns produced. Then two statistical measures were computed to measure the degree of similarity. The Pearson produce moment correlation was calculated to determine the pattern similarities between supposedly comparable factors in the two years under study. Also, the root-mean-square coefficient was computed as a pattern-magnitude measure. The root mean square is proportional to the Euclidean distance between the factor loadings and measures any deviation between two factors, which obviously imposes very stringent similarity requirements on the comparison of the two factors.[9] Although possible values of the root mean square range from -1.00 to 1.00, the coefficient is unlike the correlation coefficient in that higher similarities are measured as the score approaches a value of zero.

Differential r-technique

A differential r-technique was employed to attempt to identify change patterns over the ten year span.[10] Basically this technique requires the calculation and assignment of a standard score for each

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[9]Pinches and others, "Financial Ratio Dimensions," p. 11.

[10]Cattell has also used the terminology "incremental R" to describe such a technique. See:
R. B. Cattell, "The Structuring of Change by P-Technique and Incremental R-Technique," in Problems in Measuring Change, ed. by C. W. Harris. Madison: University of Wisconsin Press, 1963, pp. 167-98.

data element in each matrix.[11] The standardized score data matrix of the first observation was subtracted from the similar matrix of the second observation, and then the resulting differential matrix was subjected to an oblique r-analysis. Factors resulting in this analysis can be interpreted as dimensions of change. A differential r-analysis provides insight into the direction and patterns of change over a period of time.

Methodological Problems in Applying Factor Analysis

A problem of frequent concern in factor analysis is the number of cases versus the number of variables. Generally speaking, when the intent of the analysis is to draw inference from the sample result, the number of cases should be greater than the number of variables to avoid possible biases. Although Cattell has suggested the use of a 4- to -1 ratio of cases to variables,[12] in this study a ratio of approximately 2- to -1 was employed. A preliminary examination for biases by reduction of the number of variables indicated the adequacy of this design.

Ordinarily, factor analysis is applied to phenomena that are arithmetically independent of each other. This approach avoids the possibility of extracting factors that are functions of the

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[11]The standard score was obtained by combining all fifty (state) observations of each variable for the two years into one distribution for each variable, and then performing the necessary computations from the enlarged sample.

[12]Cattell, Factor Analysis, p. 350.

arithmetical operations on the data and not on the empirical data themselves. However, for some research purposes such as the determination of which arithmetically dependent variable best represents the others, "a number of variables with known arithmetical dependence may be included in an analysis."[13] Therefore, the arithmetic dependence of certain ratios in this study would seem to pose no procedural difficulties.

Since the scales of the different variables selected for study differed to a large degree both in magnitude and unit of measurement, a standardization transformation was applied to the data matrix before the factor analysis was performed. Such a transformation enables the comparison not only of data with different unit bases (e.g., dollars and median years of school), but also of data with magnitude differences.[14]

Concluding Comments

All computations were performed at the Oklahoma State University Computer Center using the IBM 360 Model 65 computer. Factor analysis routines employed were the BMD03M and the BMDX72 from the program library provided by the University of California at Los Angeles Biomedical Research Project. The factor comparison and the differential data matrix routines were developed by the author and are stored in the university computer library.

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[13] Rummel, Applied Factor Analysis, p. 213.

[14] Rummel, Applied Factor Analysis, pp. 290-91.

Additional detail on the interpretation of factor analysis patterns and the conduct of the study are included as appropriate in the following chapter when the results of the study are analyzed.

CHAPTER IV

ANALYSIS OF THE RESULTS

Factor analysis was employed as the principal technique to examine the twenty-four descriptors of the fifty states for the two time periods included in this study. As suggested in the previous chapter, several types of rotations and data slices were available for the analysis with a total of twenty-two separate examinations being computed. Although the results from each analysis are included in this chapter, only seven will be discussed in detail.

First, the analyses of the two rotations for 1960 using the r-technique will be compared, and the oblique rotation will be described in detail. Next, the two r-slices of 1970 will be examined in a similar manner. Then, the results of the 1960 and the 1970 factor comparisons will be reported along with the results of the differential r-analysis. Following the factor comparisons, attempts at second-and third-order oblique rotations will be described. After the tentative conclusions are made for the r-factor analysis rotations, attention will be focused on the q-technique rotations for the same periods. As in the earlier sections, both orthogonal and oblique rotations for each time period will be described, with the oblique rotations again being discussed in greater detail. After comparison of the groupings of states for the two time periods, the q-factor analysis rotations will be summarized.

Patterns of Characteristics Using the r-Technique: 1960

An orthogonal rotation of the 1960 data matrix resulted in six factors before satisfying the eigenvalue criterion of 1.00. These six factors, however, cumulatively explained 0.87163 of the total variance of the twenty-four original variables. Likewise, the oblimin (biquartimin) rotation also resulted in six factor patterns under a similar rotation criterion and accounted for the same proportion of cumulative variance. An examination of the factor correlation matrix for the oblique rotation (Table III) indicates that the orthogonal and oblique rotations are highly similar.[1]

TABLE III

FACTOR CORRELATION MATRIX
1960 OBLIQUE SOLUTION

	1	2	3	4	5	6
1	1.00000					
2	-0.11459	1.00000				
3	0.06300	0.05954	1.00000			
4	-0.06735	0.20317	0.00685	1.00000		
5	0.06296	0.13563	-0.12166	-0.02236	1.00000	
6	-0.05024	-0.08543	-0.06613	-0.11914	0.21548	1.00000

[1] For the obliquely rotated solution to be congruent with the orthogonal solution, the correlations between patterns (except the principal diagonal) would be 0.00.

Further, the comparisons of the factor analysis patterns indicate a high degree of similarity. The lowest product moment correlation coefficient between matched pairs of factors was a very strong 0.9708 while the root mean square coefficient equaled 0.0653. Table IV lists the coefficients between the patterns for each rotation.

1960 Oblique Patterns

Although some controversy exists on the question of whether the orthogonal or the oblique rotation is the better approach,[2] the obliquely rotated factors and their loadings will be reported here. This selection was based on the slightly better definition of clusters generated from the oblique rotations and the significant correlation between factors.[3] Further, use of the oblique factor loadings enabled a higher order analysis to be performed.

The Effort Dimension. The first factor in the 1960 oblique r-analysis can tentatively be termed the "effort dimension." Using a factor loading criterion of $\pm$0.65000, twelve of the original variables are associated with the first factor. Included among these twelve variables are most of the familiar effort indices which divide some financial measure by a unit measure for the state. Besides the effort measures, several supply and demand measures (e.g., enrollment per capita) are also included in this dimension, which suggests either that a state's effort is closely related to its demand or that it

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[2]For example, see Rummel, Applied Factor Analysis, pp. 386-89.

[3]Rummel has suggested that correlation coefficients less than 0.10 can be considered as nearly orthogonal. See Rummel, Applied Factor Analysis, p. 388.

TABLE IV

CORRELATION AND ROOT MEAN SQUARE COEFFICIENTS
1960 r-TECHNIQUE SOLUTIONS

Orthogonal Rotation Pattern Number	Oblique Rotation Pattern Number	Product-Moment Correlation Coefficient*	Root Mean Square Coefficient
1	1	0.9987	0.0279
2	2	0.9880	0.0634
3	6	0.9950	0.0377
4	4	0.9887	0.0404
5	5	0.9708	0.0653
6	3	0.9886	0.0448

*Positive and/or negative signs are omitted.

encourages a large supply of activity in higher education. Table V lists each of the twelve variables in the pattern with their factor loadings. As will be recalled from Chapter III, these loadings can be considered as approximations of the correlation coefficients between the variables and the concept expressed by the factor. Also included in Table V are the factor scores for the cases most heavily involved in factor one.

TABLE V

FACTOR ONE: EFFORT

Key Variables

	Variables	Factor Loadings
2.	Expenditures/College Age Population	0.96180
3.	Expenditures/Population	0.94402
12.	Public Enrollment/Population	0.94257
8.	Appropriations/Population	0.88040
7.	Appropriations/College Age Population	0.88122
4.	Expenditures/Personal Income	0.88040
5.	Expenditures/Tax Revenue	0.87707
10.	Appropriations/Tax Revenue	0.83720
9.	Appropriations/Personal Income	0.81427
16.	Personal Income/Public Enrollment	-0.72409
11.	Public Enrollment/Total Enrollment	0.70343
3.	Campuses/Population	0.68657

Key Cases

		Rankings of States on Reference Variables		
Cases	Factor Scores	2.	3.	12.
North Dakota	+1.97368	5	5	4
Wyoming	+1.81508	2	3	5
Utah	+1.65761	3	2	2
Massachusetts	-2.02304	50	50	49
Pennsylvania	-1.88397	48	48	50
New York	-1.59593	42	47	47

As could be expected, the sparsely populated, poorer states make greater efforts than do the wealthier, more densely populated states.

The Economic Development Dimension. The second factor resulting from the oblique rotation of the 1960 data included five variables from the original data set. Since each of the measures relate familiar concepts concerning the wealth and industrialization of an area, this dimension can be tentatively identified as "economic development." The two measures of personal income per unit of population best defined this cluster; however, the industrialization, educational attainment, and urbanization measures are also highly associated with this factor. As in factor one, there was no technique available for determining the direction of a possible causal relationship between education and development although the two measures were highly related. According to the factor scores, the relatively poor rural states of the southeast and the relatively urban wealthy coastal states represented the polar points of this dimension. Table VI lists the key variables and their loadings, the principal cases and their scores, and the ranks for the cases on several reference variables for factor two.

Operating Support. Only one variable was generated in factor three, thereby indicating that this measure uniquely explains a significant portion of the total variance of the entire data set. This measure was Appropriations/Public Enrollment. Since "appropriations" has been defined as the amount of state tax funds for operating expenses, this dimension can be identified as "operating support." A significant aspect of this measure is that it did not cluster with the other appropriations-based measures in the effort dimension, thereby indicating that this per student variable indeed

TABLE VI

FACTOR TWO: ECONOMIC DEVELOPMENT

Key Variables

Variables	Factor Loadings
15. Personal Income/Population	0.96351
17. Personal Income/College Age Population	0.95799
21. Non Agricultural Employment/Population	0.85640
20. Educational Level	0.80793
22. Urban Population/Population	0.77618

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variables 15.	17.	21.
New York	+1.95376	5	3	2
California	+1.77202	6	7	12
Nevada	+1.54836	1	6	3
Mississippi	-2.41415	50	50	50
South Carolina	-1.73582	49	49	42
Arkansas	-1.65695	48	46	48

provided a unique measure.[4] A varied collection of states represented the end points on the distribution of this dimension with Iowa and Colorado being the two most extreme cases. The surprising inclusion of California as a relatively low-ranking state on this measure in this time period can perhaps be explained by its reliance on local support of its extensive junior college network. Table VII illustrates the key variable and cases for this factor.

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[4]The loading for Appropriations/Public Enrollment in the effort dimension was only +0.04086.

TABLE VII

FACTOR THREE: OPERATING SUPPORT

Key Variable

Variable	Factor Loading
6. Appropriations/Public Enrollment	0.89879

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variable 6.
Iowa	+2.25719	1
Idaho	+2.05835	6
Montana	+1.90859	3
Colorado	-1.74886	46
Maine	-1.54236	49
California	-1.30844	42

The Size Dimension. The two variables which emerged in factor four--as shown in Table VIII--indicate that this dimension was related to the size of a state. These measures, bank deposits and paved mileage of roads, were both unadjusted to a unit basis (e.g., Deposits/Population) and as such probably illustrated size. An alternative explanation could be that since roads did not cluster with any of the educational measures, this cluster represents an alternative state and local spending pattern. In most areas, education and roads are prime competitors for public funds. The key states in the formulation of this factor were the geographically large and wealthy states and, on the other end of the continuum, the geographically small states.

TABLE VIII

FACTOR FOUR: SIZE

Key Variables

Variables	Factor Loadings
24. Highway Mileage	0.91497
23. Deposits	0.72691

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variables 24.	23.
New York	+3.13205	10	1
Texas	+2.50262	1	4
California	+2.27463	2	2
Delaware	-1.81783	47	39
Alaska	-1.65982	48	50
Hawaii	-1.33687	50	44

Alaska was an exception to this point with respect to geographical size, but relatively few roads have been built there due to the stage of development of the state.

Potential Need. Factor five also was composed of only one variable with a factor loading above the criterion value of $\pm$0.65000. This variable, College Age Population/Population, is a measure of the youth of the state. To put such a concept in educational terms, this represents the potential need for higher education services under the traditional assumptions of college attending ages. The factor loading for this variable and the scores for the key cases are shown in Table IX.

TABLE IX

FACTOR FIVE: POTENTIAL NEED

Key Variable

Variable	Factor Loading
13. College Age Population/Population	0.87415

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variable 13.
Alaska	+4.20734	1
Hawaii	+2.50342	2
California	+1.55909	25
Pennsylvania	-1.30652	47
Mississippi	-1.15566	10
Iowa	-1.04115	42

Combined Support. Factor six, the final factor extracted above the eigenvalue criterion of 1.00000, is similar to the operating support dimension since each indicates that the per student variable is a distinct measure in itself. However, the combined support dimension differs from operating support in that the term "expenditures" was defined as the amount of operating and capital support from state, local, and student sources. By combining sources and purposes of expenditure, Expenditures/Public Enrollment evolves as a unique measure. Although available data sources do not enable one to determine whether capital expenditures or non-state support is the distinguishing feature of the measure, knowledge of the cases, as shown in Table X, would seem to indicate that the expenditures for

capital needs probably was the major determinant of the factor in 1960. Pennsylvania and Arizona represented the extreme points on the distribution of cases.

TABLE X

FACTOR SIX: COMBINED SUPPORT

Key Variable

Variable	Factor Loading
1. Expenditures/Public Enrollment	-0.92612

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variable 1.
Arizona	+2.08953	49
Hawaii	+1.87290	46
Oklahoma	+1.49345	47
Pennsylvania	-2.54951	1
Vermont	-2.28879	3
Indiana	-2.25632	2

Patterns of Characteristics Using

the r-Technique: 1970

The orthogonal rotation of the 1970 data matrix resulted in six factors, as did the rotation for the similar matrix in 1960. In all, these six factors accounted for 0.85007 of the total variance of the data matrix. The oblimin biquartimin rotation of the same matrix also

resulted in six similar factors which had the same cumulative proportion of the total variance explained.

The factor correlation matrix for the 1970 oblique patterns (see Table XI) again shows that the orthogonal and oblique solutions were relatively similar, although the oblique solution was not as nearly orthogonal as was the 1960 case. An examination of the correlation and root mean square coefficients between the two solutions also illustrates that they were highly similar although to a lesser degree than in 1960. These coefficients are seen in Table XII. The oblique factor patterns for 1970 will be described in greater detail below in order that a comparison with a higher order analysis can be made.

TABLE XI

FACTOR CORRELATION MATRIX
1970 OBLIQUE SOLUTION

	1	2	3	4	5	6
1	1.00000					
2	-0.18012	1.00000				
3	0.05884	-0.03757	1.00000			
4	0.32047	-0.09120	0.28974	1.00000		
5	-0.19513	0.01177	-0.11119	-0.02608	1.00000	
6	-0.03494	0.21126	-0.24062	-0.05548	0.00522	1.00000

TABLE XII

CORRELATION AND ROOT MEAN SQUARE COEFFICIENTS
1970 r-TECHNIQUE SOLUTIONS

Orthogonal Rotation Pattern Number	Oblique Rotation Pattern Number	Product-Moment Correlation Coefficient*	Root Mean Square Coefficient
1	4	0.9749	0.0881
2	2	0.9876	0.0623
3	1	0.9732	0.0827
4	6	0.9840	0.0507
5	5	0.9903	0.0377
6	3	0.9444	0.1158

*Positive and/or negative signs are omitted.

1970 Oblique Patterns

Operating Support. The operating support concept from 1960 emerged as the first factor in the 1970 oblique rotation. However, an additional measure loaded above the criterion value besides Appropriations/Public Enrollment. The variable Public Enrollment/ Population also helped to define the cluster although it was inversely related with the first variable. Apparently those states with higher student loads were failing, or unable, to support each student as well financially while those states with smaller enrollments (percentage wise) in public institutions were relatively generous to higher education on a per student basis. The states which rank relatively low in per student support and high in student load seemed to be the newer additions to the United States, thus suggesting that the age of a state might help explain its support for higher education. Factor loadings and factor scores are reported in Table XIII along with reference variable ranks.

Economic Development. The second factor for 1970 was composed of five variables, each of which might be used to measure the economic development of an area. These five measures were the same variables which generated a similar pattern for the 1960 data although the significance of each in the dimension had changed. The variable Personal Income/Population was again the best descriptor to represent the entire cluster. The cases that were most involved in the dimension were similar to those of the earlier period. Table XIV lists the basic information for factor two and the economic development dimension.

TABLE XIII

FACTOR ONE: OPERATING SUPPORT

Key Variables

Variables	Factor Loadings
6. Appropriations/Public Enrollment	-0.99271
12. Public Enrollment/Population	0.66566

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variables 6.	12.
Arizona	+1.73221	47	1
Oklahoma	+1.59143	50	15
North Dakota	+1.45278	43	4
North Carolina	-2.25619	1	45
Alaska	-2.19140	2	39
South Carolina	-2.00227	3	50

Combined Support. The combined support factor of 1960 still existed in 1970, although four separate variables helped to describe the dimension in the latter time period as opposed to the single measure in the earlier period. The variable Expenditures/Public Enrollment remained as the best single descriptor, but three other expenditure-based measures can also be identified with the cluster as can be seen in Table XV. A possible explanation of this variation could be the tremendous growth in expenditures that occurred between the two periods under consideration with respect to the growth of the unit measures. The only unit measure of expenditures that did not meet the factor loading criterion was Expenditures/Tax Revenue, which would seem to indicate that total government financial activity was increasing

TABLE XIV

FACTOR TWO: ECONOMIC DEVELOPMENT

Key Variables

Variables	Factor Loadings
15. Personal Income/Population	0.95561
17. Personal Income/College Age Population	0.84948
22. Urban Population/Population	0.83467
21. Non Agricultural Employment/Population	0.82008
20. Educational Level	0.73753

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variables 15.	17.	22.
Nevada	+1.88563	1	1	8
Connecticut	+1.85198	2	3	14
New York	+1.65932	3	4	4
Mississippi	-1.98680	49	49	47
South Dakota	-1.91706	39	33	46
North Dakota	-1.55263	43	41	48

at a faster pace than personal income or population. It would again appear, upon examination of key cases, that the capital expenditure aspect served to differentiate this dimension from the operating support factors.

Effort. Factor four for the 1970 oblique rotations was similar to the effort pattern for 1960 except as noted in the previous section on expenditures. Only four variables, all appropriations-based, were highly involved in this cluster as opposed to the twelve variables for the earlier period. Appropriations/College Age Population appeared to be the most sensitive indicator for the factor as Table XVI

TABLE XV

FACTOR THREE: COMBINED SUPPORT

Key Variables

Variables	Factor Loadings
1. Expenditures/Public Enrollment	0.82664
3. Expenditures/Population	0.71581
2. Expenditures/College Age Population	0.70863
4. Expenditures/Personal Income	0.68690

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variables 1.	3.	2.
Alaska	+3.48336	1	1	6
Vermont	+2.60517	2	24	3
Wyoming	+1.72231	12	4	1
Pennsylvania	-1.48538	49	50	50
Texas	-1.16415	45	34	37
Louisiana	-1.12271	41	38	40

illustrates. The east-west dichotomy of cases probably reflected the greater reliance on private higher education in the east with the resulting smaller demands for public appropriations.

The Need Dimension. Factor five was represented by only one variable that was significantly involved. The measure College Age Population/Population, best described this dimension which was identified in 1960 as the "needs cluster." Hawaii and Alaska represented one end of the case distribution while Vermont represented the other polar point. Table XVII lists the key cases for this variable along with the factor scores and ranks for the reference variable.

TABLE XVI

FACTOR FOUR: EFFORT

Key Variables

Variables	Factor Loadings
7. Appropriations/College Age Population	0.98645
8. Appropriations/Population	0.94671
9. Appropriations/Personal Income	0.91334
10. Appropriations/Tax Revenue	0.83527

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variables 7.	8.	9.
Washington	+2.35976	1	1	1
Wyoming	+1.93858	2	3	5
Montana	+1.58205	6	8	9
Massachusetts	-2.44459	49	49	50
New Hampshire	-2.01394	50	50	48
New Jersey	-1.85383	47	48	49

TABLE XVII

FACTOR FIVE: NEED

Key Variable

Variable	Factor Loading
13. College Age Population/Population	0.95156

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variable 13.
Hawaii	+2.02681	2
Alaska	+1.73217	1
North Carolina	+1.60068	5
Vermont	-3.77168	50
Wyoming	-1.71276	45
Montana	-1.20099	42

State Size. The size of a state again appeared to distinguish it from the educational finance information in the data matrix. However, in 1970 the variable Public Enrollment/Faculty became the best descriptor of the dimension, although the same variable only had a factor loading of 0.23830 in the earlier time period. Perhaps such a change can be explained by the surge in junior and/or community college education in the larger states in recent years. It would seem that junior colleges typically have a larger campus-wide student-teacher ratio and systems which relied on this form of structure would have accordingly high averages. To some extent, it appears that size has enabled an economy of scale in higher education in certain states. Table XVIII examines the loadings, scores, and ranks associated with this sixth dimension.

Preliminary Summary of Characteristic Patterns

From the results of r-factor analyses with 1960 and 1970 data using both the orthogonal and oblique rotations, it appears that six factors can describe approximately eighty-five to ninety per cent of the total data matrix containing twenty-four variables. Use of these six factors would result in a more parsimonious description of the data without any great loss of information. The six patterns have been identified as: (1) Operating Support; (2) Economic Development; (3) Combined Support; (4) Effort; (5) Need; and (6) Size. The next section will examine the stability of these dimensions between the two time periods as well as discuss those areas of greatest change. After describing the patterns of stability and

TABLE XVIII

FACTOR SIX: SIZE

Key Variables

Variables	Factor Loadings
18. Public Enrollment/Faculty	0.87231
23. Deposits	0.81840
24. Highway Mileage	0.68166

Key Cases

Cases	Factor Scores	Rankings of States on Reference Variables* 18.	23.	24.
New York	+4.13487	1	1	13
California	+2.97841	2	2	2
Texas	+2.55170	4	4	1
Nevada	-1.21561	28	46	35
Hawaii	-1.18890	48	38	50
Maine	-1.10005	33	45	43

*Ranks for variable number 18 (the student/faculty ratio) are such that the highest rank represents the highest (worst) ratio under traditional assumptions concerning quality instruction.

change as well as exploring possible higher order dimensions, the characteristic patterns can be summarized in greater detail.

Characteristic Pattern Stability 1960-1970

In order to have more confidence in the utilization of the factor patterns suggested in the previous sections, it would be of great benefit to have some knowledge of the stability of the dimensions. While similarity of analyzed data that were collected for two points in time separated by a span of ten years does not provide any

conclusive arguments as to whether the patterns occurred by chance, a high degree of correlation between these two base points would begin to establish a sound foundation from which to embark for additional study. Further, if the minor changes which did occur can be explained by existing knowledge, confidence in the use of the patterns would be increased. In this section, the factor patterns for each time period will be compared using the product-moment correlation coefficient and the root mean square coefficient. Also, an examination of the results from factor analyzing the data difference matrix for the two years will be reported. After such inquiry, much more will be known about the stability and/or dynamic traits of the suggested characteristic factor patterns.

Comparison of Rotated Patterns

Since both orthogonal and oblique rotations were performed for each time period under consideration, a comparison between years for each type of rotation will be reported. By reporting both comparisons, possible problems resulting from the use of oblique patterns (as discussed in earlier sections) can be placed in a better perspective.

Orthogonal Pattern Comparisons. The six patterns from the 1960 orthogonal rotation were compared with the six patterns of 1970. The coefficients of the correlation and root mean square comparisons are reported in Table XIX.

An examination of the table discloses that there is not a one-to-one correspondence between the factors in each instance. This is particularly evident for the combined support dimension for 1970 which correlates more highly with the 1960 effort pattern than with

TABLE XIX

ORTHOGONAL FACTOR COMPARISONS

1960 Factor Number	1960 Pattern Name	1970 Factor Number	1970 Pattern Name	Product Moment Correlation Coefficient	Root Mean Square Coefficient
1	Effort	1	Effort	0.9079	0.2360
1	Effort	6	Combined Support	0.7412	0.3794
2	Economic Development	2	Economic Development	0.9375	0.1424
3	Combined Support	3	Operating Support	0.6187	0.2758
4	Size	4	Size	0.8364	0.1579
5	Potential Need	5	Potential Need	0.6782	0.2100
6	Operating Support	3	Operating Support	0.6618	0.2655

the 1960 combined support factor. The highest correlate with the 1960 combined support pattern in 1970 is operating support, although the two operating support patterns associate to a higher degree. As was discussed in a previous session (see p. 69), the rapid rise in capital expenditures, along with the greater reliance on local support, might explain the distortion in the combined support dimension.

Other than the exceptions noted, there are relatively strong correlations between the other matched pairs of dimensions, with effort and economic development exhibiting the strongest pattern correlation. In comparing pattern-magnitude correspondence with the root mean square coefficient, the economic development patterns are again most similar along with the state size dimension. However, all root mean square coefficients except for the 1970 Combined Support dimension indicate strong pattern-magnitude relationships.

Oblique Pattern Comparisons. An examination of the correspondence between 1960 and 1970 oblique patterns in Table XX indicates the same instability in the combined support dimension that was suggested in the orthogonal case. Likewise, all other pattern comparisons again exhibited relatively strong pattern and pattern-magnitude relationships for the oblique case. The two non-education factors of economic development and size held the strongest correspondence on both measures while Operating Support appeared to be the most stable education-related pattern.

Differential r-Analysis

By subtracting the data matrix for 1960 from the similar matrix for 1970, a difference matrix results which can itself be submitted to

TABLE XX

OBLIQUE FACTOR COMPARISONS

1960 Factor Number	1960 Pattern Name	1970 Factor Number	1970 Pattern Name	Product Moment Correlation Coefficient	Root Mean Square Coefficient
1	Effort	4	Effort	0.8099	0.3095
2	Economic Development	2	Economic Development	0.9229	0.1550
3	Operating Support	1	Operating Support	0.8095	0.2191
4	Size	6	Size	0.8336	0.1585
5	Potential Need	5	Potential Need	0.7571	0.1845
6	Combined Support	1	Operating Support	0.5409	0.3079
6	Combined Support	3	Combined Support	0.4544	0.3214

r-factor analysis.[5] Such an analysis serves to illustrate dimensions of change or stability over the time period being studied. By applying this technique to the data collected for this study, the oblimin biquartimin rotation yielded seven factors which accounted for 0.80287 of the total variance of the differential data matrix.

Appropriations Change Pattern. The first factor pattern from the differential r-analysis rotation included five appropriations-based variables. Although each of the variables had relatively high factor loadings, the measure Appropriations/Personal Income had the strongest association with the pattern with a factor loading of 0.93278. The cases which best exemplified the change aspect of this dimension were Oklahoma (with great decreases in rank) and Hawaii (which underwent dramatic growth). The loadings, scores, and reference variable ranks are shown in Table XXI.

Development Rate. The second change factor was one of the rate of economic development. The industrialization measure had the highest loading, as can be seen in Table XXII. From the polar cases as determined by the factor scores, Hawaii appeared to be the fastest developing state while Vermont has been the slowest.

Public Enrollment. The impact of the United States' pluralistic system of higher education can be seen in the third factor in Table XXIII. Changes in the reliance of a state on the private sector of higher education during this decade has created rank changes in several variables. The measure Public Enrollment/Population has the

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[5]The standard scores for the distribution of each variable for each year were calculated and the difference matrix computed was actually a "Z-score difference matrix."

TABLE XXI

DIFFERENCE FACTOR ONE:
APPROPRIATIONS CHANGE

Key Variables

Variables	Factor Loadings
9. Appropriations/Personal Income	0.93278
7. Appropriations/College Age Population	0.89531
8. Appropriations/Population	0.89290
6. Appropriations/Public Enrollment	0.80921
10. Appropriations/Tax Revenue	0.76158

Key Cases

Cases	Factor Scores	Reference Variable Rank Changes* 9.	7.	8.
Oklahoma	+2.09661	12-41	15-41	15-41
New Hampshire	+1.85436	40-48	31-50	34-50
Louisiana	+1.71974	4-17	12-36	10-31
Hawaii	-2.64812	35-4	34-3	29-2
North Carolina	-1.93514	29-10	40-26	37-18
New York	-1.66977	48-38	41-11	45-20

*The first rank is the 1960 figure; the second number of the 1970 rank.

highest factor loading and should serve as the best descriptor of the dimension. Pennsylvania served as the extreme case for states now placing a higher importance on the public sector while Alaska and South Carolina have shown a relative drop on this measure. Perhaps these changes can be partially explained by the introduction of the new public and private campuses.

Age Distribution. Two measures evolved in the fourth change factor which seem related to the distribution of ages of inhabitants of a state. These variables were Personal Income/College Age Population

TABLE XXII

DIFFERENCE FACTOR TWO:
DEVELOPMENT RATE

Key Variables

Variables	Factor Loadings
21. Non Agricultural Employment/Population	0.91659
22. Urban Population/Population	0.89918
15. Personal Income/Population	0.82222

Key Cases

Cases	Factor Scores	Reference Variable Rank Changes 21.	22.	15.
Vermont	+5.79280	26-50	46-50	34-50
New Hampshire	+0.95427	9-14	30-37	23-30
Pennsylvania	+0.87362	10-8	17-20	17-15
Hawaii	-1.43728	17-7	8-6	14-6
South Carolina	-1.04752	42-29	43-44	49-46
Nevada	-1.02338	3-1	18-8	1-1

and College Age Population/Population, with each having moderately high factor loadings. Several New England states seemed to be showing a more youthful tendency in relative terms while Florida seems to have a relatively older population (perhaps as a result of numerous retirement villages). The variables, polar cases, and ranks are shown in Table XXIV.

Expenditure Change Dimension. The fifth factor from the oblique rotation of the differential-r matrix contained five expenditures-based measures. The three effort-related expenditure variables had the highest factor loadings as seen in Table XXV. Alaska has shown the most improvement along this dimension over the past decade while

TABLE XXIII

DIFFERENCE FACTOR THREE:
PUBLIC ENROLLMENT

Key Variables

Variables	Factor Loadings
12. Public Enrollment/Population	-0.85733
16. Personal Income/Public Enrollment	0.78691
11. Public Enrollment/Total Enrollment	-0.66977

Key Cases

Cases	Factor Scores	Reference Variable Rank Changes 12.	16.	11.
Pennsylvania	+3.54674	50-46	1-5	49-46
Missouri	+1.66579	39-27	10-21	35-45
Wisconsin	+1.42701	24-19	24-25	27-21
Alaska	-2.64484	22-39	13-7	3-9
South Carolina	-2.46185	45-50	22-4	37-42
Vermont	-1.51792	28-48	23-50	42-44

California has shown a relative deterioration in position over this time period. The latter occurrence has been well publicized due to the recent political climate in the state toward higher education.

Political Priority Stability. The most stable dimension resulting from the differential r-analysis seems to deal with political priorities for services provided by the states. If one can consider road construction and education to be competing in priority for scarce legislative resources, and the median educational level of a state as the result of such a priority, factor six reveals that these priorities are slow to change. The variables Highway Mileage and Educational Level have generated a separate dimension which indicates a stability in state rank. The states in the northwestern region of the country seem to

TABLE XXIV

DIFFERENCE FACTOR FOUR:
AGE DISTRIBUTION

Key Variables

Variables	Factor Loadings
17. Personal Income/College Age Population	0.84087
13. College Age Population/Population	-0.81819

Key Cases

Cases	Factor Scores	Reference Variable Rank Changes 17.	13.
New Hampshire	+2.90037	16-35	36-10
Maine	+2.37331	31-45	24-8
Utah	+1.84429	37-48	8-4
Michigan	-1.88923	25-11	9-28
Florida	-1.85444	27-12	38-48
Nevada	-1.63989	6-1	17-40

possess higher ranks on median years of school completed than do many of the older states. Pertinent information for this pattern appears in Table XXVI.

Salary Change. The last factor to evolve from the differential r-analysis reflected changes in faculty salaries over the decade. It is interesting to note that this factor is the only instance of the variable Faculty Salary having a strong relationship with any static or dynamic dimension. Perhaps this lack of significance can be explained by the difficulty in obtaining reliable data for the measure and the resulting estimation technique employed. Nevertheless, the change in the way that states have seen fit to compensate college and university faculty was sufficient to generate a unique change

TABLE XXV

DIFFERENCE FACTOR FIVE:
EXPENDITURE CHANGE

Key Variables

Variables	Factor Loadings
2. Expenditures/College Age Population	-0.89518
4. Expenditures/Personal Income	-0.88873
3. Expenditures/Population	-0.88528
5. Expenditures/Tax Revenue	-0.77459
1. Expenditures/Public Enrollment	-0.72987

Key Cases

Cases	Factor Scores	Reference Variable Rank Changes 2.	4.	3.
Alaska	+3.22190	29-6	33-8	17-1
Hawaii	+2.13775	37-13	36-13	30-4
Wisconsin	+2.05173	20-2	30-6	23-5
California	-3.10544	1-25	7-33	1-19
Nevada	-1.60319	11-28	27-45	8-29
Mississippi	-1.39228	26-33	6-15	27-32

pattern. Florida and Illinois appear to be the polar cases for this dimension as illustrated in Table XXVII.

Differential-r Factor Summary. Seven factors were extracted from the differential-r analysis. These were identified as appropriations change, development rate, public enrollment, age distribution, expenditure change, political priority, and salary change. These seven change dimensions can be considered as representing the more dynamic aspects of support for higher education.

TABLE XXVI

DIFFERENCE FACTOR SIX:
POLITICAL PRIORITIES

Key Variables

Variables	Factor Loadings
24. Highway Mileage	0.72632
20. Educational Level	-0.64335

Key Cases

Cases	Factor Scores	Reference Variable Rank Changes 24.	20.
Nebraska	+1.58750	12-15	11-8
New York	+1.55931	28-25	10-13
Indiana	+1.52917	27-30	14-18
Oregon	-3.33787	25-17	8-7
Washington	-2.36278	30-27	3-4
Idaho	-1.65623	36-33	9-12

TABLE XXVII

DIFFERENCE FACTOR SEVEN:
SALARY CHANGE

Key Variable

Variable	Factor Loading
19. Salary	0.83119

Key Cases

Cases	Factor Scores	Reference Variable Rank Changes 19.
Illinois	+2.18925	5-9
California	+1.54414	1-5
Virginia	+1.11081	3-23
Florida	-2.58613	37-12
New York	-2.51993	20-6
Connecticut	-1.88404	29-1

Higher Order Characteristic Patterns

In an attempt to identify more theoretically interesting relationships described in the data matrix, higher order analysis was performed on the factor correlation matrices of both time periods. The purpose of a higher order analysis is to attempt to identify underlying dimensions within the support information. Such dimensions evolve from the clustering of two or more lower level dimensions. At this level of investigation, the factor patterns of one analysis become the basis for a higher order analysis defining underlying clusters of interrelationships.

Second Order Patterns

1960 Data. The second order oblique rotations for both 1960 and 1970 each resulted in three factors although the factors did not seem to have much correspondence between time periods. The first factor for 1960 contained three first order factors: combined support, size, and economic development. The second factor consisted of operating support and potential need, while the final second order factor for 1960 reproduced the effort pattern. A tentative interpretation of the second order patterns indicates that operating support and combined support continue to represent two separate dimensions of information. Further, the other frequently used comparative measures which were earlier labeled as the effort dimension represent still a different dimension of financial data. Factor loadings for the 1960 second order analysis appear in Table XXVIII. A visual interpretation of how the factors clustered together is presented in Figure 2.

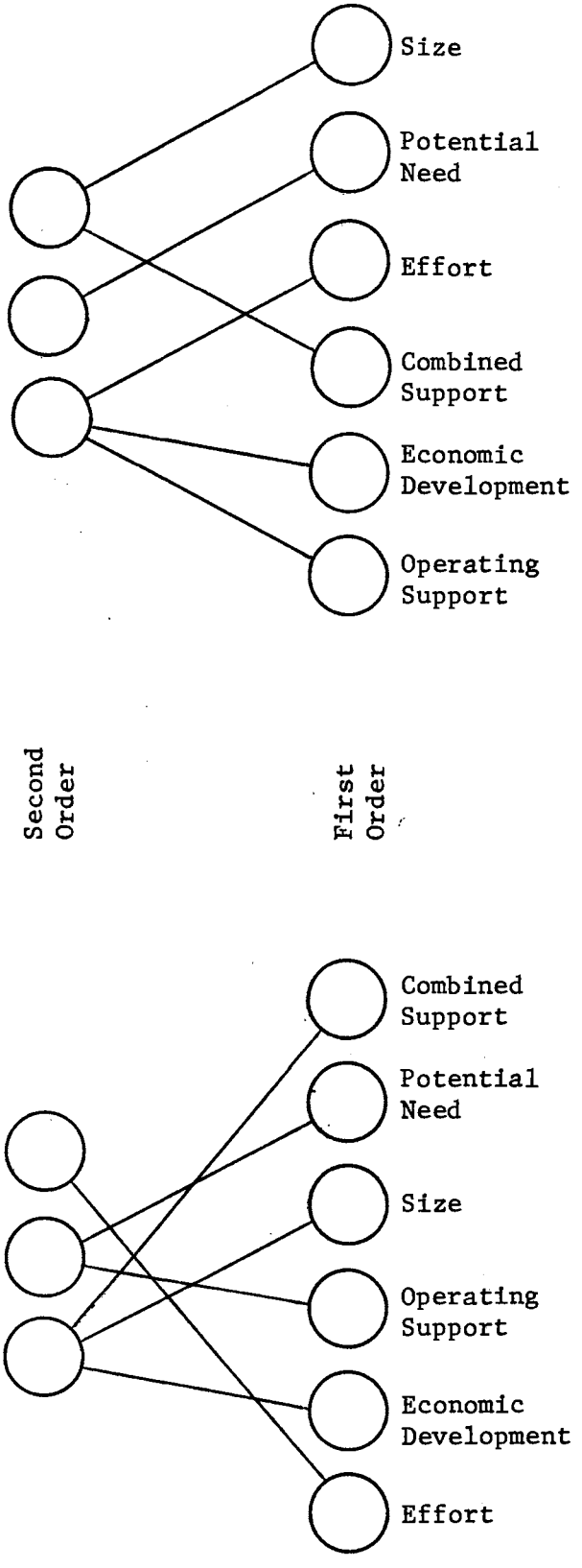

Figure 2. Higher Order Groupings

TABLE XXVIII

SECOND ORDER PATTERNS

	Higher Order Factor	First Order Factor	Factor Loading
1960	I	#6 Combined Support	0.82923
		#4 Size	-0.77344
		#2 Economic Development	-0.58905
	II	#3 Operating Support	0.94839
		#5 Potential Need	-0.78370
	III	#1 Effort	0.98766
1970	I	#2 Economic Development	-0.87992
		#1 Operating Support	0.81043
		#4 Effort	0.63418
	II	#5 Potential Need	0.98517
	III	#3 Combined Support	0.92658
		#6 Size	-0.82608

1970 Data. As suggested in the preceding paragraph, the six oblique patterns for 1970 were also reduced to only three dimensions in the second order analysis. In this time period, operating support and combined support continued to be in separate dimensions while potential need produced the third pattern. A possible explanation for the variation is that it will be recalled that the effort dimension for 1960 differed from the 1970 effort pattern with the capital outlay of the latter period being offered as the tentative cause. Table XXVIII also lists and Figure 2 illustrates the 1970 second order results.

Third Order Attempts

In an effort to refine even further the factors for higher order meaning, the factor correlation matrix for each year was submitted for

another (third order) r-factor analysis. In each instance the generated factor loading matrix resulted in only a single pattern. At this level of analysis, such a result is without a meaningful interpretation.

Higher Order Summary

The attempts made in the higher order analyses were not particularly fruitful in this application. Based on a comparison of the results from the two time periods, there do not appear to be any stable underlying dimensions of the financial support data. The major insight gained from the higher order efforts is that Operating Support and Combined Support do represent different dimensions of information about how higher education is financed.

Summary of Characteristic Patterns

From both the 1960 and the 1970 rotated factor solutions, it appears that the twenty-four variables of the original data set can be expressed in a more parsimonious manner without a serious loss of information. Taken as a whole, the six pattern sets for each time period are relatively stable and, as such, can be used with some confidence that the dimensions do not represent chance occurrences.

Table XXIX lists the six dimensions for each year under study along with the highest loading variables within each dimension. Further, the consistently high loading variables within each pattern are identified. This latter group might tentatively serve as the most parsimonious set of variables to describe the entire data set. Under such a proposal, one could argue that by knowing: (1) the State Appropriations per Student; (2) the Personal Income per Capita;

TABLE XXIX

SUMMARY OF OBLIQUE PATTERNS
r-FACTOR ANALYSIS

DIMENSION	OPERATING SUPPORT	ECONOMIC DEVELOPMENT	COMBINED SUPPORT	EFFORT	NEED	SIZE
1960 LEADING VARIABLES	Appropriations/ Public Enrollment	Personal Income/ Population	Expenditures/ Public Enrollment	(1) Expenditures/ College Age Population (2) Appropriations/ College Age Population	College Age Population/ Population	(1) Highway Mileage (2) Deposits
1970 LEADING VARIABLES	Appropriations/ Public Enrollment	Personal Income/ Population	Expenditures/ Public Enrollment	Appropriations/ College Age Population	College Age Population/ Population	(1) Public Enrollment Faculty (2) Deposits
CONSISTENT LEADING VARIABLES	Appropriations/ Public Enrollment	Personal Income/ Population	Expenditures/ Public Enrollment	Appropriations/ College Age Population	College Age Population/ Population	Deposits

(3) the Operating and Capital Expenditures per Student; (4) the State Appropriations per College-Aged Resident; (5) the proportion of College-Aged Population; and (6) the Bank Deposits, a person would know essentially all the information that is vital to assessing the adequacy of the financial support of higher education in a state. Based on the results of the higher order analyses, these six dimensions appear to be the most concise description possible.

An oblique factor analysis of the data difference matrix indicated that seven dimensions of change and/or stability exist. These dimensions, shown with the most representative variable in Table XXX, are: appropriations change, development rate, public enrollment, age distribution, expenditure change, political priorities, and salary change. Thus, if one is interested in understanding how comparative data can reflect changes in the nation's higher education system, the representative variables should be considered. As might be expected, none of the seven variables representing change are among those suggested in Table XXIX to measure a static situation in a parsimonious manner.

TABLE XXX

DIFFERENTIAL r-ANALYSIS SUMMARY

Dimension	Representative Variable
I - Appropriations Change	Appropriations/Personal Income
II - Development Rate	Non Agricultural Employment/Population
III - Public Enrollment	Public Enrollment/Population
IV - Age Distribution	Personal Income/College Age Population
V - Expenditure Change	Expenditures/College Age Population
VI - Political Priorities	Highway Mileage
VII - Salary Change	Salary

Entity Patterns Using the q-Technique

In order that the natural groupings of states based on the higher education financial data could be determined, the original data matrix was transposed to fit the requirements of the q-format. Then factor analysis techniques similar to those described above were performed, and this q-analysis yielded patterns of states in terms of the characteristic variables. Such information is necessary in order to determine if any of the ratio measures tend to have a natural bias in the evaluation of states and their efforts to support public higher education. With such knowledge, one might propose that certain measures are more appropriate for the evaluation of certain patterns of states than are those measures suggested in the section immediately above.

1960 q-Factor Analysis

Both orthogonal and oblique rotations were performed on the 1960 q-format data. As was the case in both the 1960 and the 1970 r-factor analyses, the results from each type of rotation were highly similar. A total of six entity patterns emerged from each rotation, and both rotations explained the same cumulative proportion of total variance (0.86258).

The patterns generated from the orthogonal rotation had a moderate degree of similarity with those from the oblique rotation. The correlation and root mean square coefficients are shown in Table XXXI. It would appear that the oblimin biquartimin rotation more clearly defined orthogonal factors one and three as oblique factors one and five. Table XXXII illustrates the factor correlation matrix of the

TABLE XXXI

CORRELATION AND ROOT MEAN SQUARE COEFFICIENTS
1960 ORTHOGONAL AND OBLIQUE PATTERNS

Orthogonal Pattern Number	Oblique Pattern Number	Product Moment Correlation Coefficient*	Root Mean Square Coefficient
1	1	0.8743	0.2698
2	2	0.9780	0.8041
3	1	0.5958	0.4162
3	5	0.5358	0.3551
4	4	0.9439	0.1028
5	3	0.9426	0.1171
6	6	0.9779	0.0706

*Positive and/or negative signs are omitted.

TABLE XXXII

FACTOR CORRELATION MATRIX
1960 OBLIQUE PATTERNS

	1	2	3	4	5	6
1	1.00000					
2	-0.07154	1.00000				
3	0.00364	0.00786	1.00000			
4	0.00115	-0.04712	-0.08793	1.00000		
5	0.24029	-0.18703	-0.43546	-0.02950	1.00000	
6	0.32585	0.19471	0.10338	-0.15779	0.11273	1.00000

oblique factors. As will be discussed in a later section, patterns three and five tend to measure the same aspects. Since it does appear that the oblique rotation more clearly defined the factor patterns, these patterns will be reported in the following section.

Development v. Effort. The first oblique pattern from the 1960 q-factor analysis seemed to group states according to their economic development and their effort in supporting higher education. Those states with the highest factor loadings for this dimension were Illinois, Missouri, and New Mexico. The state characteristics which were instrumental in the groupings were Personal Income/Enrollment and Expenditures/Personal Income as shown in Table XXXIII. The same dichotomy of states can be seen pictorially in Figure 3.

The Economically Depressed Southeast. Factor two of the q-analysis rotations mapped out the states comprising the southeastern United States. These states were notorious during this period for their low ability to support higher education and their relatively high need.

TABLE XXXIII

q-FACTOR ONE: DEVELOPMENT v. EFFORT

Key Variables

Variables		Factor Loadings
13.	Illinois	0.99489
31.	New Mexico	-0.94122
25.	Missouri	+0.91768
44.	Utah	-0.87442
50.	Wyoming	-0.86048
38.	Pennsylvania	0.85291
32.	New York	0.79475
9.	Florida	0.77217
6.	Colorado	-0.75817
21.	Massachusetts	0.72549
30.	New Jersey	0.72455
3.	Arizona	-0.70805
7.	Connecticut	0.67262
34.	North Dakota	-0.66392

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 13.	31.	35.
Personal Income/Public Enrollment	+1.75545	6	45	8
Non Agricultural Employment/ Population	+1.37033	5	38	11
Deposits	+1.21466	3	33	6
Expenditures/Personal Income	-1.32706	43	3	41
Public Enrollment/Population	-1.20302	38	11	35
Expenditures/Population	-1.19089	35	6	36

The ten states which loaded highly on this cluster are shown in Table XXXIV. The geographical impact on this dimension of states can be seen more clearly in Figure 4.

Support. The third factor seemed to reflect those states which exhibited a high level of support per student and the resultant low

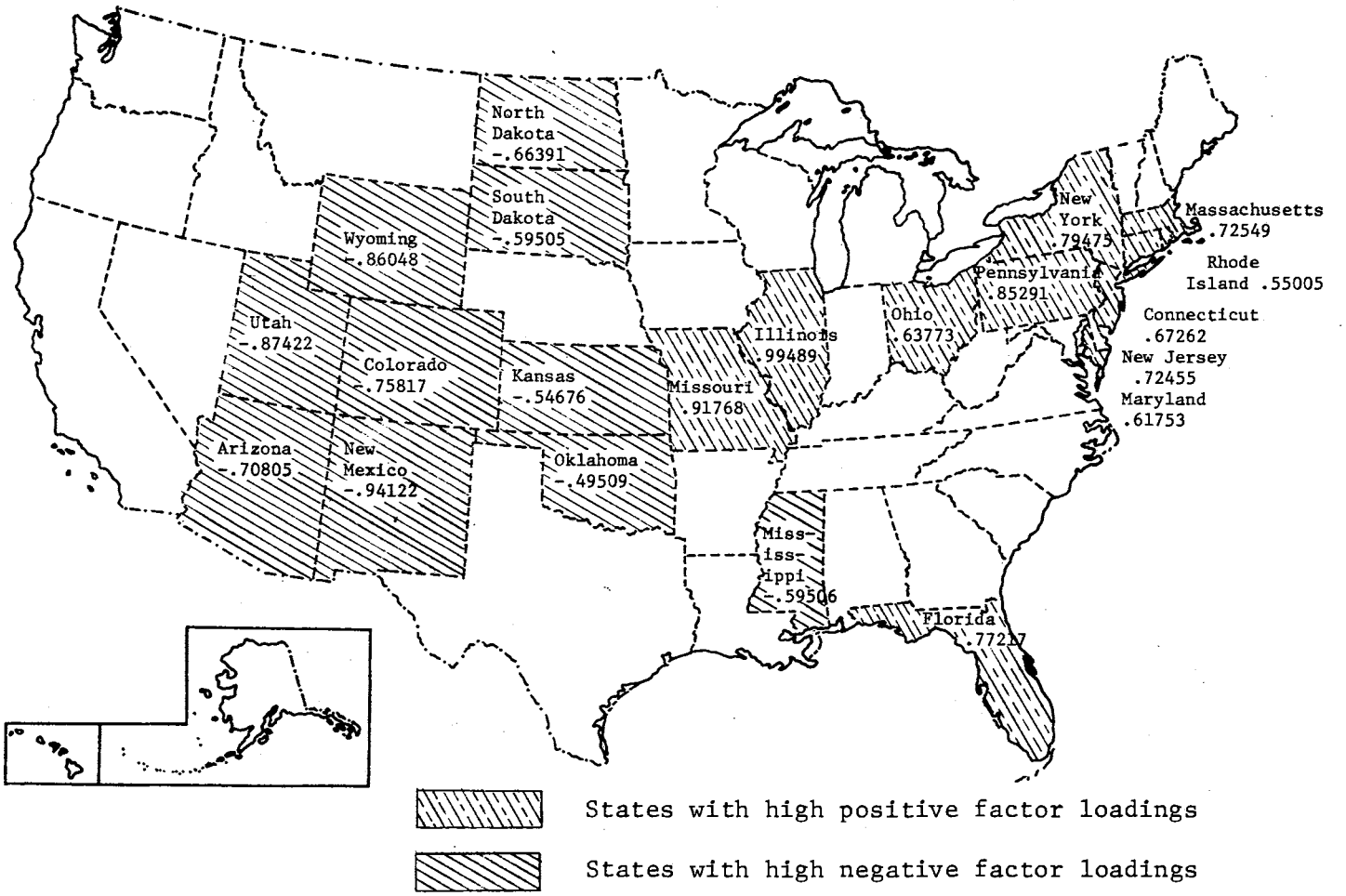

Figure 3. q-Factor 1

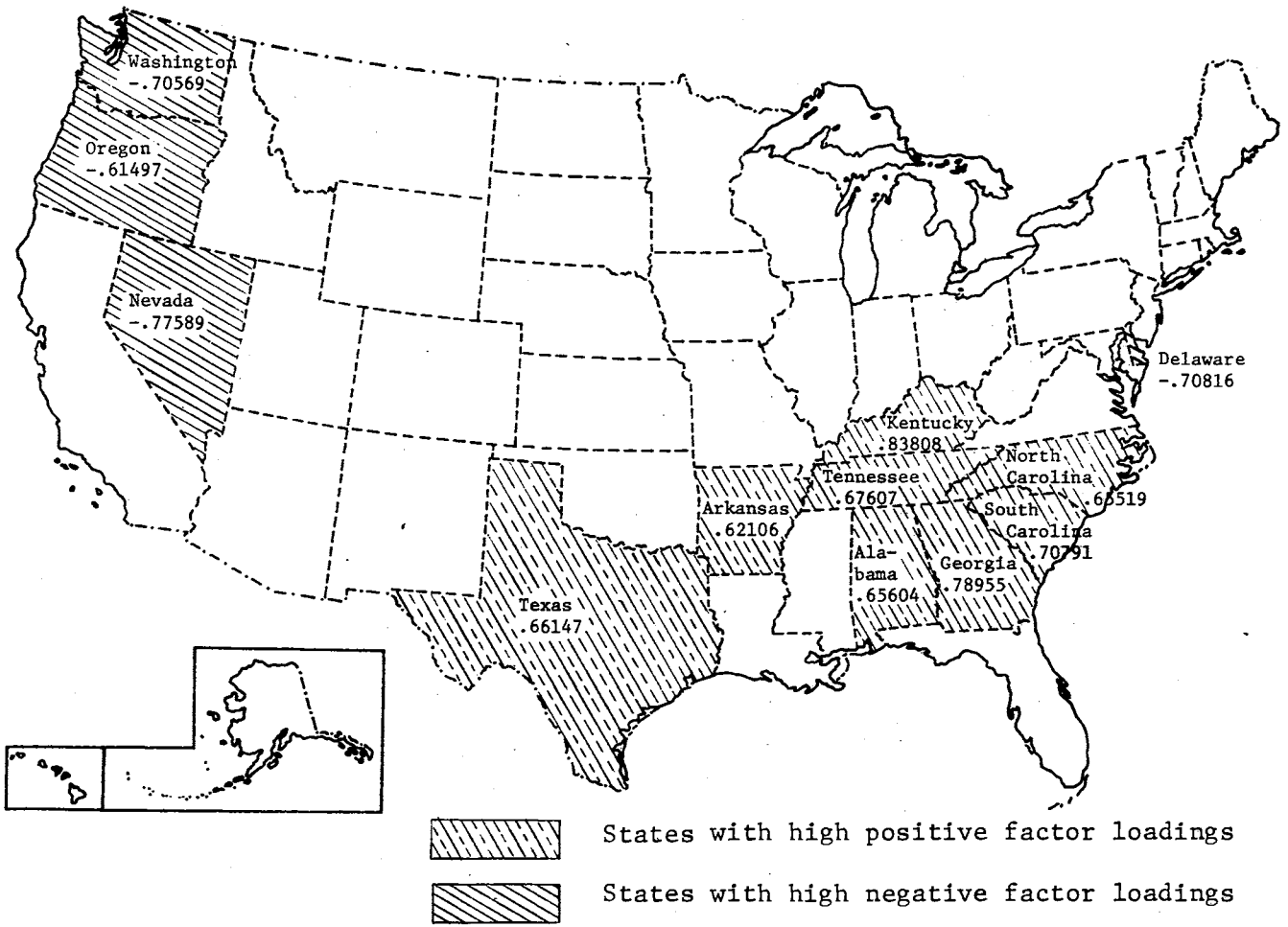

Figure 4. q-Factor 2

TABLE XXXIV

q-FACTOR TWO: SOUTHEAST

Key Variables

Variables		Factor Loadings
17.	Kentucky	0.83803
10.	Georgia	0.78955
28.	Nevada	-0.77589
8.	Delaware	-0.70816
40.	South Carolina	0.70791
47.	Washington	-0.70569
42.	Tennessee	0.67607
43.	Texas	0.66147
1.	Alabama	0.65604
33.	North Carolina	0.65519

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 17.	10.	28.
College Age Population/Population	+2.02862	13	7	17
Highway Mileage	+1.90686	26	16	35
Educational Level	-1.84068	50	42	4
Personal Income/Population	-1.60185	44	42	1
Personal Income/College Age Population	-1.57468	43	44	6

student-teacher ratio in 1960. These states, Vermont, New Hampshire, and Indiana, are further grouped on the basis of their relatively rural population. The factor loadings and factor scores are listed in Table XXXV.

Salary Support. The states of Michigan, Minnesota, and California combined to form a cluster which might be labeled as "salary support." Apparently these states chose to place a premium on selecting outstanding faculty as opposed to providing a relatively large number

TABLE XXXV

q-FACTOR THREE: SUPPORT

Key Variables

Variables	Factor Loadings
45. Vermont	0.95024
29. New Hampshire	0.90007
14. Indiana	0.72897

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 45.	29.	14.
Expenditures/Public Enrollment	+3.07822	3	6	2
Appropriations/Public Enrollment	+1.72139	13	34	11
Public Enrollment/Faculty	-1.70319	50	35	49
Urban Population/Population	-1.43501	46	30	26

of locations within their states. Table XXXVI lists the relevant data for this dimension.

Appropriations Efforts. The fifth cluster seemed to define states in 1960 according to their operating support per student and their effort as measured by operating support per thousand dollars of personal income. Louisiana, as seen in Table XXXVII, best defined states along this dimension. In many respects, this dimension is highly similar to factor three.

Non-Contiguous States. The last factor to evolve in the 1960 q-factor analysis was characterized by the nation's two non-contiguous states--Alaska and Hawaii. As can be seen in Table XXXVIII, the

TABLE XXXVI

q-FACTOR FOUR: SALARY SUPPORT

Key Variables

Variables	Factor Loadings
22. Michigan	0.94266
23. Minnesota	0.73130
5. California	0.71502

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 22.	23.	5.
Salary	+3.03993	2	7	1
Highway Mileage	+1.39152	8	4	2
Campuses/Population	-2.35401	37	27	22
Personal Income/Public Enrollment	-1.44772	28	33	39

TABLE XXXVII

q-FACTOR FIVE: APPROPRIATIONS EFFORTS

Key Variables

Variables	Factor Loadings
18. Louisiana	-0.96032
29. New Hampshire	0.79216
19. Maine	0.75534
12. Idaho	-0.70443
47. Washington	-0.67453

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 18.	29.	19.
Urban Population/Population	+1.22180	24	30	38
Public Enrollment/Faculty	+1.17355	32	34	30
Appropriations/Public Enrollment	-2.76425	7	34	49
Appropriations/Personal Income	-1.70169	4	40	45

characteristics which have best served to distinguish these states are their age distribution and their mileage of paved roads.

TABLE XXXVIII

q-FACTOR SIX: NON CONTIGUOUS STATES

Key Variables

Variables	Factor Loadings
11. Hawaii	0.91190
2. Alaska	0.75773

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 11.	2.
College Age Population/Population	+2.91487	2	1
Highway Mileage	-1.76604	50	48

1970 q-Factor Analysis

Six factors again emerged in both the oblique and orthogonal q-factor analyses for the 1970 data matrix. These six factors explained a cumulative proportion of 0.81762 of the total variance. As in the previous sections, the patterns generated from each rotation were highly similar as shown in the correlations from Table XXXIX. The factor correlation matrix, shown in Table XL, indicates that the oblique solution varies somewhat from the orthogonal case with one

TABLE XXXIX

CORRELATION AND ROOT MEAN SQUARE COEFFICIENTS
1970 ORTHOGONAL AND OBLIQUE PATTERNS

Orthogonal Pattern Number	Oblique Pattern Number	Product Moment Correlation Coefficient*	Root Mean Square Coefficient
1	1	0.9813	0.0916
2	2	0.9652	0.0951
3	3	0.9758	0.0823
4	4	0.9831	0.0598
5	5	0.9733	0.0685
6	6	0.9768	0.9708

*Positive and/or negative signs are omitted.

TABLE XL

FACTOR CORRELATION MATRIX
1970 OBLIQUE PATTERNS

	1	2	3	4	5	6
1	1.00000					
2	-0.15104	1.00000				
3	0.25969	-0.00077	1.00000			
4	-0.29437	-0.06117	-0.10782	1.00000		
5	0.13639	0.10287	-0.18135	-0.29821	1.00000	
6	-0.08130	0.41465	-0.10185	0.00935	0.05569	1.00000

pair of factors having a correlation coefficient of 0.41465. The oblique factor patterns will be reported in the subsequent analysis.

Income Applied to Higher Education. The first pattern in the 1970 q-factor analysis seemed to relate groups of states according to their efforts to support higher education. It particularly served to identify those states that have relatively high personal incomes and comparatively low support levels. Table XLI lists the states involved in this grouping along with the important measures on which these states clustered.

Congruent Operating Support States. An interesting pattern of states emerged in the second oblique factor for 1970. Each of these states seems to have approximately the same rank on measures of need, ability to pay, and operating support. However, these states depart widely from this pattern on the combined support measure. The key variables and cases from this dimension are shown in Table XLII.

TABLE XLI

q-FACTOR ONE: INCOME APPLIED TO HIGHER EDUCATION

Key Variables

Variables		Factor Loadings
13.	Illinois	0.93460
38.	Pennsylvania	0.93263
9.	Florida	0.92220
6.	Colorado	-0.90057
44.	Utah	-0.85283
32.	New York	0.82688
25.	Missouri	0.80515
31.	New Mexico	-0.76330
7.	Connecticut	0.66143
41.	South Dakota	-0.65462

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 13.	38.	9.
Personal Income/College Age Population	+1.31292	5	7	12
Personal Income/Public Enrollment	+1.28987	9	5	9
Expenditures/Personal Income	-1.61016	37	49	43
Expenditures/Population	-1.38117	27	50	44

Development. On the third dimension states tended to be clustered together according to their economic development. Arkansas and Delaware were inversely related to each other along this dimension based on income per capita and median educational level. Table XLIII lists the involvements of the key states in this pattern. Figure 5 indicates that there was a slight regional pattern reflected.

Operating Support and Effort. There appeared to be a high relationship between effort measures and operating support measures

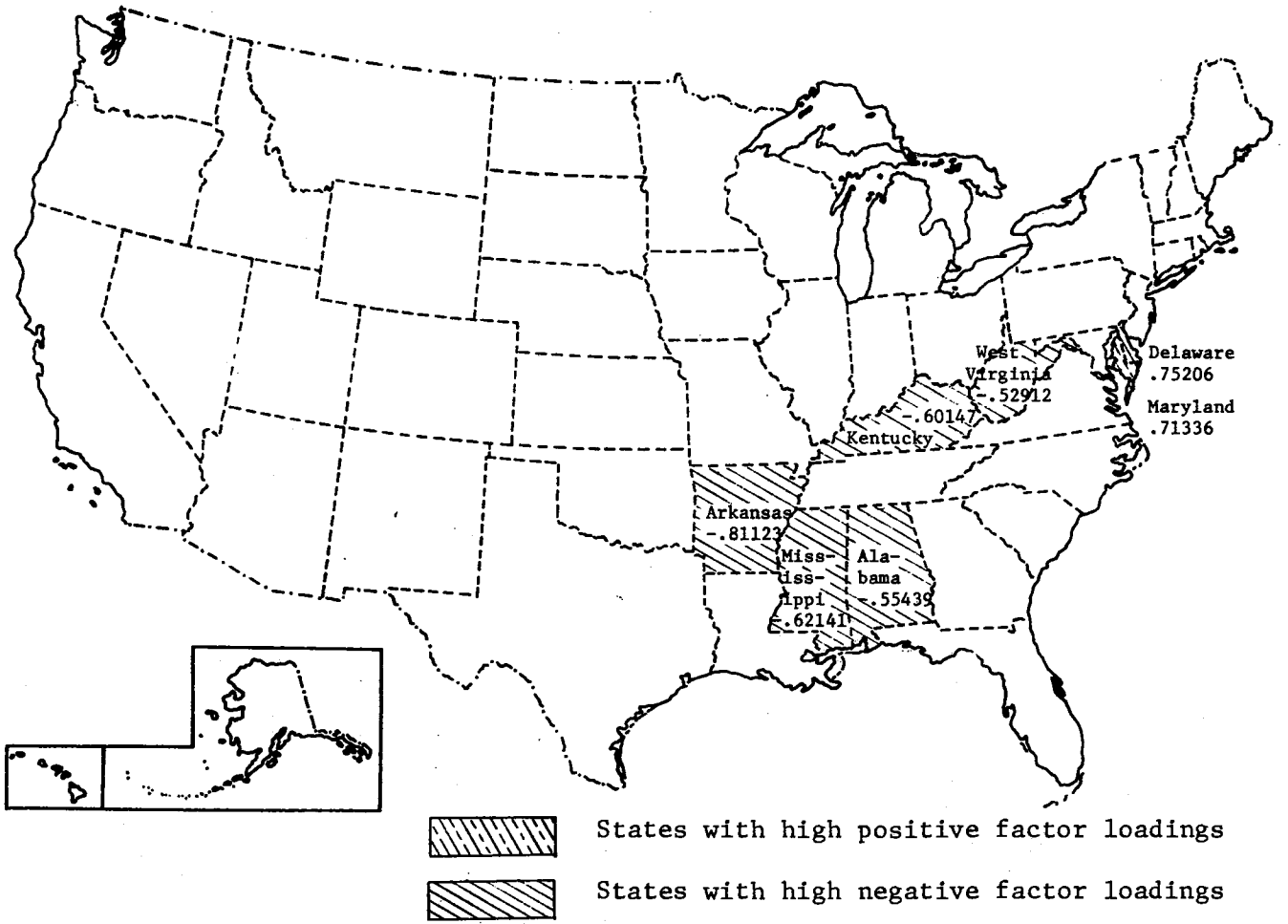

Figure 5. q-Factor 3

TABLE XLII

q-FACTOR TWO: CONGRUENT OPERATING SUPPORT STATES

Key Variables

Variables	Factor Loadings
22. Michigan	0.96077
19. Maine	-0.81720
23. Minnesota	0.72866
40. South Carolina	-0.70959
46. Virginia	-0.70640

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 22.	19.	23.
Expenditures/College Age Population	+1.42509	14	46	15
College Age Population/Population	-2.25402	28	8	33
Appropriations/Public Enrollment	-2.05755	26	13	32
Personal Income/Public Enrollment	-1.94168	25	19	33

for the states identified in factor four. Further, this effort and support is reflected in a spending pattern as well--the student to faculty ratio as shown in Table XLIV. New Hampshire and Washington vary inversely along this dimension.

Expenditures Dilemma. Factor Five in Table XLV reflected the expenditures dilemma facing many states, especially those with high factor loadings on this pattern. From the data shown, it appeared that certain states have high demands placed on higher education but have low combined support levels. Further, the median educational level in these states seems to correspond closely to the support

TABLE XLIII

q-FACTOR THREE: DEVELOPMENT

Key Variables

Variables	Factor Loadings
4. Arkansas	-0.81123
8. Delaware	0.75206
20. Maryland	0.71336
11. Hawaii	0.66966
28. Nevada	0.66127

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 4.	8.	20.
Educational Level	+1.87790	49	33	29
Personal Income/Population	+1.79198	48	9	11
Highway Mileage	-1.89165	23	49	42

per student. Louisiana serves as an example of a high demand-low support state while Vermont exhibits the opposite characteristics.

Poor States. The last factor for the 1970 q-factor analysis oblique rotations involved several states that seem to be bound together by their lack of state funds. These states illustrated high effort in Table XLVI as measured by the per cent of state funds devoted to higher education, yet they ranked low in their per student support of capital and operating expenses. As can be seen in Figure 6, these states were geographically grouped in the northwest and plains areas.

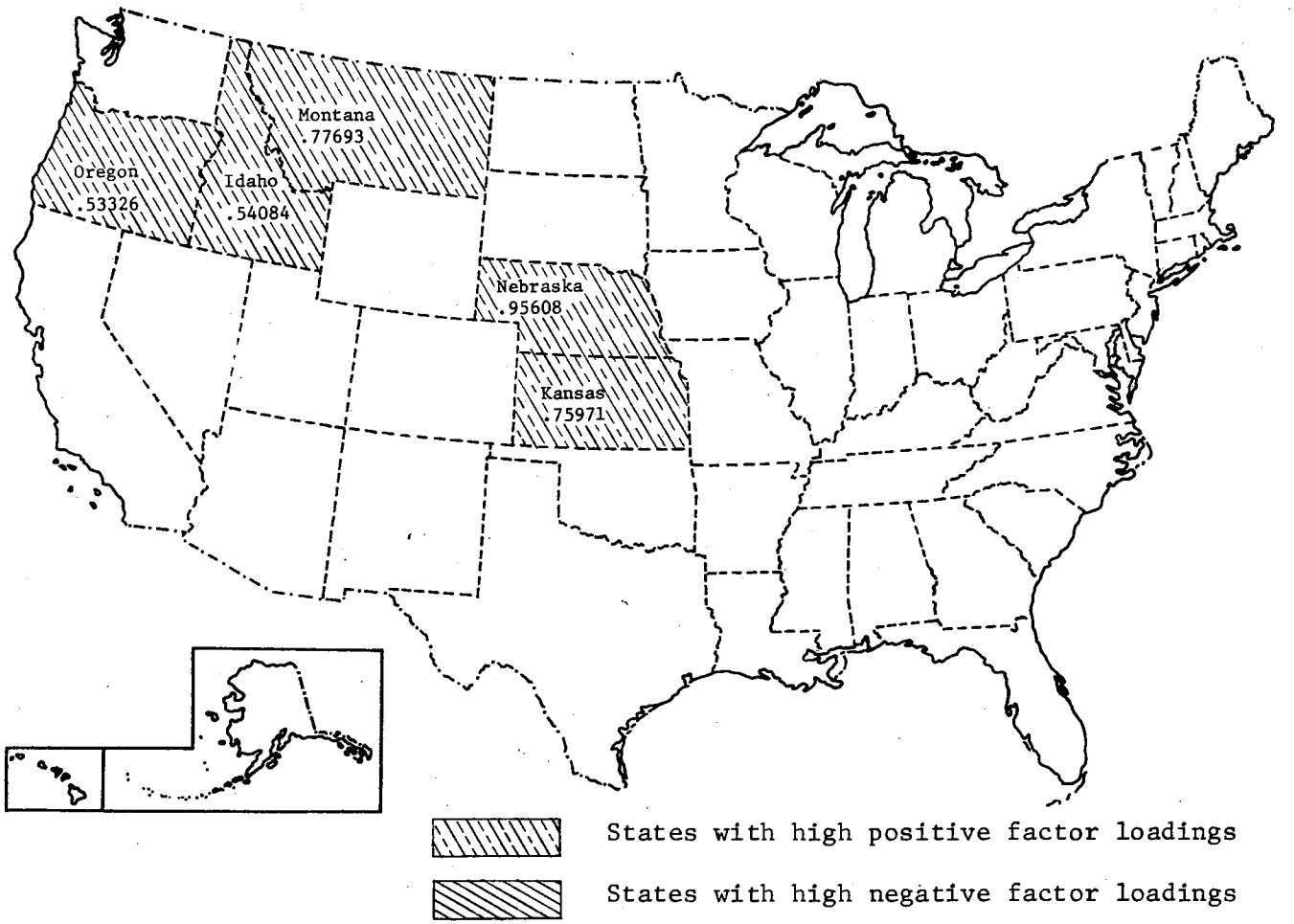

Figure 6. q-Factor 6

TABLE XLIV

q-FACTOR FOUR: OPERATING SUPPORT AND EFFORT

Key Variables

Variables	Factor Loadings
29. New Hampshire	-0.90344
47. Washington	0.88617
11. Hawaii	0.69212
36. Oklahoma	-0.64544

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 29.	47.	11.
Appropriations/College Age Population	+2.11671	50	1	3
Appropriations/Population	+2.00530	50	1	2
Appropriations/Personal Income	+1.90812	48	1	4
Appropriations/Public Enrollment	+1.59336	49	9	5
Public Enrollment/Faculty	-1.28267	27	45	48

Entity Pattern Stability

The patterns of states were not nearly as stable as the patterns of ratio measures over the decade under study. While some 1960 patterns did not reproduce for 1970, all patterns had somewhat lower correlations between the two measuring periods than did the support variables. Table XLVII lists the correlation and root mean square coefficients between the 1960 and the 1970 oblique patterns of states. Although the orthogonal and oblique patterns for each period were

TABLE XLV

q-FACTOR FIVE: EXPENDITURES DILEMMA

Key Variables

Variables	Factor Loadings
18. Louisiana	0.79780
45. Vermont	-0.76652
15. Iowa	-0.73076
14. Indiana	-0.69072

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 18.	45.	15.
Public Enrollment/Total Enrollment	+2.06116	18	44	43
College Age Population/Population	+1.47266	15	50	43
Expenditures/Public Enrollment	-1.83782	41	2	6
Educational Level	-1.31559	41	16	11

TABLE XLVI

q-FACTOR SIX: POOR STATES

Key Variables

Variables	Factor Loadings
27. Nebraska	0.95608
26. Montana	0.77693
16. Kansas	0.75971

Key Cases

Cases	Factor Scores	Rankings of Reference States on Cases 27.	26.	16.
Appropriations/Tax Revenue	+2.03928	8	1	7
Educational Level	+1.63690	8	9	10
Expenditures/Public Enrollment	-2.08224	46	48	39
Appropriations/Public Enrollment	-1.27250	34	31	39

TABLE XLVII

CORRELATION AND ROOT MEAN SQUARE COEFFICIENTS
1960 AND 1970 OBLIQUE PATTERNS

1960 Pattern Number	1970 Pattern Number	Product Moment Correlation Coefficient*	Root Mean Square Coefficient
1	1	0.8750	0.2509
2	3	0.7660	0.2648
3	5	0.6723	0.2621
5	4	0.5722	0.3269
6	6	0.6569	0.2740

*Positive and/or negative signs are omitted.

generally similar, the relationships between the 1960 and the 1970 orthogonal patterns were noticeably smaller than the oblique relationships.

The cluster identified as "development v. effort" in 1960 and the cluster "income to higher education" in 1970 displayed the strongest relationship between periods, primarily along the lines of the personal income of the state per student enrolled and the expenditures per one thousand dollars of personal income. The pattern in the latter period was slightly better defined in terms of educational support measures. The 1960 pattern for the southeastern states correlated highly with the development dimension from 1970. Although the states were defined in terms of several of the same variables, the geographic pattern did not persist as strongly, which perhaps indicates that the southern states are less similar to each other now than in previous years. A similar occurrence can be seen in the last 1960 pattern, the non-contiguous states, where the pattern is correlated with 1970's "poor states," but the geographical distinction has lessened. The only 1970 pattern with no moderate or higher correlations was the "congruent operating support states" dimension where each of those states with the highest involvement in the dimension had nearly the same ranks on measures of need, ability to pay, and operating support. A possible explanation of this new factor is the increased use of comparative measures, such as those used in this study, in the appropriations decision by legislators.

Summary of Entity Patterns

Six patterns of states evolved in each of the four q-factor analyses performed. It appears that a sizable proportion of the total variance between states can be explained by six factors. Although the states grouped into patterns with moderate correlations between periods, the patterns did not seem to group along geographical lines, particularly in the later period. Likewise, other non-educational indices--such as size, industrialization, and urbanization--seemed to have had relatively little effect in grouping states. Instead the states appeared to group in terms of their efforts and dilemmas in financing higher education. Based on these groupings of states, it would appear that it is no longer necessary to propose separate indices for states bound together geographically; rather a uniform set of variables, such as the six from the characteristic suggested patterns above, can adequately compare all states.

CHAPTER V

SUMMARY AND CONCLUSIONS

This final chapter will first summarize the main findings of the study. Conclusions and interpretations will be drawn from these findings, and a framework for future reference will be developed. Possible alternatives for additional research on this topic will also be discussed. Finally, several propositions will be described which would enable an expansion of the current study into situations tying qualitative assessments of output with these quantitative measures of input.

General Summary

It will be recalled that several different major approaches were undertaken to study the current problem. Each of these attempts will be summarized in the following sections. First, a brief review of the patterns of characteristics will be presented for both the 1960 and the 1970 time periods. Of particular importance will be the examination for stability between the two periods. Also, attention will be directed to the change dimensions of these characteristics. The concluding portion of the characteristic pattern section will describe the findings from the higher order analyses. The other major approach utilized to gain an understanding of the financial support information was q-factor analysis. Patterns of entities

from both 1960 and 1970 will be presented as well as a review of the instability of entity patterns.

Characteristic Patterns

1960 r-Analysis. Both orthogonal and oblique rotations were performed on the r-format data for 1960. Six major dimensions emerged in each rotation, accounting for eighty-seven per cent of the total data variance. Further, the factors from each rotation were highly similar, with the lowest correlation coefficient between matched pairs of factors being 0.9708. The following six factors, extracted through the oblique rotation, describe the data for 1960 in a more parsimonious manner:

(1) Effort: a dimension composed of twelve variables, most being characterized as a ratio of dollars available to higher education divided by a demographic characteristic such as population;

(2) Economic Development: a pattern of five variables describing the economic development of an area, including personal income, educational level, industrialization, and urbanization;

(3) Operating Support: a factor described by a single variable, namely the appropriations from state tax funds for operating expenses divided by the enrollment;

(4) Size: a dimension composed of non-educational data which can be said to indicate the sheer size of a state;

(5) Potential Need: a measure of the age distribution of the population which can cause demands for the services of higher education; and

(6) Combined Support: a dimension of the total money available, regardless of source of funds or purpose of expenditures, expressed on a per student basis.

1970 r-Analysis. Similar results were derived from both the orthogonal and oblique solutions using the 1970 financial support information. Six dimensions again emerged which could explain eighty-five per cent of the total variance in the data set. These six oblique dimensions, along with a brief explanation, are:

(1) Operating Support: a pattern best described by the ratio of appropriations per student;

(2) Economic Development: a dimension of five variables expressing income, education, urbanization, and industrialization;

(3) Combined Support: a factor composed of four ratios which divide expenditures by measures of enrollment, population, and income;

(4) Effort: a pattern of four appropriations based ratios which express the magnitude of the appropriations in non-educational terms;

(5) Need: a measure which reflects the youthfulness of a state's population and the resultant needs for higher education; and

(6) Size: a dimension not only of sheer size, but also including an indication of possible economies of scale.

Characteristic Pattern Stability. The six patterns of 1960 were to a great extent reproduced by the patterns from 1970. Further, statistics which measure the degree of comparability indicated a high degree of similarity for five of the six patterns. A summary of the factors for each period and the correlation and root mean square coefficients are given in Table XLVIII.

Change Dimensions. Using the differential r-technique, seven patterns of change emerged by factor analyzing the difference matrix between 1960 and 1970. These patterns can be considered to represent the more dynamic aspects of finance for public higher education. As identified in the analysis, the change dimensions are:

TABLE XLVIII

CHARACTERISTIC PATTERN STABILITY

1960	1970	Correlation Coefficient	Root Mean Square
Effort Expenditures/College Age Population Expenditures/Population Public Enrollment/Population	Effort Appropriations/College Age Population Appropriations/Population Appropriations/Personal Income	0.8099	0.30935
Economic Development Personal Income/Population Personal Income/College Age Population Non Agricultural Employment/Population	Economic Development Personal Income/Population Personal Income/College Age Population Urban Population/Population	0.9229	0.1550
Operating Support Appropriations/Public Enrollment	Operating Support Appropriations/Public Enrollment Public Enrollment/Population	0.8095	0.2191
Size Highway Mileage Deposits	Size Public Enrollment/Faculty Deposits Highway Mileage	0.8336	0.1585
Potential Need College Age Population/Population	Potential Need College Age Population/Population	0.7571	0.1845
Combined Support Expenditures/Public Enrollment	Combined Support Expenditures/Public Enrollment Expenditures/Population Expenditures/College Age Population	0.4544	0.3214

(1) Appropriations Change: a factor best measured by dividing the state appropriation by personal income or population;

(2) Development Rate: a factor drawn from a pattern of urbanization and industrialization;

(3) Public Enrollment: a dimension reflecting the relative load borne by public institutions of higher learning;

(4) Age Distribution: a pattern composed primarily of two ratios based on population between the ages of eighteen and twenty-four;

(5) Expenditure Change: a factor comprised of five variables which convert total expenditures to a unitary basis;

(6) Political Priorities: a pattern which illustrates the priorities that must be established by a state; and

(7) Salary Change: a pattern from a single variable measuring the level of faculty salaries.

Higher Order Analysis. Few meaningful results were drawn from the attempts using a higher order analysis. Although three higher order patterns were extracted in each time period, relatively little comparability existed between them. The only identifiable result was the further clarification that measures based on appropriations do indeed differ from those based on expenditures.

Entity Patterns

Similar analyses were performed with the financial support data being converted to the q-format (i.e., entities are expressed in terms of their characteristics). The following paragraphs describe the patterns of states for both 1960 and 1970 and compare these patterns for stability.

1960 q-Analysis. Six factors emerged using both orthogonal and oblique solutions, and each explained eighty-six per cent of the total variance within the data set. The six oblique factors were:

(1) Development v. Effort: a pattern characterized by Illinois and New Mexico as polar cases on measures previously defined to be development and effort criteria;

(2) Southeast: a geographic dimension comprised primarily of states in the southeast along the dichotomy of needs and attainment;

(3) Support: a factor generated by states with high levels of support for operating and capital purposes;

(4) Salary Support: a dimension of states paying relatively large faculty salaries;

(5) Appropriations Efforts: a pattern with northeastern and northwestern states in a dichotomy along the lines of appropriations per student; and

(6) Non-Contiguous States: a pattern signifying that the two more recent additions to the United States can not be adequately measured on several variables.

1970 q-Analysis. The six patterns evolving from the q-analysis efforts in 1970 varied to a large extent from those of 1960. These patterns, which accounted for eighty-one per cent of total variance in the data, were:

(1) Income Applied to Higher Education: a moderately geographical pattern of states illustrating that the rich states of the northeast have different expenditure patterns than do other states;

(2) Congruent Operating Support States: a pattern of states that seemed to support the operations of higher education in accordance with their needs;

(3) Development: a dimension of states with a relatively high rate of development in terms of income and education;

(4) Operating Support and Effort: a factor grouping states in terms of extreme ranks on appropriations based measures;

(5) Expenditures Dilemma: a dimension of states characterized by an inverse relationship between demand for services of public higher education and its support; and

(6) Poor States: a pattern of states spending a large proportion of their revenue on higher education yet unable to support students well in terms of either appropriations or expenditures.

Entity Pattern Stability. The patterns of states were not as stable as were the patterns of characteristic variables. To some extent, it seems that the patterns of states in 1970, the latter time period for this study, did not exhibit as strong of a geographical orientation. Table XLIX lists the comparison coefficients for the patterns of the two time periods.

Interpretation of the Factors

In order to utilize the results drawn from the various factor analysis rotations, additional interpretations of the dimensions are necessary. It is not sufficient merely to select the highest loading variable within each factor and indiscriminately apply it in measuring a state's efforts in educational support. Rather, these quantitative findings must be meshed with a certain amount of subjective reasoning in order that their meaning will also have construct validity. The following sections thus analyze the primary findings suggested from the application of stability measurements to both the r-technique and q-technique results.

TABLE XLIX

ENTITY PATTERN STABILITY

1960	1970	Correlation Coefficient*	Root Mean Square
Development v. Effort	Income Applied to Higher Education	0.8750	0.2509
Southeast	Development	0.7660	0.2648
Support	Expenditures Dilemma	0.6723	0.2621
Appropriations Efforts	Operating Support and Effort	0.5722	0.3269
Non-Contiguous States	Poor States	0.6569	0.2740

*Positive and/or negative signs are omitted.

Characteristic Factor Patterns

The six patterns emerging from the 1960 r-analysis and six similar patterns from 1970 have been discussed above and were listed in Table XLVIII along with several comparison coefficients. Although the patterns themselves were relatively similar in each time period, the variables with the highest loadings in each factor were not always the same. Therefore, each of the dimensions will be discussed, and the determination of the appropriate measure will be made.

Operating Support. The variable Appropriations/Public Enrollment was the measure with the highest loading in each time period, thus indicating its ability to measure the pattern. Such a measure of "dollars per student" has previously been used in several studies.

Combined Support. Although many previous applications of this type of data have treated this dimension synonomously with the one described above, it appears that expenditures is a different concept than appropriations. The measure Expenditures/Public Enrollment appears to be the best expression of this factor.

Effort. It has long been recognized that states should also be compared using data not expressed on a per student basis. Although several different measures have been proposed, the results of this study suggest that the appropriate basis is College Age Population. Since the appropriations oriented measures were stronger in the more recent time period, Appropriations/College Age Population was selected as the preferred measure.

Potential Need. Most of the earlier studies seemed to be only vaguely aware that states might differ in terms of need for the

services of higher education. However, the analyses for each of the years revealed this dimension, and factor loadings indicate that College Age Population/Population is the best measure.

Economic Development. This dimension was created largely by non-educational measures. Therefore, it is questionable whether the comparison of states in their support of higher education should utilize such terms. However, the leading measure, Personal Income/Population, probably could help explain the difficulty some states encounter in funding their colleges and universities.

Size. In the earlier time period, this dimension did not depend on any educational variables, although the dimension in 1970 was best characterized by Public Enrollment/Faculty. The use of this measure is highly questionable until further studies determine whether this was a spurious relationship.

Characteristic Pattern Summary. It appears that as few as five measures can adequately describe the financial support situation for public higher education in a state. These measures are Appropriations/Public Enrollment, Expenditures/Public Enrollment, Appropriations/College Age Population, College Age Population/Population, and Personal Income/Population.

Entity Factor Patterns. The examinations using q-factor analysis were conducted to determine whether there were any natural groupings of states which might suggest alternative bases for comparison. From the results from the 1960 data, it appears that several such groupings may have existed then. Especially noticeable during this period were the southeast, the northeast, the non-contiguous states, and a rough grouping of frontier states (the plains, the southwest, and the

mountain states). However, a similar analysis for the later time period (i.e., 1970) failed to reproduce these state groupings clearly. The latter occurrence suggests that there may have been sufficient change in the decade of the sixties to have made policy-making in regional terms irrelevant. At best, it appears that wealth and income differences should be taken into consideration when making such educational comparisons. This conclusion adds credence to the use of Personal Income/Population as suggested in a previous section.

Recommendations for Similar Studies

In order to establish greater confidence in the use of the findings of this study, this examination might be replicated. However, several minor modifications are suggested for inclusion in future efforts. First, several of the measures should be expressed in a ratio or unitary format. For instance, the variable Highway Mileage could be expressed as Highway Mileage/Land Area or Highway Mileage/Population. Likewise, Deposits should be converted to a per capita basis. The other non-adjusted variable, Faculty Salaries, might be modified in two ways. First, a better estimation or measurement technique could be developed. Also, it might be more meaningful to express this measure as Salaries/Per Capita Income.

Two suggested modifications call for possible changes in the definition of variables. It should prove valuable to be able to reduce the effects of Expenditures into sources of funds and applications of funds. It will be recalled that because of this inability to distinguish effects, it was difficult to determine why appropriations and expenditures generated two separate dimensions. Also, a more

refined method for counting students would be desirable, perhaps the full-time-equivalent student.

In future attempts at similar studies, different time periods should be employed. Not only would this additional information serve to create more credence for the present findings, but it would also assist in determining whether the occurrence of new variables in old dimensions (such as the student-faculty ratio in the size pattern) were examples of spurious relationships.

A final modification of the current study involves the form of the actual data employed. Whereas this study used standardized scores for the computed values on various measures as source information, one might prefer to use rank data instead. Since much of the application of data of this type is in terms of rankings, it might prove to be more valuable to conduct the analysis with rank order data.

Suggestions for Expanded Study

As suggested in the opening comments of this report, much of the use of this type of data is due to the inability to measure quality effectively. In the event that such quality measures are forthcoming, these measures should be included as input data, and a similar analysis should be performed. Then the relationships between financial inputs and qualitative outputs could be determined from the factor groupings. If it were determined at that time that both sets of data were measuring the same dimensions, the more easily obtained information could then be used in future efforts comparing states.

Since future efforts at measuring quality are likely to be on an institutional, rather than a state-wide, basis, a study similar to this

one should be conducted using institutional level information where possible. Not only would such a study prepare for the use of quality assessment data, but it would also provide a better understanding of financial problems on the institutional level.

The current problem, along with the alternatives suggested above, is only a part of a larger set of problems facing the social scientist. Too frequently we have relied unquestioningly on assumptions and techniques in our attempts to assess current situations. A great number of other social problems would benefit from analyses similar to the present study. Only through better understanding of current phenomena can we effectively assess plans for the future.

Summary

From the original set of twenty-four variables chosen to assess the level of financial support for higher education within a state, it appears that as few as five measures can describe most of the data variation. Further, it seems that these five measures apply equally well to all fifty states with no regional adjustments being necessary. The five measures were Appropriations per Student, Expenditures per Student, Appropriations per College Age Population, the proportion of College Age Population, and Personal Income per Capita. Generally speaking, these are measures of operating support, total support, effort, need, and ability.

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APPENDIX A

MEASURE COMPONENTS, DEFINITIONS, AND SOURCES

1. Expenditures: Direct expenditures by state and local governments for institutions of higher education, including capital outlay.

Sources - 1960: U. S., Department of Commerce, Bureau of the Census, Governmental Finances in 1960 (Washington, D. C.: Government Printing Office, September 1961), p. 32.

1970: U. S., Department of Commerce, Bureau of the Census, Governmental Finances in 1969-70 (Washington, D. C.: Government Printing Office, September 1971), pp. 34-38.

2. Appropriations: Appropriations of State tax funds for operating expenses of institutions of higher education, excluding capital outlay.

Source - 1960 and 1970: M. M. Chambers, A Record of Progress: Three Years of State Tax Support of Higher Education, 1969-70 Through 1971-72, (Danville, Illinois: Interstate Printers & Publishers, 1972), p. 6.

3. Public Enrollment: Total degree-credit enrollment in public institutions of higher education.

Sources - 1960: U. S., Department of Health, Education, and Welfare, Office of Education, Opening (Fall) Enrollment in Higher Education, 1959: Analytic Report (Washington, D. C.: Government Printing Office, 1960), p. 31.

1970: U. S., Department of Health, Education, and Welfare, Office of Education, Fall Enrollments in Higher Education, 1969: Supplementary Information, Summary Data (Washington, D. C.: Government Printing Office, 1970), pp. 45-47.

4. Total Enrollment: Total degree-credit enrollment in all institutions (public and private) of higher education.

Sources - 1960: U. S., Department of Health, Education, and Welfare, Office of Education, Opening (Fall) Enrollment in Higher Education, 1959: Analytic Report (Washington, D. C.: Government Printing Office, 1960), p. 28.

1970: U. S., Department of Health, Education, and Welfare, Office of Education, Fall Enrollment in Higher Education, 1969: Supplementary Information, Summary Data (Washington, D. C.: Government Printing Office, 1970), pp. 36-38.

5. College Age Population: Resident population with ages eighteen through twenty-four (18-24) years.

Sources - 1960: U. S., Department of Commerce, Bureau of the Census, U. S. Census of Population: 1960, Vol. I, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1962 (Washington, D. C.: Government Printing Office, 1962), p. 27 (estimated from 15-19, 20-24 years old brackets).

1970: U. S., Department of Commerce, Bureau of the Census, "1970 Census of Population, Advance Report," General Population Characteristics, PC(V2)-1, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1971 (Washington, D. C.: Government Printing Office, 1971), p. 25.

6. Population: Total civilian resident population.

Source - 1960 and 1970: U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1971 (Washington, D. C.: Government Printing Office, 1971), p. 12.

7. Personal Income: The personal income in thousands of dollars.

Source - 1960 and 1970: U. S., Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, Vol, 52 (August 1972), pp. 24-25.

8. Institutions: Number of institutions of higher education under public control.

Sources - 1960: U. S. Department of Health, Education, and Welfare, Office of Education, Opening (Fall) Enrollment in Higher Education, 1959: Analytic Report (Washington, D. C.: Government Printing Office, 1960), p. 37 (estimated).

1970: U. S., Department of Health, Education, and Welfare, Office of Education, unpublished data from the survey of "Opening Fall Enrollment in Higher Education, 1969," cited in the U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1971 (Washington, D. C.: Government Printing Office, 1971), p. 86.

9. Tax Revenues: General revenue of state and local governments derived from taxes other than the property tax.

Sources - 1960: U. S. Department of Commerce, Bureau of the Census, Governmental Finances in 1960 (Washington, D. C.: Government Printing Office, September 1961), p. 25.

1970: U. S., Department of Commerce, Bureau of the Census, Governmental Finances in 1969-70 (Washington, D. C.: Government Printing Office, September 1971), pp. 31-33.

10. Faculty: Full-time-equivalent employment of instructional staff in state institutions of higher education.

Sources - 1960: U. S., Department of Commerce, Bureau of the Census, State Distribution of Public Employment in 1959 (Washington, D. C.: Government Printing Office, 1960), p. 10 (estimated).

1970: U. S., Department of the Census, Public Employment in 1969 (Washington, D. C.: Government Printing Office, 1970), p. 20.

11. Educational Level: Median years of school completed by persons twenty-five years old and older.

Sources - 1960: U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population: 1960, Vol. I, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1962 (Washington, D. C.: Government Printing Office, 1962), p. 118.

1970: U. S., Department of Commerce, Bureau of the Census, U. S. Census of Population: 1970, Vol, I, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1972 (Washington, D. C.: Government Printing Office, 1972), p.

12. Non-agricultural Employment: Average number of employees in non-agricultural establishments.

Source - 1960 and 1970: U. S., Department of Labor, Bureau of Labor Statistics, Employment and Earnings, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1971 (Washington, D. C.: Government Printing Office, 1971), p. 218.

13. Urban Population: Number of residents residing in places with a population of 2,500 or more.

Sources - 1960: U. S., Department of Commerce, Bureau of the Census, U. S. Census of Population: 1960, Vol, I, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1962 (Washington, D. C.: Government Printing Office, 1962), p. 20.

1970: U. S., Department of Commerce, Bureau of the Census, U. S. Census of Population: 1970, Vol. I, cited in the U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1971 (Washington, D. C.: Government Printing Office, 1971), p. 18.

14. Deposits: Total demand deposits of commercial and stock savings banks.

Sources - 1960: U. S., Treasury Department, Comptroller of the Currency, Annual Report, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1961 (Washington, D. C.: Government Printing Office, 1961), p. 438.

1970: U. S., Federal Deposit Insurance Corporation, Assets, Liabilities, and Capital Accounts: Commercial and Mutual Savings Banks, cited in U. S., Department of Commerce, Bureau of the

Census, Statistical Abstract of the United States, 1970 (Washington, D. C.: Government Printing Office, 1970), p. 443.

15. Highway Mileage: Total mileage of municipal and rural highways.

Sources - 1960: U. S., Department of Commerce, Bureau of Public Roads, Highway Statistics, 1959, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstracts of the United States, 1961 (Washington, D. C.: Government Printing Office, 1961), p. 547.

1970: U. S., Department of Transportation, Federal Highway Administration, Highway Statistics, 1969, cited in U. S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1971 (Washington, D. C.: Government Printing Office, 1971), p. 528.

16. Faculty Salary: Average faculty salary over all ranks for teaching faculty in public institutions (estimated).

Sources - 1960: "The Economic Status of the Profession, 1959-60: Annual Reports of Committee Z," AAUP Bulletin, Vol. 46 (Summer, 1960), pp. 156-93.

1970: "Rising Costs and the Public Institutions: The Annual Report of the Economic Status of the Profession, 1969-70," AAUP Bulletin, Vol. 56 (Summer, 1970), pp. 174-239.

APPENDIX B

INTERPRETATIONS OF MEASURES

1. Expenditures/Public Enrollment: Gross expenditures on higher education by state and local governments per degree-credit student.

This "dollars per student" ratio indicates the amount of money from state and local funds that was spent per student. A commonly held conception is that this measure would closely parallel a quality of education measure should the latter be adequately developed.

2. Expenditures/College Age Population: Gross expenditures on higher education by state and local governments per potential collegiate student.

This measure indicates the extent to which a quality higher education is made available to the young people of a state.

3. Expenditures/Population: Gross expenditures on higher education by state and local governments per resident.

This measure indicates the amount of support from public funds per resident for institutions of higher education.

4. Expenditures/Personal Income: Gross expenditures on higher education by state and local governments per thousand dollars of personal income.

This measure has been considered as an "ability to pay" measure and indicates public expenditures as a function of state wealth.

5. Expenditures/Tax Revenues: Gross expenditures on higher education by state and local governments as a share of total tax revenues.

This measure indicates the relatively priority placed on higher education as a public function in each state.

6. Appropriations/Public Enrollment: Appropriations of state tax funds for operations of institutions of higher education per degree-credit student.

This measure is similar to measure number one, except that capital outlays are excluded and only state funds are included.

7. Appropriations/College Age Population: Appropriations of state tax funds for operations of institutions of higher education per potential college student.

This measure is similar to measure number two, but uses an alternative definition for dollars as described above.

8. Appropriations/Population: Appropriations of state tax funds for operations of institutions of higher education per resident.

This measure is similar to measure number three, but uses an alternative definition for dollars as described above.

9. Appropriations/Personal Income: Appropriations of state tax funds for operations of institutions of higher education per thousand dollars of personal income.

This measure is similar to measure number four, but uses an alternative definition for dollars as described above.

10. Appropriations/Tax Revenues: Appropriations of state tax funds for operations of institutions of higher education as a share of total tax revenues.

This measure is similar to measure number five, but uses an alternative definition for dollars as described above.

11. Public Enrollment/Total Enrollment: Total degree-credit enrollment in public institutions as a percentage of total degree-credit enrollment in all (public and private) institutions of higher education.

This measure illustrates the relative burden borne by the governments in the states in providing college-level education.

12. Public Enrollment/Population: Total degree-credit enrollment in public institutions of higher education as a share of state population.

This measure indicates the relative demand expressed by residents of a state for providing higher education.

13. College Age Population/Population: Resident population from the ages of eighteen through twenty-four years as a share of total population.

This measure indicates the potential demand for the services of public institutions of higher education.

14. Institutions/Population: The number of public institutions of higher education per resident of the state.

This ratio indicates one approach to illustrating the level of support for higher education, or the extent to which a state is obligated in supporting higher education.

15. Personal Income/Population: The amount of personal income measured in thousands of dollars per resident.

This measure illustrates the relative ability of a state to pay for government functions (including education).

16. Personal Income/Public Enrollment: The amount of personal income measured in thousands of dollars per student enrolled in public institutions.

This ratio is also used to indicate the ability of a state to pay for public higher education.

17. Personal Income/College Age Population: The amount of personal income measured in thousands of dollars per resident from the ages of eighteen through twenty-four.

This measure is still another which serves to illustrate the ability of a state to pay for education.

18. Public Enrollment/Faculty: The number of degree-credit students enrolled in public institutions per full-time-equivalent of the instructional staff in these institutions.

This is the familiar student-teacher ratio which some argue indicates the quality of education.

19. Faculty Salary: The average faculty salary (10 month basis) over all ranks for the instructional staff in public institutions of higher education.

The average salary figures should illustrate to some extent the quality of faculty, which in turn should indicate the quality of education. It should also reflect the state's efforts in supporting higher education.

20. Educational Level: The median years of education completed by residents aged twenty-five years and older.

This measure indicates the demand for services of institutions of higher education.

21. Non-agricultural Employment/Population: The number of employees of non-agricultural institutions as a per cent of the population.

This measure, although not directly related to higher education, indicates the extent of industrialization of a state.

22. Urban Population/Population: The number of residents in places of 2,500 or more as a per cent of the total population.

This measure also indicates the degree of development of a state.

23. Deposits: Total demand deposits of commercial and stock savings banks.

This measure indicates the level of economic activity within a state.

24. Highway Mileage: Total mileage of municipal and rural highways within a state.

This measure is still another indication of the extent of the development of a state.

VALUES AND RANKS FOR VARIABLES

	Expenditures/Public Enrollment				Expenditures/ College Age Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$1,240	45	$2,600	21	$ 130	41	$ 508	31
Alaska	1,920	8	6,160	1	171	29	880	6
Arizona	1,100	49	2,210	38	278	14	880	5
Arkansas	1,520	32	2,030	47	160	32	410	43
California	1,790	12	1,660	50	420	1	602	25
Colorado	1,610	24	2,640	19	339	4	785	12
Connecticut	1,540	29	2,090	44	136	39	359	47
Delaware	1,490	35	2,710	18	213	23	813	9
Florida	1,560	27	2,140	40	141	38	456	38
Georgia	1,610	23	2,970	11	126	43	455	39
Hawaii	1,190	46	3,250	9	144	37	784	13
Idaho	1,470	37	2,290	33	205	25	609	23
Illinois	1,690	18	2,900	13	168	30	609	22
Indiana	2,240	2	3,460	7	277	15	703	17
Iowa	2,100	5	3,470	6	240	18	687	19
Kansas	1,400	40	2,180	39	290	13	688	18
Kentucky	1,690	17	3,200	10	158	33	595	26
Louisiana	1,670	20	2,130	41	209	24	453	40
Maine	1,470	36	2,430	28	123	44	366	46
Maryland	1,440	39	2,100	43	150	35	468	36
Massachusetts	1,550	28	2,270	35	69	50	318	49
Michigan	1,830	9	2,820	15	274	16	766	14
Minnesota	1,750	15	2,600	20	302	10	758	15
Mississippi	1,510	34	2,300	32	188	26	495	33
Missouri	1,340	41	2,260	36	130	40	514	30

	Expenditures/Public Enrollment				Expenditures/ College Age Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$1,770	13	$1,940	48	$ 305	9	$ 639	20
Nebraska	1,280	44	2,050	46	235	19	591	27
Nevada	2,160	4	2,440	25	296	11	572	28
New Hampshire	1,980	6	3,440	8	225	22	517	29
New Jersey	1,140	48	2,480	23	912	49	379	45
New Mexico	1,820	11	2,860	14	293	12	888	4
New York	1,590	26	2,340	30	128	42	468	35
North Carolina	1,970	7	3,630	3	151	34	472	34
North Dakota	1,590	25	2,250	37	339	5	812	10
Ohio	1,530	30	2,430	27	163	31	500	32
Oklahoma	1,160	47	2,110	42	228	21	612	21
Oregon	1,520	31	2,530	22	317	7	861	8
Pennsylvania	2,530	1	1,920	49	103	48	309	50
Rhode Island	1,290	43	2,410	29	115	45	430	42
South Carolina	1,510	33	3,500	4	103	47	322	48
South Dakota	1,820	10	2,320	31	312	8	733	16
Tennessee	1,060	50	2,280	34	108	46	438	41
Texas	1,330	42	2,060	45	187	28	466	37
Utah	1,610	22	2,710	17	348	3	869	7
Vermont	2,220	3	4,330	2	254	17	925	3
Virginia	1,680	19	2,430	26	145	36	389	44
Washington	1,730	16	2,750	16	317	6	811	11
West Virginia	1,460	38	2,440	24	187	27	606	24
Wisconsin	1,620	21	3,480	5	231	20	954	2
Wyoming	1,760	14	2,900	12	383	2	1,075	1

	Expenditures/Population				Expenditures/Personal Income			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$12.76	39	$59.35	31	$ 8.53	31	$20.59	24
Alaska	23.45	17	132.00	1	8.19	33	28.31	8
Arizona	26.88	12	104.86	6	13.05	10	28.63	7
Arkansas	14.33	34	45.03	45	10.40	21	15.70	35
California	38.03	1	73.88	19	13.93	7	16.59	33
Colorado	31.70	4	103.85	8	13.84	8	26.89	9
Connecticut	10.93	44	38.59	47	3.89	46	7.99	50
Delaware	18.61	26	93.43	12	6.67	38	21.39	22
Florida	12.28	40	47.95	44	6.24	39	12.98	43
Georgia	12.93	38	58.26	33	7.87	35	17.33	31
Hawaii	16.59	30	111.18	4	7.11	36	24.63	13
Idaho	18.74	25	69.14	23	10.10	24	21.07	23
Illinois	14.25	35	67.39	27	5.38	13	14.99	37
Indiana	11.15	43	82.19	17	11.36	19	21.65	18
Iowa	20.56	20	55.32	38	10.36	22	19.93	26
Kansas	25.03	14	83.89	15	12.07	14	21.40	21
Kentucky	15.37	32	72.41	20	9.71	25	23.33	14
Louisiana	19.86	22	55.23	38	11.94	15	18.07	29
Maine	11.15	43	47.98	43	6.04	40	14.76	39
Maryland	13.48	37	54.72	39	5.74	42	12.72	44
Massachusetts	5.86	50	37.56	49	2.39	50	8.63	47
Michigan	27.70	9	88.97	13	11.83	17	21.47	20
Minnesota	26.07	15	86.44	14	12.31	11	22.33	16
Mississippi	18.46	27	58.46	32	15.29	6	22.52	15
Missouri	11.32	41	57.24	35	5.34	44	15.36	36

	Expenditures/Population				Expenditures/Personal Income			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$27.11	11	$70.03	22	$ 13.23	9	$20.25	25
Nebraska	20.48	21	68.17	25	9.67	26	17.90	30
Nevada	28.07	8	63.19	29	9.65	27	12.56	45
New Hampshire	19.60	24	67.34	28	9.15	29	18.50	28
New Jersey	7.20	49	38.57	48	2.64	49	8.40	48
New Mexico	30.18	6	104.82	7	15.95	3	33.46	2
New York	10.45	47	50.77	42	3.80	47	10.72	46
North Carolina	15.89	31	62.89	30	10.16	23	19.51	27
North Dakota	31.65	5	95.95	11	18.40	1	31.26	5
Ohio	14.11	36	57.07	36	6.02	41	14.30	41
Oklahoma	21.49	19	71.98	21	11.47	18	21.49	19
Oregon	26.51	13	97.94	10	11.91	16	26.20	10
Pennsylvania	8.53	48	32.90	50	3.79	48	8.33	49
Rhode Island	10.59	45	56.28	37	4.80	45	14.30	40
South Carolina	11.25	42	43.77	46	8.16	34	14.89	38
South Dakota	27.46	10	82.58	16	15.35	4	26.10	11
Tennessee	10.51	46	52.47	40	6.79	37	17.03	32
Texas	18.07	28	57.44	34	9.31	28	15.99	34
Utah	35.58	2	117.28	2	17.87	2	36.07	1
Vermont	22.82	18	68.97	24	12.18	13	33.03	3
Virginia	15.18	33	51.42	41	8.20	32	14.07	42
Washington	28.67	7	100.85	9	12.25	12	25.28	12
West Virginia	16.83	29	67.78	26	10.48	20	22.31	17
Wisconsin	19.66	23	108.83	5	9.01	30	29.22	6
Wyoming	34.85	3	116.57	3	15.33	5	31.54	4

	Expenditures/Tax Revenue				Appropriations/Public Enrollment			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	.135	35	.271	29	$ 635	35	$ 923	38
Alaska	.180	25	.416	10	763	20	1,847	2
Arizona	.239	14	.403	11	440	50	780	47
Arkansas	.158	31	.241	35	805	15	1,114	24
California	.260	12	.249	34	564	42	842	46
Colorado	.282	9	.433	9	502	46	1,002	33
Connecticut	.115	42	.157	47	682	28	1,436	10
Delaware	.118	39	.255	33	668	32	898	42
Florida	.105	44	.209	41	1,038	5	1,308	16
Georgia	.131	37	.269	30	761	21	1,378	12
Hawaii	.080	47	.234	37	564	43	1,586	5
Idaho	.184	23	.313	24	1,035	6	1,386	11
Illinois	.146	33	.235	36	1,060	4	1,570	8
Indiana	.298	6	.434	8	872	11	1,249	17
Iowa	.213	18	.335	19	1,282	1	1,727	4
Kansas	.277	10	.435	7	615	39	922	39
Kentucky	.200	19	.314	23	542	45	1,309	15
Louisiana	.137	34	.208	42	1,034	7	1,069	30
Maine	.126	38	.232	38	458	49	1,326	13
Maryland	.116	40	.168	46	822	12	903	41
Massachusetts	.060	50	.152	48	625	38	906	40
Michigan	.248	13	.327	20	806	14	1,091	26
Minnesota	.261	11	.319	21	712	26	1,013	32
Mississippi	.196	21	.260	31	568	41	850	45
Missouri	.134	36	.279	27	679	30	1,078	29

	Expenditures/Tax Revenue				Appropriations/Public Enrollment			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	.289	8	.384	12	$1,086	3	$1,064	31
Nebraska	.381	1	.363	16	675	31	982	34
Nevada	.158	30	.186	45	993	8	1,165	20
New Hampshire	.297	7	.537	1	660	34	740	49
New Jersey	.098	46	.188	44	572	40	1,132	23
New Mexico	.228	15	.377	14	710	27	972	35
New York	.067	49	.122	49	714	24	1,583	6
North Carolina	.159	29	.271	28	772	19	1,992	1
North Dakota	.338	2	.478	4	742	23	881	43
Ohio	.149	32	.315	22	484	47	959	37
Oklahoma	.178	27	.338	18	625	37	681	50
Oregon	.218	16	.464	5	928	10	1,082	28
Pennsylvania	.076	48	.116	50	1,139	2	1,572	7
Rhode Island	.104	45	.231	39	633	36	1,310	14
South Carolina	.111	43	.206	43	682	29	1,803	3
South Dakota	.323	4	.460	6	789	16	770	48
Tennessee	.115	41	.259	32	480	48	967	36
Texas	.214	17	.305	25	547	44	1,089	27
Utah	.324	3	.489	3	667	33	872	44
Vermont	.199	20	.373	15	807	13	1,150	21
Virginia	.182	24	.211	40	712	25	1,197	19
Washington	.178	26	.351	17	991	9	1,526	9
West Virginia	.165	28	.294	26	788	18	1,136	22
Wisconsin	.193	22	.378	13	788	17	1,207	18
Wyoming	.312	5	.511	2	755	22	1,098	25

	Appropriations/ College Age Population				Appropriations/Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$ 67	35	$ 180	46	$ 7	35	$ 21	46
Alaska	68	33	264	25	9	23	40	6
Arizona	111	20	311	12	11	17	37	14
Arkansas	85	29	226	37	8	31	25	39
California	133	11	306	13	12	12	38	12
Colorado	105	23	298	15	10	20	39	7
Connecticut	60	38	246	30	5	43	26	36
Delaware	96	25	269	24	8	27	31	24
Florida	94	26	278	22	8	28	29	30
Georgia	59	39	211	38	6	38	27	34
Hawaii	68	34	383	3	8	29	54	2
Idaho	144	8	369	4	13	7	42	5
Illinois	105	22	329	9	9	25	36	15
Indiana	108	21	254	27	10	21	30	28
Iowa	147	6	341	7	13	9	37	13
Kansas	128	13	291	18	11	16	35	17
Kentucky	51	44	244	33	5	42	30	29
Louisiana	129	12	227	36	12	10	28	31
Maine	38	49	200	40	3	49	26	37
Maryland	85	28	201	39	8	30	23	40
Massachusetts	28	50	127	49	2	50	15	49
Michigan	121	17	296	16	12	11	34	19
Minnesota	123	16	296	17	11	19	34	21
Mississippi	71	32	182	45	7	33	22	45
Missouri	66	36	245	32	6	39	27	33

	Appropriations/ College Age Population				Appropriations/Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$ 187	2	$ 352	6	$ 17	1	$ 38	8
Nebraska	124	14	283	19	11	18	33	22
Nevada	136	9	274	23	13	8	30	27
New Hampshire	75	31	111	50	7	34	14	50
New Jersey	46	48	173	47	4	48	18	48
New Mexico	114	18	301	14	12	14	36	16
New York	57	41	316	11	5	45	34	20
North Carolina	59	40	259	26	6	37	35	18
North Dakota	159	5	318	10	15	5	37	11
Ohio	52	43	197	42	4	46	23	43
Oklahoma	123	15	198	41	12	15	23	41
Oregon	194	1	368	5	16	3	42	4
Pennsylvania	46	47	252	28	4	47	27	35
Rhode Island	57	42	233	35	5	40	31	25
South Carolina	47	46	166	48	5	41	23	42
South Dakota	135	10	243	34	12	13	27	32
Tennessee	49	45	185	44	5	44	22	44
Texas	77	30	246	29	7	32	30	26
Utah	144	7	280	21	15	6	38	10
Vermont	93	27	246	31	8	26	18	47
Virginia	62	37	191	43	6	36	25	38
Washington	182	3	450	1	16	2	56	1
West Virginia	101	24	282	20	9	24	32	23
Wisconsin	112	19	331	8	10	22	38	9
Wyoming	165	4	408	2	15	4	44	3

	Appropriations/Personal Income				Appropriations/Tax Revenue			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$ 4.35	26	$ 7.31	37	.069	33	.096	43
Alaska	3.26	37	8.49	24	.071	31	.125	30
Arizona	5.24	17	10.11	14	.096	17	.143	16
Arkansas	5.51	15	8.63	22	.084	25	.133	19
California	4.40	24	8.43	26	.082	26	.126	27
Colorado	4.30	27	10.22	12	.088	23	.164	10
Connecticut	1.72	46	5.48	46	.051	41	.107	37
Delaware	3.00	41	7.07	40	.053	39	.084	47
Florida	4.15	28	7.91	32	.070	32	.128	23
Georgia	3.71	31	8.05	31	.062	38	.125	29
Hawaii	3.36	35	12.03	4	.038	47	.115	34
Idaho	7.11	6	12.76	2	.130	9	.190	5
Illinois	3.38	34	8.11	29	.092	19	.127	24
Indiana	4.43	23	7.82	33	.116	11	.157	13
Iowa	6.33	10	9.91	15	.130	8	.167	9
Kansas	5.31	16	9.06	18	.122	10	.184	7
Kentucky	3.11	38	9.56	16	.064	36	.129	21
Louisiana	7.40	4	9.07	17	.085	24	.104	39
Maine	1.88	45	8.05	30	.039	46	.127	25
Maryland	3.27	36	5.46	47	.066	35	.072	49
Massachusetts	.96	50	3.45	50	.024	50	.061	50
Michigan	5.22	18	8.30	28	.110	12	.127	26
Minnesota	5.01	20	8.71	20	.106	13	.124	31
Mississippi	5.75	13	8.31	27	.074	28	.096	42
Missouri	2.71	42	7.32	36	.068	34	.133	18

	Appropriations/Personal Income				Appropriations/Tax Revenue			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$ 8.12	2	$11.13	9	.177	2	.211	1
Nebraska	5.09	19	8.57	23	.201	1	.174	8
Nevada	4.44	22	6.01	44	.073	30	.089	45
New Hampshire	3.06	40	3.98	48	.089	21	.115	33
New Jersey	1.33	49	3.83	49	.050	44	.086	46
New Mexico	6.21	11	11.35	7	.089	21	.128	22
New York	1.70	48	7.24	38	.030	49	.083	48
North Carolina	3.99	29	10.71	10	.063	37	.149	15
North Dakota	8.62	1	12.26	3	.159	3	.187	6
Ohio	1.90	44	5.64	45	.047	45	.124	32
Oklahoma	6.20	12	6.95	41	.096	16	.109	36
Oregon	7.29	5	11.22	8	.134	7	.199	2
Pennsylvania	1.71	47	6.81	43	.034	48	.095	44
Rhode Island	2.36	43	7.77	34	.051	42	.125	28
South Carolina	3.69	32	7.68	35	.050	43	.106	38
South Dakota	6.67	8	8.65	21	.140	4	.153	14
Tennessee	3.08	39	7.21	39	.052	40	.110	35
Texas	3.82	30	8.46	25	.088	22	.161	11
Utah	7.41	3	11.62	6	.134	5	.157	12
Vermont	4.47	21	8.78	19	.073	29	.099	41
Virginia	3.48	33	6.92	42	.077	27	.104	40
Washington	7.02	7	14.03	1	.102	14	.195	3
West Virginia	5.66	14	10.38	11	.089	20	.137	17
Wisconsin	4.39	25	10.15	13	.094	18	.131	20
Wyoming	6.58	9	11.96	5	.134	6	.194	4

	Public Enrollment/ Total Enrollment				Public Enrollment/Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	.727	21	.826	20	.0103	29	.0228	33
Alaska	1.000	3	.872	9	.0122	22	.0214	39
Arizona	.973	4	.977	3	.0245	1	.0475	1
Arkansas	.715	25	.844	17	.0094	33	.0222	36
California	.819	10	.879	8	.0213	3	.0446	2
Colorado	.777	14	.854	13	.0196	6	.0394	6
Connecticut	.388	47	.527	48	.0071	46	.0184	44
Delaware	.868	8	.845	16	.0125	21	.0344	13
Florida	.602	33	.773	28	.0079	43	.0224	35
Georgia	.665	29	.784	26	.0080	42	.0196	42
Hawaii	.912	7	.898	7	.0139	17	.0343	14
Idaho	.767	16	.758	31	.0128	20	.0302	20
Illinois	.466	44	.656	38	.0085	38	.0232	31
Indiana	.584	35	.694	36	.0112	27	.0238	28
Iowa	.500	41	.599	43	.0098	32	.0216	38
Kansas	.813	11	.845	15	.0187	7	.0385	8
Kentucky	.632	32	.768	29	.0091	36	.0227	34
Louisiana	.718	24	.830	18	.0119	25	.0259	25
Maine	.634	31	.690	37	.0076	44	.0198	41
Maryland	.575	36	.767	30	.0093	34	.0260	23
Massachusetts	.152	50	.340	50	.0038	49	.0165	47
Michigan	.779	13	.849	14	.0152	14	.0316	18
Minnesota	.708	26	.805	22	.0149	16	.0333	16
Mississippi	.805	12	.863	10	.0122	23	.0254	26
Missouri	.459	45	.700	35	.0084	39	.0253	27

	Public Enrollment/ Total Enrollment				Public Enrollment/Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	.868	9	.901	6	.0153	13	.0362	11
Nebraska	.720	23	.758	32	.0160	12	.0332	17
Nevada	1.000	2	.995	2	.0130	19	.0259	24
New Hampshire	.521	40	.524	49	.0099	31	.0196	43
New Jersey	.468	43	.623	40	.0063	48	.0156	49
New Mexico	.949	6	.921	5	.0165	11	.0366	10
New York	.325	48	.547	45	.0066	47	.0217	37
North Carolina	.554	38	.651	39	.0081	41	.0173	45
North Dakota	.953	5	.961	4	.0199	4	.0427	4
Ohio	.545	39	.730	33	.0092	35	.0235	29
Oklahoma	.775	15	.827	19	.0186	8	.0342	15
Oregon	.766	17	.862	11	.0175	9	.0387	7
Pennsylvania	.213	49	.546	46	.0034	50	.0171	46
Rhode Island	.405	46	.532	47	.0082	40	.0233	30
South Carolina	.568	37	.608	42	.0075	45	.0125	50
South Dakota	.736	20	.789	25	.0151	15	.0355	12
Tennessee	.592	34	.722	34	.0099	30	.0230	32
Texas	.724	22	.805	23	.0136	18	.0279	21
Utah	.649	30	.620	41	.0221	2	.0433	3
Vermont	.486	42	.563	44	.0104	28	.0159	48
Virginia	.674	28	.781	27	.0090	37	.0211	40
Washington	.759	19	.858	12	.0166	10	.0367	9
West Virginia	.760	18	.802	24	.0115	26	.0276	22
Wisconsin	.681	27	.813	21	.0121	24	.0313	19
Wyoming	1.000	1	1.000	1	.0198	5	.0402	5

	College Age Population/ Population				Campuses/Population (millions)			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	.098	11	.117	27	2.45	40	7.84	15
Alaska	.137	1	.150	1	4.42	26	3.33	41
Arizona	.097	14	.119	19	3.84	28	6.78	20
Arkansas	.090	32	.110	41	5.04	21	5.20	33
California	.090	25	.123	14	5.03	22	5.51	28
Colorado	.094	19	.132	7	7.41	11	9.06	9
Connecticut	.081	49	.108	46	2.37	41	5.61	27
Delaware	.087	35	.115	30	4.48	25	5.47	29
Florida	.087	38	.105	48	3.03	36	5.01	35
Georgia	.102	7	.128	11	5.07	20	5.88	25
Hawaii	.115	2	.142	2	1.58	46	1.30	49
Idaho	.091	22	.114	35	6.00	17	8.42	12
Illinois	.085	45	.111	39	1.98	45	3.87	39
Indiana	.090	27	.117	26	1.07	49	.96	50
Iowa	.086	42	.109	43	6.16	16	5.31	32
Kansas	.090	29	.122	16	9.64	6	12.02	4
Kentucky	.097	13	.122	17	2.63	38	2.17	46
Louisiana	.095	16	.122	15	3.07	35	3.30	42
Maine	.091	24	.131	8	7.22	13	2.02	47
Maryland	.090	28	.117	25	4.84	23	5.61	26
Massachusetts	.085	44	.118	23	3.30	30	5.10	34
Michigan	.101	9	.116	28	2.94	37	4.51	36
Minnesota	.086	41	.114	33	4.39	27	6.31	22
Mississippi	.098	10	.118	20	11.02	3	11.28	5
Missouri	.087	39	.111	38	3.24	33	4.28	37

	College Age Population/ Population				Campuses/Population (millions)			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	.089	33	.110	42	10.37	4	12.97	3
Nebraska	.087	37	.115	29	6.38	15	7.42	17
Nevada	.095	17	.110	40	3.51	29	6.13	24
New Hampshire	.087	36	.131	10	8.24	9	5.42	30
New Jersey	.079	50	.102	49	1.48	48	3.07	44
New Mexico	.103	6	.118	22	7.36	10	7.87	14
New York	.082	48	.109	44	3.16	34	3.95	38
North Carolina	.106	4	.133	5	3.29	32	10.04	7
North Dakota	.093	20	.118	21	17.41	1	14.56	2
Ohio	.087	40	.114	32	.93	50	1.88	48
Oklahoma	.094	18	.118	24	9.45	7	8.99	10
Oregon	.084	46	.114	34	4.52	24	9.56	8
Pennsylvania	.083	47	.107	47	1.50	47	2.46	45
Rhode Island	.092	21	.131	9	2.33	42	3.17	43
South Carolina	.109	3	.136	3	2.52	39	7.33	18
South Dakota	.088	34	.113	36	8.81	8	10.51	6
Tennessee	.098	12	.120	18	2.24	44	3.82	40
Texas	.096	15	.123	13	5.53	18	6.16	23
Utah	.102	8	.135	4	7.86	10	8.50	11
Vermont	.090	31	.075	50	10.26	5	6.78	19
Virginia	.105	5	.132	6	2.27	43	5.38	31
Washington	.090	26	.124	12	5.26	19	7.92	13
West Virginia	.090	30	.112	37	6.45	14	6.31	21
Wisconsin	.085	43	.114	31	3.29	31	7.47	16
Wyoming	.091	23	.108	45	12.12	2	21.08	1

	Personal Income/Population				Personal Income/Public Enrollment			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$ 1,496	47	$ 2,882	47	$ 146	30	$ 126	30
Alaska	2,863	2	4,663	4	234	13	218	7
Arizona	2,059	27	3,663	28	84	50	77	48
Arkansas	1,378	48	2,869	48	146	29	129	27
California	2,730	6	4,454	8	128	39	100	40
Colorado	2,291	15	3,862	19	117	42	98	41
Connecticut	2,809	3	4,828	2	396	5	262	3
Delaware	2,789	4	4,369	9	223	15	127	29
Florida	1,967	31	3,694	27	250	11	165	18
Georgia	1,643	42	3,363	33	205	17	171	14
Hawaii	2,332	14	4,515	6	168	26	132	24
Idaho	1,856	36	3,282	35	146	31	109	37
Illinois	2,647	8	4,495	7	313	6	194	9
Indiana	2,203	20	3,797	21	197	20	160	20
Iowa	1,984	30	3,757	22	203	19	174	12
Kansas	2,163	22	3,920	17	116	43	102	39
Kentucky	1,582	44	3,103	41	174	25	137	22
Louisiana	1,663	41	3,056	44	140	35	118	32
Maine	1,845	38	3,252	36	244	12	164	19
Maryland	2,349	10	4,303	11	251	9	165	17
Massachusetts	2,458	9	4,351	10	650	2	263	2
Michigan	2,342	12	4,145	12	154	28	131	25
Minnesota	2,117	25	3,872	18	142	33	116	33
Mississippi	1,208	50	2,596	49	99	47	102	38
Missouri	2,116	26	3,726	24	251	10	147	21

	Personal Income/Population				Personal Income/Public Enrollment			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$ 2,049	28	$ 3,458	32	$ 134	37	$ 96	44
Nebraska	2,118	24	3,809	20	133	38	115	34
Nevada	2,909	1	5,031	1	224	14	194	8
New Hampshire	2,142	23	3,640	30	216	16	186	11
New Jersey	2,724	7	4,594	5	430	3	295	1
New Mexico	1,892	33	3,133	40	114	45	86	47
New York	2,752	5	4,737	3	420	4	219	6
North Carolina	1,563	45	3,224	38	194	21	186	10
North Dakota	1,720	40	3,070	43	86	49	72	50
Ohio	2,345	11	3,990	14	254	8	170	15
Oklahoma	1,873	35	3,349	34	101	46	98	42
Oregon	2,227	18	3,738	23	127	40	96	43
Pennsylvania	2,249	17	3,949	15	667	1	231	5
Rhode Island	2,206	19	3,935	16	268	7	169	16
South Carolina	1,378	49	2,939	46	185	22	235	4
South Dakota	1,786	39	3,164	39	118	41	89	46
Tennessee	1,548	46	3,081	42	156	27	134	23
Texas	1,940	32	3,591	31	143	32	129	28
Utah	1,991	29	3,251	37	90	48	75	49
Vermont	1,874	34	2,088	50	181	23	131	26
Virginia	1,850	37	3,654	29	205	18	173	13
Washington	2,341	13	3,990	13	146	34	109	36
West Virginia	1,606	43	3,037	45	139	36	109	35
Wisconsin	2,181	21	3,725	25	180	24	119	31
Wyoming	2,273	16	3,696	26	115	44	92	45

	Personal Income/ College Age Population				Public Enrollment/Faculty			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$15,272	47	$24,689	46	15.39	38	16.62	31
Alaska	20,871	30	31,089	26	38.43	1	22.88	12
Arizona	21,278	28	30,744	27	25.09	4	27.83	3
Arkansas	15,381	46	26,147	40	15.40	37	20.53	18
California	30,178	7	36,315	10	25.56	3	37.64	2
Colorado	24,500	17	29,188	29	20.44	13	16.38	35
Connecticut	35,084	1	44,092	3	16.65	27	18.74	20
Delaware	31,897	4	38,000	6	13.40	44	20.05	19
Florida	22,596	27	35,122	12	13.74	43	24.73	8
Georgia	16,032	44	26,248	39	16.55	28	18.15	22
Hawaii	20,219	34	31,853	24	24.71	5	13.37	48
Idaho	20,295	33	28,889	31	17.88	22	17.65	28
Illinois	31,142	5	40,619	5	21.89	10	21.11	15
Indiana	24,397	19	32,489	21	10.92	49	14.05	46
Iowa	23,191	24	34,458	14	11.06	48	14.77	41
Kansas	24,051	22	32,146	22	20.57	12	17.83	26
Kentucky	16,295	43	25,485	43	21.54	11	17.89	25
Louisiana	17,474	42	25,063	44	16.22	33	14.27	44
Maine	20,318	31	24,815	45	16.25	31	16.61	33
Maryland	26,111	12	36,769	9	15.75	36	14.47	43
Massachusetts	28,831	8	36,885	8	22.34	8	24.18	11
Michigan	23,187	25	35,679	11	14.98	40	24.84	7
Minnesota	24,498	18	33,945	16	16.48	29	17.55	29
Mississippi	12,290	50	21,966	49	18.95	18	24.41	9
Missouri	24,379	20	33,449	17	22.04	9	21.36	14

	Personal Income/ College Age Population				Public Enrollment/Faculty			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$23,050	26	$31,579	25	14.88	41	12.62	50
Nebraska	24,293	21	33,035	18	17.64	24	14.63	42
Nevada	30,704	6	45,556	1	16.33	30	12.98	49
New Hampshire	24,528	16	27,979	35	15.97	35	17.71	27
New Jersey	34,501	2	45,171	2	23.74	6	20.96	17
New Mexico	18,357	39	26,525	38	13.30	45	17.13	30
New York	33,657	3	43,654	4	36.41	2	39.99	1
North Carolina	14,809	48	24,199	47	13.05	46	16.61	32
North Dakota	18,424	38	25,986	41	19.65	17	16.06	37
Ohio	27,065	10	34,980	13	19.80	16	24.97	6
Oklahoma	19,900	36	28,472	32	17.99	21	21.04	16
Oregon	26,615	11	32,840	19	18.85	19	18.06	24
Pennsylvania	27,220	9	37,056	7	13.87	42	26.18	5
Rhode Island	23,987	23	30,048	28	16.16	34	18.09	23
South Carolina	12,676	49	21,631	50	12.39	47	16.33	36
South Dakota	20,300	32	28,093	33	17.02	26	18.17	21
Tennessee	15,865	45	25,726	24	17.64	23	14.97	40
Texas	20,117	35	29,140	30	23.51	7	26.50	4
Utah	19,494	37	24,077	48	17.59	25	15.46	38
Vermont	20,886	29	28,018	34	10.40	50	21.99	13
Virginia	17,687	41	27,620	36	15.06	39	13.80	47
Washington	25,891	13	32,080	23	20.19	15	14.25	45
West Virginia	17,886	40	27,164	37	18.33	20	16.61	34
Wisconsin	25,576	14	32,653	20	16.23	32	15.14	39
Wyoming	25,000	15	34,083	15	20.44	14	24.29	10

	Faculty Salary				Educational Level (years)			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$ 7,438	26	$11,815	45	9.1	41	10.8	43
Alaska	8,464	8	14,037	10	12.1	7	12.5	2
Arizona	6,943	36	13,494	20	11.3	6	12.2	22
Arkansas	6,845	39	11,957	44	8.9	45	10.5	49
California	10,425	1	14,895	5	12.1	6	12.3	14
Colorado	7,631	19	12,582	36	12.1	5	12.4	6
Connecticut	7,371	29	15,297	1	11.0	20	12.2	21
Delaware	5,656	50	12,657	34	11.1	18	12.1	33
Florida	6,906	37	13,919	12	10.9	24	12.1	32
Georgia	6,804	40	13,997	11	9.0	42	10.8	42
Hawaii	8,275	11	13,601	16	11.3	15	12.3	13
Idaho	6,156	48	11,462	48	11.8	9	12.3	12
Illinois	9,034	5	14,061	9	10.5	30	12.1	31
Indiana	8,350	9	13,555	19	10.8	27	12.1	30
Iowa	7,658	17	13,033	26	11.3	14	12.3	11
Kansas	7,410	27	13,338	22	11.7	10	12.3	10
Kentucky	6,672	43	13,427	21	8.7	50	9.9	50
Louisiana	7,805	15	12,422	38	8.8	48	10.8	41
Maine	7,162	32	11,536	46	11.0	19	12.2	20
Maryland	7,508	24	13,810	14	10.4	35	12.1	29
Massachusetts	7,120	33	15,152	2	11.6	13	12.2	19
Michigan	10,389	2	13,632	15	10.8	26	12.1	28
Minnesota	8,718	7	13,892	13	10.8	25	12.2	18
Mississippi	5,819	49	11,288	49	8.9	44	10.7	44
Missouri	7,365	30	13,128	25	9.6	39	11.8	36

	Faculty Salary				Educational Level (years)			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$ 6,949	35	$12,309	40	11.6	12	12.3	9
Nebraska	7,617	21	12,916	31	11.6	11	12.3	8
Nevada	7,505	25	13,008	27	12.1	4	12.4	5
New Hampshire	7,263	31	12,993	29	10.9	23	12.2	17
New Jersey	7,635	18	14,309	7	10.6	29	12.1	27
New Mexico	7,713	16	13,003	28	11.2	17	12.1	26
New York	7,619	20	14,450	6	10.7	28	12.1	25
North Carolina	9,166	4	14,972	3	8.9	43	10.6	47
North Dakota	6,390	46	11,489	47	9.3	40	11.0	40
Ohio	7,834	14	12,972	30	10.9	22	12.1	24
Oklahoma	6,749	42	12,638	35	10.4	34	12.1	23
Oregon	7,573	22	12,813	32	11.8	8	12.3	7
Pennsylvania	6,798	41	12,750	33	10.2	36	12.0	34
Rhode Island	6,892	38	12,519	37	10.0	37	11.6	39
South Carolina	6,621	44	13,158	25	8.7	49	10.5	48
South Dakota	6,370	47	10,952	50	10.4	33	11.9	35
Tennessee	6,949	34	12,277	41	8.8	47	10.6	46
Texas	7,550	23	14,903	4	10.4	32	11.6	38
Utah	8,060	12	13,579	18	12.2	1	12.5	1
Vermont	8,000	13	11,966	43	10.9	21	12.2	16
Virginia	9,431	3	13,166	23	9.9	38	11.6	37
Washington	8,893	6	14,302	8	12.1	3	12.4	4
West Virginia	6,512	45	12,322	39	8.8	46	10.6	45
Wisconsin	8,312	10	13,596	17	10.4	31	12.2	15
Wyoming	7.374	28	12,209	42	12.1	2	12.4	3

	Non Agricultural Employment/ Population				Urban Population/Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	.238	44	.292	40	.549	34	.584	35
Alaska	.252	36	.307	36	.381	48	.487	43
Arizona	.257	35	.308	35	.746	11	.796	12
Arkansas	.205	48	.277	46	.428	42	.500	42
California	.312	12	.351	15	.864	3	.909	1
Colorado	.294	20	.336	23	.737	13	.875	13
Connecticut	.361	4	.396	2	.783	7	.773	14
Delaware	.345	6	.389	6	.657	22	.723	19
Florida	.267	28	.318	32	.739	12	.805	9
Georgia	.267	29	.337	22	.553	33	.603	33
Hawaii	.299	17	.377	7	.765	8	.831	6
Idaho	.233	45	.289	42	.475	40	.540	38
Illinois	.349	5	.390	5	.807	6	.830	7
Indiana	.307	14	.356	12	.624	26	.649	29
Iowa	.247	41	.312	34	.530	36	.572	36
Kansas	.257	34	.301	38	.610	29	.661	26
Kentucky	.215	46	.284	45	.445	41	.523	40
Louisiana	.243	43	.287	43	.633	24	.66.	27
Maine	.287	23	.335	24	.513	38	.508	41
Maryland	.289	21	.332	26	.727	16	.766	15
Massachusetts	.371	1	.394	3	.836	5	.845	5
Michigan	.301	16	.335	25	.734	15	.738	17
Minnesota	.281	25	.344	17	.622	27	.664	25
Mississippi	.185	50	.260	49	.377	49	.445	47
Missouri	.311	13	.354	13	.666	20	.701	21

	Non Agricultural Employment/ Population				Urban Population/Population			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	.247	39	.290	41	.501	39	.535	39
Nebraska	.270	27	.324	28	.543	35	.616	31
Nevada	.361	3	.414	1	.705	18	.808	8
New Hampshire	.331	9	.351	14	.583	30	.564	37
New Jersey	.332	8	.364	10	.886	1	.889	2
New Mexico	.248	38	.285	44	.658	21	.698	22
New York	.368	2	.393	4	.854	4	.856	4
North Carolina	.263	31	.344	18	.396	44	.450	45
North Dakota	.199	49	.264	48	.353	50	.442	48
Ohio	.324	11	.365	9	.734	14	.753	16
Oklahoma	.250	37	.301	37	.630	25	.680	23
Oregon	.288	22	.339	19	.622	28	.671	24
Pennsylvania	.328	10	.369	8	.716	17	.715	20
Rhode Island	.340	7	.361	11	.865	2	.871	3
South Carolina	.245	42	.324	29	.412	43	.475	44
South Dakota	.209	47	.264	47	.392	45	.446	46
Tennessee	.260	32	.338	21	.523	37	.587	34
Texas	.264	30	.325	27	.750	9	.797	11
Utah	.297	18	.339	20	.749	10	.804	10
Vermont	.227	26	.201	50	.385	46	..94	50
Virginia	.257	33	.315	33	.556	32	.631	30
Washington	.285	24	.318	31	.681	19	.726	18
West Virginia	.247	40	.295	39	.382	47	.389	49
Wisconsin	.302	15	.347	16	.638	23	.659	28
Wyoming	.294	19	.322	30	.570	31	.605	32

	Bank Deposits (millions)				Highway Mileage (thousands)			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Alabama	$ 1,450	27	$ 2,435	27	72.7	24	78.1	25
Alaska	110	50	235	50	4.2	48	7.1	47
Arizona	804	36	1,417	43	35.7	38	41.8	36
Arkansas	970	32	1,610	31	78.4	20	78.9	23
California	12,950	2	19,989	2	143.6	2	162.2	2
Colorado	1,359	29	2,233	28	77.2	21	82.0	22
Connecticut	1,731	25	2,711	23	16.7	44	18.3	44
Delaware	520	39	735	37	4.7	47	4.8	49
Florida	3,479	11	6,862	8	66.5	27	87.7	19
Georgia	2,129	17	3,864	15	97.3	16	98.9	16
Hawaii	366	44	715	38	3.0	50	3.5	50
Idaho	414	43	613	43	42.6	36	55.1	33
Illinois	11,713	3	16,373	3	123.2	5	129.4	4
Indiana	3,164	12	5,281	12	101.4	14	90.9	18
Iowa	2,115	19	3,116	20	111.5	6	112.3	9
Kansas	1,762	24	2,543	26	133.3	3	134.1	3
Kentucky	1,814	23	2,888	21	68.3	26	69.6	28
Louisiana	2,272	15	3,406	18	47.9	34	52.5	34
Maine	352	45	558	45	20.8	43	21.3	43
Maryland	1,660	26	2,666	24	22.1	42	26.1	42
Massachusetts	4,487	9	6,812	9	26.5	41	28.9	41
Michigan	4,602	8	7,342	7	110.0	8	114.6	8
Minnesota	2,583	14	4,117	13	123.8	4	127.6	5
Mississippi	1,022	31	1,721	30	63.5	28	66.7	30
Missouri	4,657	7	6,516	11	111.0	7	114.8	6

	Bank Deposits (millions)				Highway Mileage (thousands)			
	1960		1970		1960		1970	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Montana	$ 557	38	$ 699	40	74.8	22	78.3	24
Nebraska	1,392	28	1,960	29	102.6	12	101.8	15
Nevada	236	48	462	46	44.4	35	48.8	35
New Hampshire	256	47	535	47	14.0	45	14.8	45
New Jersey	3,956	10	6,585	10	31.0	40	31.6	40
New Mexico	923	33	704	39	62.4	29	67.6	29
New York	32,667	1	56,024	1	105.9	10	104.7	13
North Carolina	2,119	18	3,500	17	80.8	19	85.5	20
North Dakota	465	42	571	44	97.4	15	106.7	12
Ohio	6,810	6	9,487	6	102.0	13	108.6	10
Oklahoma	2,101	20	2,868	22	102.6	11	107.8	11
Oregon	1,179	30	1,604	32	69.6	25	93.1	17
Pennsylvania	9,007	5	12,899	5	108.7	9	114.7	7
Rhode Island	488	40	670	41	4.2	49	5.4	48
South Carolina	813	35	1,448	33	56.2	32	59.8	32
South Dakota	483	41	651	42	92.1	18	84.4	21
Tennessee	2,209	16	3,546	16	74.5	23	77.5	26
Texas	9,280	4	14,268	4	229.4	1	243.5	1
Utah	564	37	807	36	33.7	39	39.4	38
Vermont	144	49	278	49	13.7	46	14.3	46
Virginia	1,954	21	3,288	19	56.2	31	60.7	31
Washington	1,814	22	2,555	25	59.3	30	74.6	27
West Virginia	850	34	1,211	35	36.1	37	35.8	39
Wisconsin	2,586	13	3,902	14	97.3	17	102.3	14
Wyoming	281	46	365	48	54.3	33	40.5	37

VITA

John Kent Caruthers

Candidate for the Degree of

Doctor of Education

Thesis: AN ANALYSIS OF HIGHER EDUCATION FINANCIAL SUPPORT MEASURES

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Biographical:

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Education: Graduated from Madisonville High School, Madisonville, Kentucky, in May, 1964; attended the University of Missouri-Rolla from 1964 to 1966, with a major in Applied Mathematics; received the Bachelor of Science degree from Oklahoma State University in 1968, with a major in Finance; received the Master of Business Administration degree from Oklahoma State University in 1971, with a major in Business Administration; completed requirements for the Doctor of Education Degree at Oklahoma State University in July, 1973.

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