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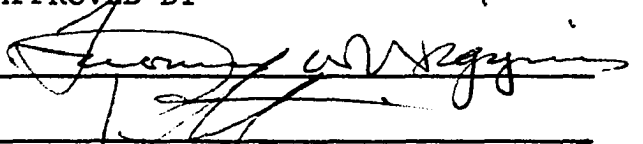
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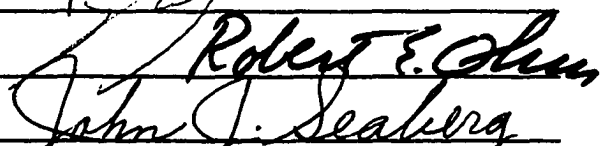
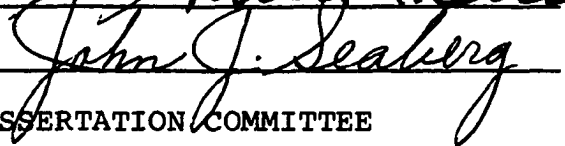
DONALD AVERY BLACKERBY

1973

A DECISION MODEL FOR THE ASSESSMENT OF
STUDENT FEES IN HIGHER EDUCATION

APPROVED BY



DISSERTATION COMMITTEE

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CHAPTER I

THE PROBLEM

Introduction

There exists a growing disenchantment with the current allocation of subsidies in American higher education. The rising costs and subsequent constrained financial problems of higher education coupled with rising interest in the rights of various minority groups have effectively raised questions regarding the efficiency of the allocation of subsidies, equality of opportunity, and equitable treatment of students. As Schultz forcefully contends:

The allocation of resources to provide the instructional services of higher education in the United States is neither socially efficient nor equitable. The rise in personal incomes in this country, associated with economic growth, is making the traditional financing, pricing, and supplying of these instructional services ever more obsolete. There is evidence, for example, that an inordinate part of the subsidies to higher education is used to provide higher educational services below cost to the growing proportion of students who come from families who have the income and wealth to pay the full cost.¹

He elaborates on this statement later by stating:

Theodore W. Schultz, "Optimal Investment in College Instruction: Equity and Efficiency," in Investment in Education: The Equity-Efficiency Quandry, ed. by Theodore W. Schultz, Supplement to the Journal of Political Economy, 80 (May/June, 1972), p. 2.

Higher education is not organized to bring about an optimal investment in its instructional services. The source of the difficulty is in the financing, pricing, and supplying of these services. The financing tends to subsidize the wrong educational activities. The pricing bears no meaningful relation to the differences in the costs of producing the services, and the suppliers of these services are, therefore, substantially sheltered from the discipline of competition, notwithstanding the large number of colleges and universities in the United States. Current endeavors to cope with the financial adversities arising out of the pause in the educational boom of the sixties are efforts to "save" the existing organization. They are not seeking solutions for the basic underlying difficulty that has become increasingly acute, . . .¹

For every different consideration inherent in subsidizing students and subsequently in assessing student fees--there has probably been a proposed solution. Some of these proposals have created problems, however, since the proposals are usually directed toward the solution of only one consideration and do not address themselves to the other considerations.

For example, it is generally accepted that equality of opportunity is a worthwhile goal. It is also generally accepted that, in the name of efficiency, the beneficiary of higher education should pay a fair proportion of the cost of education. The achievement of equality of opportunity usually implies that low-income students receive a higher subsidy from society than higher-income students. The achievement of efficiency, however, usually implies that those students whose degree will best benefit society receive the largest subsidy.

In either of these singularly purposed solutions, what happens to the student with low-income parents that enrolls in

¹Ibid., p. 22.

a degree program for which there is no manpower demand? One solution would grant the student a large subsidy because he is from a low-income family while the other solution would grant him a low subsidy because he would not benefit society. It would seem as though both of the goals of equality of opportunity and efficiency have merit and that the proper solution lies in an optimum combination of the consideration of the two goals. In fact, it appears entirely possible that both goals could be sought simultaneously. That is, every student could receive a subsidy sufficient to allow him the opportunity to attend college while subsequently receiving a larger subsidy if he possesses the inherent characteristics to benefit society.

In fact, if equity is synonymous with fairness, is it fair for two students to receive the same subsidy in higher education if their family incomes are different and if they enroll in different degree programs with different manpower demands? Is it fair for a government with constrained resources to oversubsidize one individual student while there exist other potential students whose inherent capabilities could be enhanced by higher education, but whose attendance is dependent upon receiving a larger subsidy which would enable them to attend college? Hansen and Weisbrod summarized this point very well:

The basic problem, then, is how to use limited public revenue resources most fairly and most effectively. A low or zero tuition level for everyone implies a substantially increased level of state support. But if only a limited amount of tax revenue is available for higher

education, which is more efficient? To use these funds to subsidize above average income students who can afford to go on to college and would do so, we predict, even without the subsidy? Or to subsidize lower income students, many of whom would otherwise not go to college at all, or who if they did go might have no alternative but to incur substantial debt?¹

Singularly purposed solutions pose yet another problem in their lack of flexibility for adaptation to the specific needs of each unique educational system. It seems entirely possible for one state with large numbers of low income citizens and a low literacy level, for example, to place top priority on raising the educational level of its citizens by subsidizing low-income students; while another highly industrialized state may place top priority on subsidizing certain technical or professional degree programs in order to build their manpower supply. Yet, it seems even more likely that most states would have varying combinations of the two extremes and would, therefore, need a system for optimally combining all their goals.

Many of these goals conflict, however, thereby setting the stage for a system which will provide the framework for rational compromise or the establishment of priorities. The assignment of priorities necessitates the involvement of a decision-making entity and necessitates the development of a

¹W. Lee Hansen and Burton A. Weisbrod, "Students and Parents: A New Approach to Higher Education Finance," in Financing Higher Education: Alternatives for the Federal Government, ed. by M. D. Orwig (Iowa City, Iowa: The American College Testing Program, 1971), pp. 121-22.

system whereby the decision-maker can choose among the goals or choose combinations of the goals in an attempt to provide an optimum compromise for his particular situation.

Statement of the Problem

It appears that if the appropriate decision-makers responsible for the financing of higher education are concerned about the goals of equity, equality of opportunity and efficiency, and if the proper funding is truly constrained to preclude the possibility of tuition-free higher education, is incumbent upon them to direct their subsidies more toward the achievement of all three goals rather than only one. The adjustment of subsidies would then, subsequently, affect the charges to be made to the students in the form of student fees.

Before the adjustment of subsidies can occur, though, a new system must be devised which will allow the evaluation of each student in terms of the three goals and which will allow the subsequent assessment of subsidies and student fees. Schultz states:

The problem to be solved is in the choice of educational activities that are to be subsidized by such funds . . . But, to be allocatively efficient, such subsidization must go directly to the students and not into the funds of colleges and universities, leaving it to them to distribute the financial aid to students by all manner of standards. Until those educational activities that require subsidization are identified and the amounts required determined, to simply proceed in allocating even more funds to subsidize all students is not only socially inefficient but grossly inequitable¹

¹Schultz, "Optimal Investment," pp. 24-5.

Since the proposed system of this study will have the net effect, at least from the student's perspective, of affecting the fees which they will pay, and since it will be a system which will incorporate and direct the decisions of the appropriate decision-makers toward the considerations they deem important in the assessment of student fees, the proposed system can very easily be labeled "a decision model for the assessment of student fees in higher education." In the interest of brevity, it shall hereafter be referred to as the "student fee model" or "the model."

In summary, the problem to which this study is addressing itself can be stated as: Can a decision model be devised which will allocate higher education subsidies and assess student fees toward the achievement of an optimum combination of the student-related goals of equity, equality of opportunity, and efficiency?

Definition of Terms in the Study

Societal Goals: Those goals of American higher education which are sought by a state or government entity for the good of its constituency as a whole. These goals are generally different from goals of individuals. Usually societal goals are related to economic, social, or cultural progress of the state and to student-related goals such as equality of opportunity and equity.

Full-Time-Equivalent (FTE) Student: A FTE student in an academic year is a statistic determined by:

-for undergraduate students--dividing the total number of undergraduate student credit hours by 30,

-for graduate students--dividing the total number of graduate student credit hours by 24.

Degree Program: Those approved courses and other approved educational activities which normally culminate in the awarding of a particular degree.

Program Cost: The funds needed to provide the instruction and the instruction-related services for a particular degree program for a given number of FTE students in a given academic year. In terms of the standard budget categories, these costs would normally come from all the educational budget categories except Organized Research and Extension and Public Service.

Student Fees: That portion of the program cost which is borne by the student.

Subsidy: The explicit or implicit allocation of funds by a higher education system. Normally, a student subsidy would be that portion of the program cost which is not borne by the student. However, it would be possible to subsidize a student for all of his program cost plus a portion of his living expenses.

Student-Related Goals: Those goals of American higher education which, depending upon their operational definition and the degree to which they are sought, will affect the subsidies and fees of students. In this study, they are proposed to be: equality of opportunity, equity, and efficiency.

These three goals are not operationally defined here since the nature of the student fee model proposes that each decision-maker uniquely define the goals according to the needs in his particular realm of responsibility. Chapter 3, however, offers an example of operational definitions for all three goals.

Assumptions

The following are the underlying assumptions for the proposed student fee model:

- 1) Society has the primary responsibility for providing the funds needed for the support of higher education.
- 2) Student fees are collected only when it is necessary to supplement constrained societal funds.
- 3) Society has the responsibility of providing funds to higher education in a manner which will best achieve societal goals for higher education.
- 4) The student should have the opportunity to provide student fee funds in order to obtain the type of higher education which is consistent with his personal goals.

Objective of the Study

The objective of this study is to develop a student fee model with two basic components, as follows:

- 1) A weighting system which will allow a decision-maker to rationally and systematically incorporate any number or any combination of the student-related goals of higher education and to incorporate them at any desired level of relative importance.
- 2) An allocation system which will utilize the results of the weighting system in the determination of subsidies and the subsequent assessment of student fees for each student.

Significance of the Study

The significance of this study affects three primary areas in American higher education. One of these areas concerns the apparent conflict and diversity that exists in student-related goals. As mentioned previously, the inherent conflict between goals such as efficiency, equality of opportunity, and equity suggests the need for an optimal compromise. The judgement of optimality from one decision-maker to another can vary so it seems significant to provide a decision model which will allow the responsible decision-makers to operationally define their unique optimal compromises.

Another area concerns the allocation of funds to achieve goals. The student-related goals of equity, equal opportunity and efficiency have not been concurrently pinpointed as targets for the allocation of funds in a comprehensive or coordinated fashion. It appears particularly significant to enable the long-standing American ideals of equality of opportunity and equity to be forthrightly stated as goals of American higher education and to allocate funds toward their achievement.

The final area concerns the manner in which higher education systems have traditionally been structured and financed. Institutions were funded in the name of autonomy and diversity regardless of the needs of the students or the needs of society. Somehow, it was hoped, the students would enroll and society would be served. It, therefore, seems significant to propose a "prescriptive" structure for the financing of higher education within which the needs of society and the needs of students can be met while simultaneously "prescribing" a structure which will promote diversity, autonomy and other system goals.

If a new methodology is developed which will enable American higher education to become more accountable to the student-related goals, then research will be stimulated in new areas. Student and program characteristics will have to be researched relative to their impact on both the student-related and system-wide goals. Degree programs will have to be related to manpower supply and demand. Research will also need to be

accelerated in all questions regarding equality of opportunity.

In summary, each unique system of higher education, which has the responsibility to be accountable to the student-related goals, will need research to aid the decision-makers in defining the precise combination of criteria which will provide an optimum merger of the desired goals.

CHAPTER II

THE THEORETICAL FRAMEWORK AND THE REVIEW OF RELATED LITERATURE

The theoretical framework for this study is based upon the assumption that administration is the process of decision-making. Since the purpose of this study is to provide a decision-making structure which will more nearly allow the achievement of selected higher education goals through the allocation of student subsidies and the assessment of student fees, the review of related literature must necessarily include a review of current and proposed student aid programs, a review of student-related goals of American higher education, as well as consideration of administration as decision-making.

Administration as Decision-Making

Many authors through the years have described the decision-making process in administration. Fayol described the process as: planning, organization, command, coordination and control.¹ In 1937, Gulick extended Fayol's process to the

¹Henri Fayol, "The Administrative Theory in the State," in Papers on the Science of Administration, ed. by Luther Gulick and Lyndall F. Urwick (New York: Institute of Public Administration, 1937), p. 101.

familiar POSDCORB.¹ Barnard, however, was one of the first to define the primary role of an administrator as a decision-maker when he stated: "In short, a characteristic of the services of executives is that they represent a specialization of the process of making organization decisions--and this is the essence of their functions."²

Simon, considered by many to be the originator of the theory of administration as decision-making, extended the role of the executive as a decision-maker into structuring the organization as a decision-making organization.

The executive's job involves not only making decisions himself, but also seeing that the organization, or part of an organization, that he directs makes decisions effectively. The vast bulk of the decision-making activity for which he is responsible is not his personal activity, but the activity of his subordinates.³

Griffiths also succinctly espouses this viewpoint with his statement: "The position taken is that the central function of administration is directing and controlling the decision-making process."⁴

¹Luther Gulick, "Notes on the Theory of Organization," in ibid., p. 13.

²Chester I. Barnard, The Functions of the Executive, (Cambridge, Mass.: Harvard University Press, 1964), p. 189.

³Herbert A. Simon, The New Science of Management Decision, (New York: Harper and Bros., 1960), pp. 4-5.

⁴Daniel E. Griffiths, "Administration as Decision-making," in Administrative Theory in Education, ed. by Andrew W. Halpin (New York: The Macmillan Co., 1958), pp 121-22.

One of Simon's most potent contribution to the theory of administration as decision-making may have been his elaboration upon decision-making as optimal choices between alternative courses of action. This elaboration led him and the field of administration into mathematical theories, cybernetics, operations research, and other techniques which produce alternatives.

Simon also introduced the notion of classifying types of decisions as "programmed" or "non-programmed."¹ According to Simon, "programmed" decisions are those repetitive decisions for which routine procedures are developed. The "non-programmed" decisions are those which are "novel, unstructured, and consequential."²

Selznick, similarly, distinguishes between "routine decisions" and "critical decisions."³ Palola, Lehmann, and Blischke, in applying Selznick's definition of "critical decisions" to statewide educational networks stated: "Such decisions determine the direction of its evolution and design the means for its goal achievement, and thereby set the general character and identity which will guide its long-range development."⁴ They further define the three most critical types of

¹Simon, The New Science, p. 6.

²Ibid.

³P. Selznick, Leadership in Administration (New York: Harper and Row, 1957), p. 35.

⁴Ernest G. Palola, Timothy Lehmann, and William R. Blischke, Higher Education by Design: The Sociology of Planning (Berkeley, California: University of California, 1970), p. 13.

critical decisions in higher education: "the setting of goals and the development of programs to meet the goals; the educational integration of the system; and the allocation of resources in the network."¹

The proper allocation of resources has long been considered an effective administrative procedure for aiding the achievement of organizational goals. Gulick included the process of budgeting in his POSDCORB and Barnard discussed the "method of incentives."² More recently, planning, programming, budgeting systems (PPBS) have been developed as a means of budgeting resources for the accomplishment of program goals.³

Program goals are not the only goals of American higher education. There also exist student-related goals of equality of opportunity, equity and efficiency which can also be more readily accomplished through the proper allocation of resources.

Student-Related Goals of American Higher Education

The literature is replete with the discussion of goals for American higher education. One of the inherent problems in defining goals for higher education is in its role as a

¹Ibid., p. 14.

²Barnard, Functions of the Executive, p. 142.

³See, for example, Hartley, Harry J., or Parden, Robert J., referenced in the Selected Bibliography.

servant to the public. In other words, the goals and needs of society may conflict with the goals and needs of those individuals it serves. Lawrence states:

The needs and aspirations of the state are not in every respect compatible with either the needs and aspirations of the individual or the sum of the needs and the aspirations of all of the individuals of the state. For the state, education is perceived to be an important component of social preservation and progress. For the individual, education is perceived to be the major avenue to social and financial advancement, and evidence supports this perception. While education is only one major component in meeting the needs and aspirations of the state, for most individuals education is the only viable hope for future advancement. Since both the individual and the state have a common (although unidentical) interest in education, the balance between the interests of the individual and the interests of the state must be carefully weighted in the process of state planning.¹

If the individual perceives higher education as either the major or only avenue to future advancement, then he has to be concerned about his opportunity for access to higher education. Lawrence continues:

Since education and educational achievement are perceived to be avenues to social and financial advancement, the question of who shall be given the opportunity to benefit from educational services has long been answered on paper: everyone who is qualified and desires to pursue a course in postsecondary education should have the opportunity. In fact, however, the opportunity is not open to everyone.²

¹Ben Lawrence, "Issues Related to the Purposes of Postsecondary Education," in Statewide Planning for Postsecondary Education: Issues and Design, ed. by Lyman A. Glenny and George B. Weathersby (Boulder, Colorado: Western Interstate Commission for Higher Education, 1971), p. 2.

²Ibid., p. 4.

Bolton elaborates on the difference between "equality of opportunity" and "equality of achievement":

"Equality of opportunity" sums up what I have in mind. This principle is that all should have an equal opportunity to exploit his native talents and to better the position of his father. It is opportunity which is to be equal, not achievement.¹

The societal goals for American higher education are numerous and diverse--particularly in light of its role as a servant of the public. It must be diverse enough to satisfy each individual's need--yet it must be efficient. It must be equitable to each student--yet it must be efficient. These apparent paradoxes are summarized very well as:

Most would agree that the American higher education system should be efficient, equitable, diverse, and of high quality. However, in the actual structuring of higher education system, these goals often conflict. For example, the quest for equity may mean that the poorer students and those least well prepared must be given high priority in college and university attendance. While such a decision would insure progress toward the goal of social justice, it would, in all likelihood, be bought at some sacrifice in educational quality, the growth of the economy, and efficiency in higher education. Sensitive public policy must seek to provide a higher education system which incorporates the optimum compromise between these diverse and sometimes conflicting goals.²

Lawrence reinforces the challenge of finding an optimum compromise. He claims that hostility is produced if the

¹Roger E. Bolton, "The Economics and Public Financing of Higher Education: An Overview," in The Economics and Financing of Higher Education in the United States: A Compendium of Papers, (Hereinafter referred to as Economic Report), Joint Committee Print, (Washington, D. C.: Government Printing Office, 1969), p. 56.

²U. S., Congress, "Introduction" in ibid., p. 2.

individual becomes interested and then cannot fulfill his newly found interest. He challenges state planners with:

Instead of side stepping the issue, the response of responsible planners should be to devise means by which the interests and aspirations of the individual and the interests and aspirations of the state can reinforce each other. This is indeed a challenge as well as a grave responsibility for the state planning function.

Thus, it appears that, in the distribution of subsidies and the assessment of student fees, American higher education needs to strive toward the achievement of the two goals of equality of opportunity and efficiency while simultaneously treating all students equitably. Since the different definitions of these goals or the degree to which each is sought will affect the subsidies and student fees, the three goals of equity, efficiency, and equality of opportunity are student-related. A discussion of each of these goals and pertinent comments from the literature will follow.

Equity and Efficiency

Equity is concerned with the "fairness" of the distribution of subsidies. Efficiency is concerned with the "return" per dollar invested. These two ideals are likely to directly conflict with each other. To achieve equity almost guarantees inefficiency; and vice versa. As Hansen and Weisbrod said:

The social objectives of efficiency and equity are in fact quite likely to conflict, thereby complicating the issue. Consideration of efficiency might suggest that higher education should be provided to some young

¹Lawrence, "Issues Related to Purposes," p. 3.

people but not to all; implicit is the widely held assumption that not everyone can benefit significantly from higher education. But there is still the equity question: is it "fair" for some youngsters to receive public subsidies while others do not? An efficient allocation of resources can be inequitable.

And an equitable allocation of resources can be inefficient. If, for example, every youngster were not only offered the opportunity to go to college for four years, but were required to go, then all college age people would receive a similar public subsidy. But if this is more equitable it is doubtless less efficient, for not everyone is likely to benefit enough to cover the costs of resources required to educate them. The conflict between equity and economic efficiency in higher education planning appears to be a genuine one; . . .¹

Efficiency is not only concerned with sending the "right" students to college. The degree programs which are financed can also be classed as "returns"--particularly in terms of manpower supply. For American higher education to be efficient, it should perhaps subsidize more those degree programs for which the economy has a high demand and subsidize less those degree programs with less demand.

Another aspect of efficiency is for American higher education to subsidize more those students which will return more to the government in the form of higher taxes because of higher salaries. Counter to this rationale, however, are those who argue that the higher salaries are enough incentive for students to enroll in these programs and that the government should subsidize the lower salaried but important public service professions such as teaching and social workers.

¹W. Lee Hansen and Burton A. Weisbrod, "The Search for Equity in the Provision and Finance of Higher Education," in Economic Report, pp. 108-9.

The student-related goal of efficiency not only calls for an efficient allocation of subsidies to enable upwardly aspiring students to attend college but it also should enable the most able or high ability highschool graduates who aspire to attend college to do so. This is justified from a societal perspective on the rationale that the high ability students will benefit more from a higher education and will, therefore, return more benefits to society. Segal defines this type of efficiency and the role of the policy makers as:

Efficiency here is used in the programming sense of maximizing the rate of return for a given investment. The question we ask is what are the implications of a government education policy which has as its aim maximizing the social rate of return for a given budgetary outlay.¹

Segal reviews the conflicting studies regarding the efficiency gains to be made by subsidizing only the high ability students. He also suggests that since the children of college graduates are more likely to go to college, long term efficiency gains might be significant if policy makers concentrated on broadening educational opportunity rather than concentrating all resources on short term efficiency gains in the form of subsidizing of high ability students.²

Both Segal and Berls conclude that significant numbers of high ability high school graduates are not going into higher education. Segal states:

¹David Segal, "'Equity' versus 'Efficiency' in Higher Education," in Economic Report, p. 141.

²Ibid., p. 143.

Even so, we find that significant percentages of able high school graduates appear to be left out of the higher educational system for financial reasons.¹

Berls, after reviewing the statistics relating ability and socioeconomic status (SES) from the follow-up study of 2.6 million high school graduates of Project Talent, concludes:

The highest probability of college attendance is about eighty-two per cent for the high school graduates in the top ability quintile who also have the highest SES, whereas the graduates of equal ability, but low SES, have a probability of college entrance of only thirty-seven per cent, or less than half the likelihood of college entrance of the first group. This pattern remains true of each of the ability groups: the higher the SES the greater amount of college attendance even though ability is equal.²

The advocates of the private versus public benefit arena agree on one principle: the beneficiaries of higher education should pay their fair share of the costs. The disagreements are generally over identifying and measuring the benefits which accrue to either the individual or to society. The economic benefits (such as increased earnings for the individual or increased tax intake for society) are hard enough to identify and measure but there also exist non-economic benefits (such as a "better life" for the individual or "better citizens" for society) which are almost impossible to measure and to document as an effect of higher education.

¹Ibid.

²Robert H. Berls, "Higher Education Opportunity and Achievement in the United States," in Economic Report, p. 147.

One conclusion which can be drawn from the literature is that both student and society should pay part of the costs.

As Orwig summarized:

Although the issue of the private and public benefits of higher education is represented at both extremes--with advocates of no public support and advocates of complete public support--most people agree that the benefits of higher education are shared by the individual and society and, as a consequence, that the cost of higher education should be shared by students and society.¹

Some of the benefits may accrue exclusively to the individual, some to the public; but a large majority of the benefits mutually accrue to both sides. As stated in a study submitted to the Joint Economic Committee of the U. S. Congress:

The difficulty is assessing these returns inheres in the fact that many of the benefits as well as the costs of higher education do not accrue directly to the individual who is being educated. Indirectly, the student's family, as well as the entire society, benefits when a student obtains a higher education.²

In other words, there is no single beneficiary. Cartter stated another reason for sharing the costs:

I believe that society should bear a part of the cost both because there are obvious social benefits of living in a society with an educated citizenry, and because I would like to encourage individuals to consume more education than they ordinarily would if they themselves had to pay for its full cost. . . . On the other hand, I believe that adult educational experiences are largely undervalued (and frequently wasted) when one does not have to make some personal

¹M. D. Orwig, "Summarizing the Issues: The Federal Government and the Finance of Higher Education," in Financing Higher Education: Alternatives for the Federal Government, ed. by M. D. Orwig (Iowa City, Iowa: The American College Testing Program, 1971), p. 351.

²U. S. Congress, "Introduction," p. 5.

sacrifice. Therefore, I believe that a student or his parents should contribute to educational costs, although such expected contributions should be adjusted to ability to pay.¹

Tyler presents guidelines for Federal allocations to higher education institutions. These guidelines, however, can apply to any appropriating agency.

Other legislation, particularly appropriation bills, should be shaped so as to encourage effectiveness and efficiency in the operation of colleges and universities, and to reduce the wastes of obsolete policies and practices. This might include some of the following:

1. Channeling support through student stipends to increase institutional responsiveness to the demands of students and their parents.

2. Concentrating support where greatest needs exist rather than dissipating resources through widely scattered efforts. . . . It is important to avoid a method of support which simply increases funds available without requiring an analysis of educational problems in the institution and a plan to focus efforts on promising solutions to the problems. When grants are made to educational institutions without categorical provisions, most of the increased funds are allocated on the faculty-administration bargaining table and not on the basis of critical educational problems.²

The low-tuition model prevalent throughout public higher education in the United States is designed to promote equality of opportunity while tacitly espousing equal subsidies to all students. That this is not true is easily shown by examining the various program budget publications which are becoming evident across the country.

¹Allan M. Cartter, "Student Financial Aid," in Universal Higher Education: Costs and Benefits, (Washington, D. C.: American Council on Education, 1971), p. 116.

²Ralph W. Tyler, "The Changing Structure of American Institutions of Higher Education," in Economic Report, p. 320.

For example, in an annual operating budget needs publication of the Oklahoma State Regents for Higher Education; the budget needs for three Oklahoma institutions of higher education for the 1973-74 fiscal year were computed on a program basis.¹ The three institutions served as pilot institutions for a forthcoming statewide, computerized program budgeting model. The publication shows wide variances in program cost and program subsidization per student in each institution as well as across institutions.

Table 1 shows comparative data on program cost and program subsidization of selected programs. As can be noted from the table, program cost varied across institutions from \$3,770 per full-time-equivalent (FTE) student in physics at Oklahoma College of Liberal Arts to \$520 per FTE in accounting at Tulsa Junior College. By institutions, the variances in program cost were: Central State University, \$2,564 per FTE to \$603 per FTE; Oklahoma College of Liberal Arts, \$3,770 per FTE to \$1,007 per FTE; Tulsa Junior College, \$3,554 per FTE to \$520 per FTE.

Unless student fees are raised by the fall semester of 1973, both Central State University and Oklahoma College of Liberal Arts will charge FTE resident students \$276 in student fees per academic year and Tulsa Junior College will charge

¹Oklahoma State Regents for Higher Education, Operating Budget Needs of the Oklahoma State System of Higher Education for the 1973-74 Fiscal Year (Oklahoma City: Oklahoma State Regents for Higher Education, 1973), pp. 30-2.

\$188. Therefore, for the three institutions, subsidies per FTE will range from \$3,494 to \$327 a year. By student credit hour, these subsidies will range from \$116.47 to \$10.90. Clearly, in this case, the subsidies are far from equal.

Equality of Opportunity

There are many ways to define and measure equality of opportunity. Fromkin proposes three criteria for the measurement of equality of opportunity: social origins, ability, and aspirations. They are as follows:

Social Origins. One may postulate that equality of opportunity is achieved whenever a student, irrespective of the income of his family, is equally likely to attend a post-secondary institution as any other student.

Ability. Another concept of equality of opportunity would require that all high school graduates of equal ability or achievement have an equal opportunity to enroll in a college and graduate from it.

Aspirations. A third definition of equality of opportunity would be satisfied if each high school senior who wished to attend an institution of higher education had a chance to do so.¹

¹J. Fromkin, Aspirations, Enrollments, and Resources: The Challenge to Higher Education in the Seventies, United States Office of Education Document OE-50058 (Washington, D. C.: Government Printing Office, 1970), p. 89.

TABLE 1

COMPARISON OF SELECTED PROGRAM COSTS AND SUBSIDIES AT
THREE OKLAHOMA INSTITUTIONS OF HIGHER EDUCATION

Program	Central State University			Oklahoma College Liberal Arts			Tulsa Junior College		
	FTE	Cost per FTE	Subsidy per FTE	FTE	Cost per FTE	Subsidy per FTE	FTE	Cost per FTE	Subsidy per FTE
Accounting	506	904	628	31	1789	1513	102	520	332
Art	118	1010	734	82	1018	742	67	1065	877
Biology	148	1353	1077	48	1819	1543	40	1503	1315
Business	1625	891	615	153	1167	891	351	706	518
Business (MBA)	115	1889	1613	---	---	---	---	---	---
Chemistry	66	1685	1409	34	2004	1728	12	1555	1367
Economics	38	909	633	22	1061	785	3	993	805
Elem. Educ.	830	901	625	142	1051	775	48	1575	1387
Elem. Educ. (M Ed)	98	1590	1314	---	---	---	---	---	---
English	162	1090	814	70	1168	892	18	1545	1357
Physical Educ.	264	1069	793	48	1007	731	20	820	632
History	74	1065	789	46	1110	834	22	908	720
Home Economics	72	1081	805	59	1565	1289	9	951	763
Mathematics	81	1379	1103	43	2062	1786	20	914	726
Physics	24	2564	2288	7	3770	3494	7	1334	1146
Political Science	32	923	647	30	1318	1042	20	639	451
Psychology	343	780	504	52	1029	753	70	1046	858
Sociology	184	603	327	66	1268	992	35	952	764
Spanish	---	---	---	18	1657	1381	4	3554	3366
All Programs	4780	981	705	951	1305	1029	848	900	712

Source: Oklahoma State Regents for Higher Education, Operating Budget Needs of the Oklahoma State System of Higher Education for the 1973-74 Fiscal Year (Oklahoma City: Oklahoma State Regents for Higher Education, January, 1973), pp. 30-32.

Equality of opportunity means to others that there should not be any artificial constraints on an individual's attempt to improve his situation. The only constraint on upward mobility should be ability, motivation and/or other such natural characteristics of the individual. To those who fear this type of equality of opportunity would lead to a classless society, Berls answers:

The less restraint the society places on vertical social mobility the more the sorting of individuals into occupations and social classes will be determined by individual innate ability, which is largely hereditary. But as long as society values intelligence and the mental ability and performance that goes along with it, and as long as society places high value on occupations that draw heavily on mental ability, then we can expect that classes in the society will be sorted by ability and that this tendency is likely to increase rather than disappear as we achieve equality of opportunity.¹

In summary, if an individual has the ability and is willing to work, he should be given every opportunity to improve himself. The height of his upward mobility should be governed by these inherent abilities and desires and not by society. This criteria--inherent ability and desire to work--is the major criteria which separates higher education subsidies from welfare programs. As Bolton states:

The strategy is, however, appealing because it has less of the "give-away" ring than other measures. The aid the recipient gets has an enormous value, but it also requires a great input of his own--his time and effort. It helps him create something of value out of his innate potential which is already there. And it is redistribution which is only temporarily at the expense of others, for it does

¹Berls, "Opportunity and Achievement," p. 202.

more than support current consumption. This is because it raises the incomes and appreciation of education in people who are now poor and thus tends automatically to create the financial ability and motivation for them to bequeath education to later generations.¹

Many contend it is enough to provide equal opportunity, and, in fact, contend that not everybody should go to college. Bolton agrees by saying:

Not everyone can profitably use the same education as others, either for his own benefit or for society's. For another thing, not even everybody who can afford to do so wants to make the heavy investment in education. This would be true for some even if all the benefits were capturable by the individual. Some people have a much greater preference for consumption now rather than in the future, which outweighs the future return an education brings. Others have unusually high opportunity costs at a young age, because they can already command high earnings (some athletes and entertainers are examples).²

Others contend that the way to assure equality of opportunity is to provide universal higher education. They further contend that if higher education is good for society in general then perhaps we should have mandatory higher education--at least for the first two years. They argue: the psychic costs of leaving home, the loss of earning power to the student, the amount of time and energy involved in a college degree all combine to form a formidable barrier to the undecided potential student.³ Schultz adds that one of

¹Bolton, "Economics and Financing: Overview," p. 67.

²Ibid., p. 56.

³See Bolton, ibid. for an excellent survey of both monetary and non-monetary barriers to potential students.

the primary functions of higher education is to discover talent and, if necessary, society should pay students to "try out" college. He suggests society would gain more in uncovering the hidden talent of the students who would not otherwise go to college than it would lose in wasting funds on the students with no talent.¹

Cartter, however, disagrees with mandatory or compulsory higher education:

Even so, the cost of compulsory universal higher education is so high, and so evidently wasteful in both human and economic terms, that I shall dismiss it in the remainder of this paper. It would run counter to all the present trends of conferring adulthood at age eighteen and of encouraging the assumption by young men and women of decision-making powers over their own lives.²

Compromise versions of universal higher education include: expanded access for the first two years of college through free tuition, expanded access through full financial aid to low-income students, and expanded access through close proximity to low-cost two-year colleges. All of these proposals increase the educational opportunity for potential students and all have been attempted to some degree. The first compromise--two years of free tuition--is less efficient than the others since it provides subsidies to students regardless of whether they need it. The second compromise--full financial

¹Theodore W. Schultz, "Resources for Higher Education: An Economist's View," in Journal of Political Economy, (May/June, 1968), pp. 327-47.

²Allan M. Cartter, "Student Financial Aid," in Universal Higher Education: Costs and Benefits (Washington, D. C.: American Council on Education, 1971), pp. 112-13.

aid--is widely attempted but rarely achieved because of financial and political problems. The third compromise--close proximity to two-year colleges--has been largely accomplished in California and Florida and is a goal of several other states. Some, however, have suggested that reliance on two-year institutions encourages a "track-system" whereby low-income students are confined to two-year colleges and higher-income students typically enroll in universities.¹

The problems of providing universal higher education are primarily financial. Various proposals for achieving universal higher education have been offered in the literature. As Hausman summarized:

Except for mandating universal higher education--probably both unaffordable and politically unrealistic--virtually no avenue has been unexplored. Suggestions include variations of the GI Bill of Rights and proposals for vouchers for \$2,500 a year for students to continue their education for at least two years. They range from carefully structured, actuarially based proposals to permit an individual to pay for a college education over a life-time of earnings to unrestricted institutional grants. A number of states--California and Florida, in particular--have sought equal educational opportunity through widespread establishment of two-year colleges.²

Has equality of opportunity been achieved? According to probabilities compiled from Project Talent, there still appears to be room for improvement. In tables prepared by

¹Carnegie Commission on Higher Education, The Capitol and the Campus: State Responsibility for Postsecondary Education (New York: McGraw-Hill Book Company, 1971), p. 82.

²Louis Hausman, "Pressures, Benefits, and Options," Universal Higher Education: Costs and Benefits, (Washington, D. C.: American Council on Education, 1971), p. 14.

Robert Berls,¹ the probability of high school graduates entering college, full or part-time, during the year following their graduation is distinctly related to socioeconomic status (SES): the probability for high SES graduates is 77.9 per cent while low SES graduates have only a 13.9 per cent probability. When the high school graduates are followed for five years there is still a distinct difference since the probability of high SES high school graduates entering college within five years of graduation is 79.4 per cent while the low SES high school graduates show only a 22.8 per cent probability.

The preceding statistics do not prove that the availability of sufficient funds to the low SES graduates would have affected the probability of their attending college. As Berls stated: "The reasons why high school graduates do not enter college are complex, varied, and sometimes conflicting. Socioeconomic status, lack of interest, poor record in high school, and other reasons all have a function, . . ."² However, after reviewing a longitudinal study of 10,000 high school graduates which asked for reasons for not attending college, he concluded: "The two most cited reasons (both sexes combined) were 'not enough money' and 'prefer to work.' Lack of interest, poor ability or low grades, or a preference for marriage in the case of women, were close behind, but lack of money is the predominant reason."³

¹Berls, "Opportunity and Achievement," pp. 149-50.

²Ibid., p. 151.

³Ibid., pp. 152-3.

Berls presents a good review of various studies which cite conflicting opinions on the causes of college attendance patterns. These conflicting opinions primarily included reasons such as lack of interest, parental influence, peer influence, and educational attainment of parents.¹ While these reasons may lessen the impact of the differences in probability of college attendance between low and high SES high school graduates cited previously, they do not convincingly dispel the suspicion that equality of opportunity has not been achieved.

These conflicting reasons, however, are primarily reasons for not wanting to attend college and, according to Bolton, students should have an equal opportunity to go to college--if they desire. Perhaps higher education planners whose espoused goals include equality of opportunity can concentrate on removing financial constraints from those students that desire to go to college and not dilute their energies on students who do not desire to go.

Equality of opportunity does not mean that the planners have to provide the "same opportunity" to all high school graduates. Rather, it means that any high school graduate that desires to improve himself with higher education should not be restrained by a lack of financial resources. The "same opportunity" models (e.g. free tuition or low-tuition models) are

¹Ibid., pp. 151-7.

inefficient since, in a system with constrained resources, they rob the system of funds needed to remove the financial constraints on those high school graduates who desire to go to college but cannot because of a lack of funds.

Current Programs of Student Aid

In order to provide equity and equal opportunity to any student that desires to go to college, many different kinds of "financial aid" programs have been established or proposed across the nation.¹ There are many variations of each but, basically they have the following major features:

Scholarships and Grants: Scholarships and grants may be tax or privately supported. They are usually directed toward individual students on a financial need or ability basis.

The State and Federal governments are increasingly participating in the scholarship method of directing aid to the financially needy and minority groups. For example, the Higher Education Act of 1965 instigated "Opportunity Grants" which were restricted to low-income students, and the Higher Education Amendments of 1972 are an attempt to increase the amount of the grants to the students.

The Amendments of 1972 also propose grants to institutions based partially upon the number of enrolled students with

¹For detailed surveys and critiques of proposals and programs check the Selected Bibliography for Chambers, M. M., and papers in The Economic Committee Report, Financing Higher Education: Alternatives for the Federal Government and Universal Higher Education: Costs and Benefits.

"Opportunity Grants." This obviously encourages the institutions to recruit the low-income students. Some states are increasing the amount of State scholarship funds to help offset the rising student fees and as a means of maintaining or improving equal educational opportunity.

Scholarships and grants are an important type of aid to students, but funds are usually insufficient to have significant effect on equal opportunity for all students. Some students needing aid are unaware of the possibilities of scholarships or grants and, therefore, do not entertain the possibilities of entering college.

The primary criticism of the types of scholarships and grants which are available, however, is concerned with the lack of coordination between the administration of the scholarships and grants and the financing of higher education. The costs of higher education can rise significantly or the number of students needing aid can rise significantly without any effect on the amount of funds available for scholarships and grants.

Wattenbarger comments on the practice of concurrently increasing fees and scholarships:

A common answer to objections to increased student fees is to provide more scholarship funds. This seems to be a peculiar policy, as R. L. Johns of the University of Florida, in a report to the Select Council on Post-High School Education, points out:
"It is an odd policy which would increase fees to avoid increasing appropriations for higher institutions and then provide appropriations for scholarships so that students can pay the fees. If this policy of increasing

fees to finance higher education is based on the assumption that only the students whose parents are able to pay the fees should have the opportunity for a college education, one wonders how such an assumption can be reconciled with the principles of American democracy."¹

Work-Study: The Higher Education Act of 1965 provided reimbursement funds which encouraged prospective employers to hire students on a part-time basis. The funds are used to pay a part of the wage of the student, thus providing the employer with inexpensive labor and the student with a job.

The same criticism stated previously for scholarships and grants prevail in this approach also. That is, there are insufficient funds and a lack of coordination. The amount of funds available in work-study is even less than is available for scholarships and grants.

Another criticism suggests that the employer is getting the aid rather than the student. If the student would have gotten the job at the regular wage, then the Federal funds did not aid the student at all.

Bolton describes another criticism of this financial aid program.

While recognizing the real value of this program, some have questioned it by asking who is really getting the subsidy. One suspects that some of the time spent working must be at the expense of time studying. If

¹James L. Wattenbarger, "Student Fees and Public Responsibility," in Financing Higher Education: Alternatives for the Federal Government, ed. by M. D. Orwig (Iowa City: The American College Testing Program, 1971), p. 152, quoting Roe L. Johns, "Some Notes on the Financing of Higher Education," mimeographed (Gainesville: University of Florida).

the working student sacrifices the quality of his education, what is happening of course is that the rest of the student body is getting some of the subsidy, because the college can reduce the costs it incurs and which must be financed by student fees.¹

Guaranteed Loans: Loans have always been one of the means available for students to finance their education. Recently, however, the Federal government and a large number of states have established guaranteed student loan programs. These loans for the most part, are made to students by private lending agencies and are guaranteed by the State and/or Federal government. For most students, the interest is paid by the Federal government until after the student graduates. The student then has a maximum of ten years to repay the loan plus the interest which is compiled during the repayment period.

Guarantees have their most potent effect on low income students who are financially unable to meet repayments on commercial loans, but are quite confident they can complete an education and use it profitably. For them, the guarantee eliminates the only real barrier, which is the risk their lenders feel.²

The primary criticism of guaranteed loans is well stated by Chambers: "This initial handicap in life is heavily discriminative against young women, as well as discriminative against all students from low-income families, and is retrogressive in tendency."³

¹Bolton, "Economics and Financing: Overview," p. 97.

²Ibid., p. 82.

³M. M. Chambers, Higher Education: Who Pays? Who Gains? (Danville, Illinois: The Interstate Printers and Publishers, Inc., 1968), p. 93.

Bolton adds other criticisms:

A major criticism of the existing loan guarantee programs is that the maximum amounts which can be borrowed are too low, and the repayment periods too short, to be very effective. For undergraduates, a limit of \$1,000-1,500 per year is common, and repayment must be completed by ten years after academic work is finished.

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A second major criticism is that there is some tendency in loan guarantee systems to keep the maximum guaranteed interest rate rigid in the face of changing conditions in the money markets. . . . Keeping the guaranteed rate rigid even when other interest rates are rising makes it very difficult for students to compete with other borrowers, because lenders prefer the higher rates available on other assets nearly as safe. . . . And there is reason to believe that investment by poorer families is the most likely to fall by the wayside when banks and other lenders curtail their loans: the few loans they do make are to established customers or other higher income people whose future business will be substantial, and with whom it is important to keep up banking contacts.¹

Income Contingent Loans: One of the more recent proposals for financing higher education involves a postponement of tuition and/or other educational expenses for the student until he graduates and starts earning money. His repayment scheme is essentially a percentage of his lifetime earnings. Some private institutions, such as Yale University, and the Federal government through the proposed Educational Opportunity Bank are the primary backers of this proposal.

The companion proposal of raising the tuition rates to near full-cost provides immediate relief to the financial

¹Bolton, "Economics and Financing: Overview," pp. 82-3.

problems of higher education institutions. At the present time, this proposal is in the process of full debate and its future is uncertain.

Johnstone presents the case for income contingent loans as resting on the following assumptions:

- 1) Tuitions, fees, and general costs of living borne by the student and/or his family will continue to rise.
- 2) Higher student/family costs will necessitate increasing reliance upon student borrowing.
- 3) Increasing reliance on student borrowing will require loan instruments which provide "more manageable" repayment terms than are currently available under conventional student loan programs.
- 4) At least some students will be more willing to borrow, and will be better able to handle larger debts, if provided with the opportunity to borrow under some form or forms of an income contingent loan.
- 5) Students should be provided with an opportunity to borrow under income contingent as well as conventional, fixed schedule loan contracts.¹

Chambers warns that this proposal would perhaps ". . . create a vast bureaucracy, larger, probably, than the huge social security system."² He also adds that it is apparently a ploy ". . . to keep all higher education on a high-fee basis, and thus permit private colleges to 'live in the style to which

¹D. Bruce Johnstone, New Patterns for College Lending: Income Contingent Loans (New York: Columbia University Press, 1972), pp. 13-17.

²Chambers, Who Pays? Who Gains?, p. 95.

they have become accustomed,' while forcing public institutions into a similar mold of financing."¹

Bolton warns that the program may become loaded with "poor risks" since the students attracted to the plan may well be those students which expect a low income. He concurrently suggests that the students whose incomes are expected to be high may find some other source of aid.²

Tax Credits: Another recent proposal is in the form of a tax credit for higher education expenses. In effect, it allows the student or his parents to deduct educational expenses, up to a stated maximum, from their Federal income tax obligation.

Bolton reports that some people oppose tax credits because they ". . . give too much aid to high income families who don't need it and too little to poorer ones who do."³ He also states that some of its critics proposed it would ". . . be less useful in stimulating higher education than other possible uses of Federal funds."⁴ Chambers agrees with the latter point and adds that it ". . . would cost the government the loss of more than \$1 billion annually in revenue . . ."⁵

¹Ibid.

²Bolton, "Economics and Financing: Overview," pp. 90-91.

³Ibid., p. 94.

⁴Ibid., p. 95.

⁵Chambers, Who Pays? Who Gains?, p. 95.

He continues with, "For example, \$1 billion would be ample to make all public universities entirely tuition-free."¹

Voucher Plan: The Voucher Plan would provide grants (vouchers) directly to low-income students to be used at any eligible institution. The amount of the grant would be dependent upon the ability of the student or his family to contribute to the educational expenses of the student. Since the student may take the grant to any eligible institution (even private institutions), the institutions presumably are more competitive and diverse and the students enjoy a greater freedom of choice.

Since the grants would utilize a portion of the State appropriation, the tuition would be raised perhaps to full-cost to maintain the same level of institutional expenditure. The grants would then off-set the costs of education (even at the increased tuition level) for the low-income students, and provide them with an equal educational opportunity.

The primary issue for criticism and praise of the voucher plan is related to the concept that higher education institutions would become similar to marketplaces since students could go where they wanted. In other words, the institutions would be offering programs in an attempt to attract students--not necessarily because the programs were needed. Balderston reminds: ". . . major new fields and topics of

¹Ibid.

study have developed from breakthroughs in scholarly research and new perceptions of how to organize training for the professions, not from swings in student attention-focus."¹ He adds later, however, that under certain conditions, the voucher system could increase the independence of the institutions and ". . . decrease the hazards of bureaucratic management of higher education budgets and of political intervention."²

Low Tuition: Low tuition is by far the most wide-spread method of providing financial assistance and equal opportunity to students. Traditionally, the tuition has been low to provide equal opportunity. As Bowen summarized:

Traditionally in America, low tuitions have been advocated to 'keep open the doors of opportunity to aspiring young men and women.' The raising of tuitions has almost always been done reluctantly, and only when other sources have proved inadequate.³

Has low tuition promoted greater opportunity for all students? Hansen and Weisbrod are doubtful. They claim that the uniform tuition rate provides a "windfall" for the more financially able and does not help the lower-income student.⁴

¹Frederick E. Balderston, Financing Postsecondary Education: Statement to the Joint Committee on the Master Plan for Higher Education of the California Legislature (Berkeley, California: University of California, 1972), p. 26.

²Ibid.

³Howard R. Bowen, "Tuition and Student Loans in the Finance of Higher Education," in Economic Report, p. 624.

⁴Hansen and Weisbrod, "Search for Equity," p. 114.

They also say:

Some low-income persons have benefitted handsomely from the availability of publicly-subsidized higher education. But on the whole, the effect of these subsidies is to promote greater rather than less inequality among people of various social and economic backgrounds, by making available substantial subsidies that lower-income families are either not eligible for or cannot make use of because of other conditions and constraints associated with their income position.¹

Cartter says it a little more succinctly: ". . . it can be argued that low tuition is an inefficient means of distributing aid."²

The criticism of this type of student fee system is increasing across the nation. As Orwig summarized:

But in addition to these incremental tuition increases resulting in part from the exigencies of public budget constraints, the low cost public education model is increasingly criticized as an inequitable and an inefficient mechanism for the support of public higher education.³

Hanson and Weisbrod add that the low cost public education model affects the distribution of students to the extent that half can pay more than they do now and the other half often goes deeply into debt--often dropping out of school because of financial pressures. They also state that an additional group of able young people cannot even enroll because of financial problems.⁴ They continue later:

¹Ibid., pp. 122-23.

²Cartter, "Student Financial Aid," p. 115.

³Orwig, "Summarizing the Issues," p. 337.

⁴Hansen and Weisbrod, "Students and Parents," p. 118.

Surely there must be some better system of financing higher education, one which avoids these results without producing other undesirable effects.¹

Summary

Historically administrators have been cognizant of the process of decision-making in the achievement of the goals of their organization. They also have been very cognizant of the power inherent in the process of budgeting operational funds toward the achievement of organizational goals.

American higher education, on the other hand, has been noticeably reticent in its awareness and application of these two processes. Perhaps because of the general nature of most goals of higher education or because of their conflicting nature, concrete methods of concurrently achieving most goals have not been articulated nor have operational funds been allocated toward their achievement.

Even some singular goals have not been achieved very well. For example, equality of opportunity has long been a goal of American higher education and student aid programs have been devised and implemented to aid in the achievement of this goal. For the most part, however, the student aid programs are fragmented and underfinanced and have generally failed in the achievement of equality of opportunity or any of the other student-related goals.

¹Ibid.

CHAPTER III

RESEARCH DESIGN

Design of the Model

As stated in the objectives of this study, the student fee model must include two basic components--the weighting system and allocation system. The weighting system is required to provide each decision-maker with a systematic procedure he can use to derive the optimal mixture of goals he perceives his particular educational system should be trying to achieve. The allocation system is required to provide a means to allocate funds toward the achievement of the goals as specified in the weighting system.

Definitions of Model Terminology

In addition to the general definitions in the first chapter, there exist words and expressions utilized in the model design which have special definitions. These definitions are as follows:

Student Characteristics: Those attributes of a student which are judged by the decision-maker to be important in the determination of his student fees and/or subsidy.

Student Category: A set of students which display the same student characteristic measures. Each unique combination of measures of student characteristics will constitute a distinct student category.

Criteria Weight: A real number, ranging from zero to one, assigned to each criteria (goal, subgoal, or student characteristic) as a measure of perceived relative importance.

The general goals are represented as a hierarchy within which subgoals can be identified. These subgoals can continue to be subdivided, if necessary, until the lowest-level subgoals are measurable as student characteristics. A set of criteria weights is then established for all the sets of criteria.

The set of weights assigned to each set of criteria has a sum of one. This restriction has the effect of normalizing all the weights and of aiding the decision-maker in assigning the weights. Each weight which is assigned to a criterion is interpreted to be a measure of the relative importance of that criterion when compared to the other criterion within the same higher-level criterion. The relative importance between two criteria weights is equivalent to the ratios of the assigned weights. For example, in a set of two criteria, where one is perceived to be three times as important as the other, the weights should be assigned as .75 and .25 respectively.

Effective Weights: The effective weight for each student characteristic is computed by multiplying together the "chain" of criteria weights associated with it. In other words,

each assigned weight of every higher-level criteria which is associated with a student characteristic is involved in the product.

Total Worth Score: A total worth score is computed for each student category by summing the effective weights assigned to each of the student characteristics in the student category.

Design Criteria and Their Justification

The objective of this study will be accomplished when the proposed student fee model satisfies the following design criteria:

- 1) The model must mathematically permit the consideration of an unlimited number of goals, subgoals, and student characteristics.

This criterion is needed to insure flexibility for each decision-maker. Some decision-making entities may desire to include only a few criteria whereas others may desire a highly complex and many-faceted decision model. In most cases this determination will probably be based upon the availability of appropriate data although political considerations may also be a factor.

- 2) The model must be designed such that a perceived ratio of relative importance between any two criteria in the same set can be multiplied by one criterion's weight in order to determine the weight of the other criterion.

This criterion is needed to enable the decision-maker in establishing his criteria priorities and their relative importance to his particular realm of responsibility. By

requiring this design criterion, the decision-maker can readily establish and adjust the measure of importance he assigned to any one criteria.

- 3) Each student's subsidy should vary proportionately with the cost of his degree program.

This design criterion is needed as an enabling criterion for those decision-making entities with this particular philosophy and with the capability of program budgeting. In other words, the model should allow the philosophy of the subsidy and/or fees varying with the degree program cost but yet it should not prescribe it. If a particular decision-making entity does not have degree program costs or if this is not one of its goals, then the various degree program costs can easily be replaced by an institution-wide average cost per student or some other such cost measure.

- 4) Each student's subsidy should vary proportionately as his total worth score varies.

This design criterion is obviously needed to establish the relationship between the worth scores, the subsidies, and the assessment of student fees. The worth scores are measures of importance to the decision-making entity so, if all other factors are held constant: the higher the total of a student's worth score, the higher the subsidy; and the lower the total worth score, the lower the subsidy.

- 5) Each student's subsidy should vary proportionately as the amount of non-student-fee revenue varies.

Since a basic assumption of this study is that the student pays fees to supplement constrained resources, the model must be designed such that the subsidies are allocated first and the fees are the difference in the subsidy and the cost. Therefore, the design of the model should insure that the higher the level of non-student-fee revenue; the higher the subsidy; and the lower the level of non-student-fee revenue, the lower the subsidy.

- 6) Each student's fee should vary proportionately as the number of enrolled students varies.

The amount of non-student-fee funds is to be allocated to the students in the form of subsidies. Therefore, for a given amount of non-student-fee funds: as more students enroll, the less the subsidy, and the greater the resultant fee; and as less students enroll, the greater the subsidy, and the less the resultant fee.

- 7) The model must combine the weighting system and the allocation system so that the decision-maker can vary the amount of subsidy toward any combination of student characteristics.

This design criterion is needed to insure that the decision-maker can use the model as an allocative device to aid in the achievement of student-related goals.

The Weighting System

The weighting system described herein is adapted from Miller's Professional Decision-Making.¹ In his book, Miller

¹James R. Miller, III, Professional Decision-Making (New York: Praeger Publishers, 1970).

systemized and validated a procedure for evaluating complex alternatives. Miller developed the procedure to enable decision makers in their choice of an alternative when multiple considerations are inherent in the decision process. Miller's procedure provides the decision-maker with "total worth scores" for each alternative which allows the decision-maker to select the alternative with the highest total worth score as the best alternative. The total worth score is the sum of the "effective weights" assigned to each alternative according to its perceived worth by the various criteria.

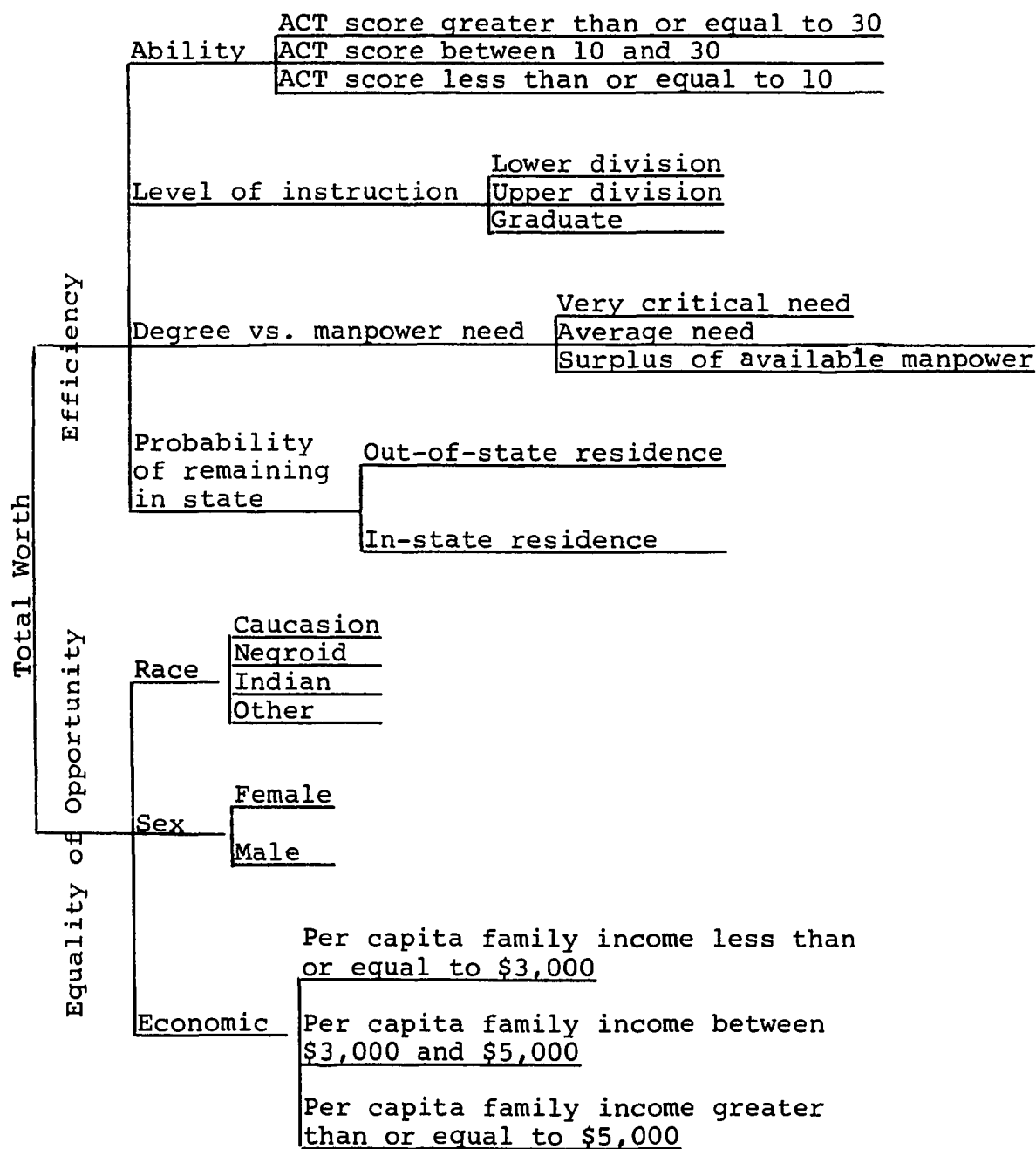
The primary adaptation of Miller's procedure for the weighting system as utilized in the student fee model is in the use of the total worth scores. Whereas Miller's procedure was designed to enable decision-makers to select one alternative based upon the highest worth score, the student fee model will use all the total worth scores as weights in the allocation system. The "alternatives" in the student fee model will be different student categories which represent sets of students displaying identical student characteristics.

For example, Figure 1 demonstrates a sample hierarchy of goals, subgoals, and student characteristics which might be utilized in the student fee model. Each branch of the hierarchy could be expanded or reduced depending upon the desires of the decision-maker or the availability of data.

In essence, the hierarchy in Figure 1 was constructed using the following procedure. The broad goals which were

FIGURE 1

SAMPLE HIERARCHY OF GOALS, SUBGOALS,
AND STUDENT CHARACTERISTICS



deemed to be important were equity, equality of opportunity, and efficiency.

Efficiency was defined as societal economic efficiency. In other words, the goal of efficiency was established to subsidize those students who would return a higher economic yield to society. Efficiency was subdivided into four subgoals: ability level of the student; level of study; probability of remaining in the state after graduation, and; the degree program as it relates to manpower supply and demand.

Equality of opportunity was selected as a goal to expedite the removal of barriers which inhibit attendance in higher education. This goal was subdivided into three subgoals: race of the student; sex of the student, and; economic level of the student and/or his family.

The goal of equity was defined as a procedure whereby students would be granted subsidies and assessed student fees according to the set of criteria defined for the student-related goals of equality of opportunity and efficiency and identically applied to each student's unique combination of student characteristics. The application of the model, therefore, constituted achievement of the goal of equity.

Each subgoal was assigned a measurable criteria which was a student characteristic. The subgoals and their related student characteristics are defined as follows:

Ability Level - High ability; those students with ACT scores greater than or equal to 30.

- Average ability; those student with ACT scores between 10 and 30.
- Low ability; those students with ACT scores less than or equal to 10

Level of Study- Lower division; freshman and sophomore students

- Upper division; junior and senior students
- Graduate division; graduate students

Probability of Remaining in the State - High probability; in-state residents

- Low probability; out-of-state residents

Manpower Need - Very critical need for manpower from student's degree program

- Average need for manpower from student's degree program
- Surplus of available manpower from student's degree program

Race - Caucasian students

- Negroid students
- Indian students
- Other students

Sex - Female student

- Male student

Economic - Low income; those students whose family has an adjusted income of less than or equal to \$3,000 per family member

- Average income; those students whose family has an adjusted income of between \$3,000 and \$5,000 per family member.

- High income; those students whose family has an adjusted income of greater than or equal to \$5,000 per family member.

The weights for the hierarchy are assigned according to the desired relative importance of each set of goals, subgoals, and student characteristics at each branch of the hierarchy. The weights for each set of criteria must be positive, and add to one. In Figure 2, for example, the two primary goals of efficiency and equality of opportunity form a set of goals. One goal was perceived to have a relative importance of one and one-half times the other -- so the goals were assigned weights of 0.40 and 0.60 ($0.40 + 0.60 = 1$).

Within the goal of equality of opportunity are three subgoals which form a set of subgoals -- they too are assigned positive weights such that their sum is one. The same technique is applied to the set of four subgoals of efficiency. Then each subgoal's student characteristics are treated similarly until, in this sample, each student characteristic has three weights associated with it -- the weight of the primary goal, the subgoal and its own. The effective weights for each

FIGURE 2

SAMPLE ASSIGNMENT OF CRITERIA WEIGHTS
AND EFFECTIVE WEIGHTS

<u>Criteria</u>	<u>Criteria Weights</u>			<u>Effective Weights</u>
Equality of Opportunity	.60			
Race	.10			
Caucasian		.10		0.006
Negroid		.40		0.024
Indian		.40		0.024
Other		.10		0.006
		<u>1.00</u>		
Sex	.10			
Male		.40		0.024
Female		.60		0.036
		<u>1.00</u>		
Economic	.80			
Low Income		.60		0.288
Average Income		.30		0.144
High Income		.10		0.048
		<u>1.00</u>	<u>1.00</u>	
Efficiency	.40			
Ability	.20			
High Ability		.60		0.048
Average Ability		.30		0.024
Low Ability		.10		0.008
		<u>1.00</u>		
Level of Instruction	.20			
Lower Division		.60		0.048
Upper Division		.30		0.024
Graduate		.10		0.008
		<u>1.00</u>		
Degree Program	.40			
Very Critical Need		.50		0.080
Average Need		.40		0.064
Surplus		.10		0.016
		<u>1.00</u>		
Probability of Remaining in State	.20			
Out-of-State Residence		.20		0.016
In-State Residence		.80		0.064
	<u>1.00</u>	<u>1.00</u>	<u>1.00</u>	<u>1.000</u>

of these three associated weights (e.g. caucasian-- (e.g. .10 X .10 X .10 = 0.006)).

The Allocation System

The following equation constitutes the allocation system of the student fee model for each student in student category p:

$$SF_p = C_p - \frac{C_p W_p}{\sum_{j=1}^m N_j C_j W_j} \cdot A, \quad (1)$$

where:

SF_p = student fee of each FTE student in student category p,

C_j = cost per FTE per academic year for the degree program
in student category j.

W_j = total worth score for student category j.

N_j = number of FTE students in student category j.

A = amount of non-student-fee revenue to be allocated as
subsidies,

m = the number of student categories in which students are
enrolled.

In non-mathematical language, the student fee for each student in a given student category is determined by subtracting the amount of the subsidy from the degree program cost. The subsidy is computed by: multiplying the program cost by the total worth score of the category; dividing the product by the sum of all such products which have been weighted or multiplied by the number of students in the respective categories;

multiplying the quotient by the total amount of money to be allocated as subsidies.

Obviously, the subsidy, S_p , for each student in student category p is

$$S_p = \frac{C_p W_p}{\sum_{j=1}^m N_j C_j W_j} \cdot A, \quad (2)$$

so that the basic equation for determining a student's fee agrees with the basic assumption that the student pays in fees the difference between his program cost and his subsidy. By substituting equation (2) into equation (1), the basic equation becomes

$$SF_p = C_p - S_p. \quad (3)$$

Other derived equations are also obvious. For example, the sum of all subsidies must be equal to the total non-student-fee revenue:

$$\sum_{j=1}^m N_j S_j = \sum_{j=1}^m \frac{N_j C_j W_j}{\sum_{j=1}^m N_j C_j W_j} \cdot A = A. \quad (4)$$

Another equation indicates that the sum of the students in all m student categories constitute the total enrollment of the educational entity:

$$\sum_{j=1}^m N_j = \text{Total FTE Enrollment}. \quad (5)$$

The total budget needs of the educational entity is given by the summation of all students' program cost:

$$\text{Total Budget Needs} = \sum_{j=1}^m N_j C_j. \quad (6)$$

The total amount of student fee revenues is the sum of all student fees:

$$\text{Total Student Fee Revenue} = \sum_{j=1}^m N_j \cdot SF_j. \quad (7)$$

Methodology and Data Collection

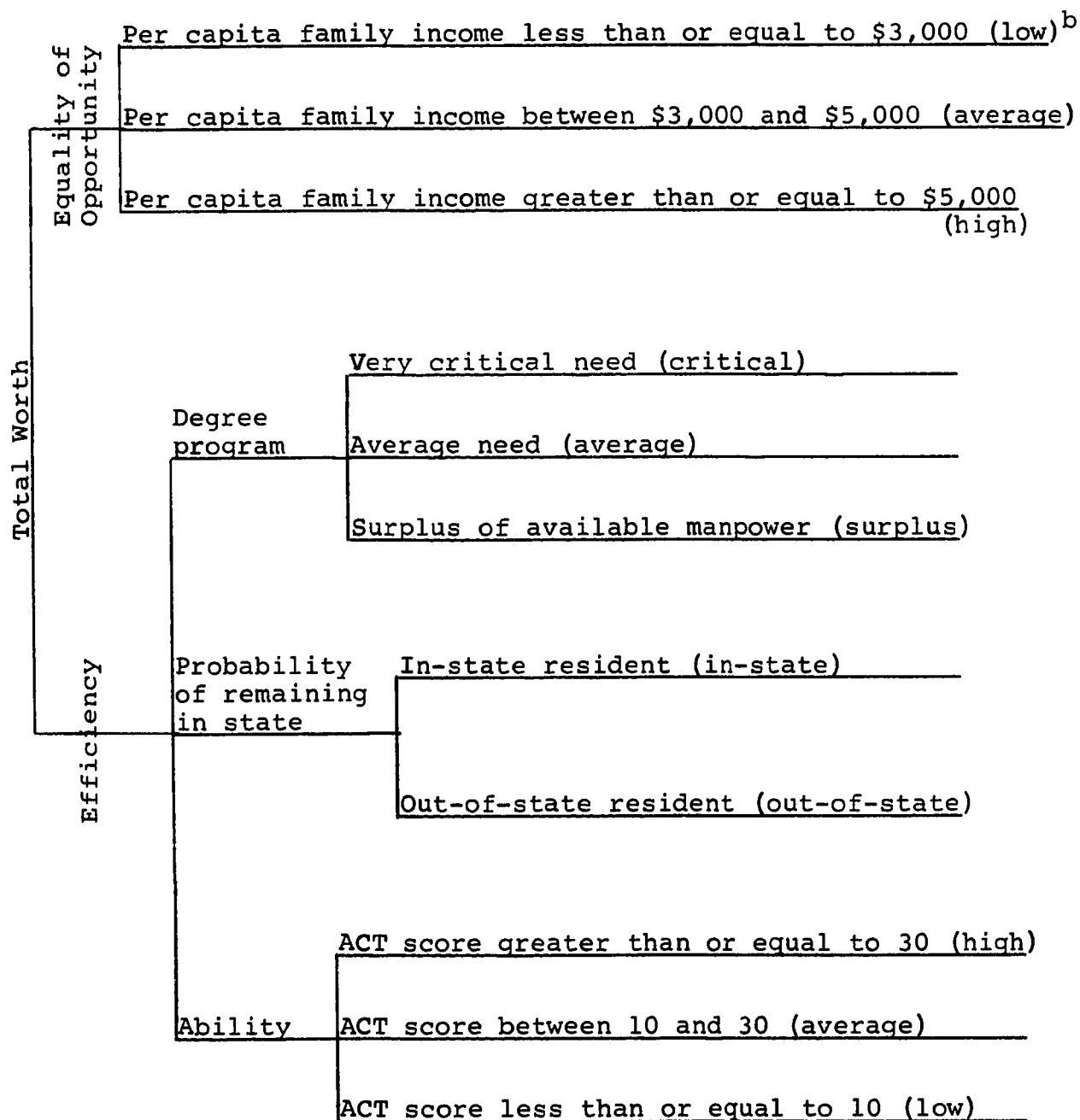
The methodology for testing the satisfaction of the design criteria will be by mathematical proofs. The design criteria will also be demonstrated by trial runs of the model on a sample institution. The various trial runs will serve primarily as examples to aid in the understanding and implementation of the model.

Description of Sample Institution

For computation ease, a sample institution was constructed with five degree programs and 259 FTE students. Pertinent information relative to the sample institution is displayed in Table 2. The hierarchy of goals and student characteristics which were utilized in the weighting system for the trial runs is displayed in Figure 3. The student characteristics utilized in the trial runs were arbitrarily distributed over the enrollment in the five programs to provide a range of combinations of characteristics. This distribution is displayed in Table 3. The level of funding of non-student-fee revenue allocated as subsidies was set at approximately 75 per cent of the total budget needs of \$333,098 or \$250,000.

FIGURE 3

HIERARCHY OF GOALS, SUBGOALS AND STUDENT
CHARACTERISTICS^a UTILIZED IN TRIAL
RUNS OF STUDENT FEE MODEL



^aSee pages 51-53 for precise definitions of criteria,

^bWords in parenthesis indicate abbreviations used in tables for the corresponding student characteristics.

TABLE 2
FINANCIAL AND ENROLLMENT DATA FOR
THE SAMPLE INSTITUTION

<u>Degree Program</u>	<u>Number of FTE Enrolled</u>	<u>Cost per FTE per Academic Year</u>	<u>Total Program Cost per Academic Year</u>
Accounting	19	\$1,842	\$34,998
Chemistry	21	2,110	44,310
Elementary Educ.	154	1,140	175,560
Management	8	1,300	10,400
History	<u>57</u>	<u>1,190</u>	<u>67,830</u>
Institution	259	\$1,286	\$333,098

Purpose and Explanation of Trial Runs

As stated earlier, the trial runs provide guidance in the implementation of the student fee model while simultaneously demonstrating its flexibility. The various trial runs demonstrate the effect on subsidies and fees of different weights assigned to the goals, subgoals, and student characteristics. The financial and enrollment data and the distribution of student characteristics are held constant throughout the trial runs.

For computational ease, only a portion of the criteria have been selected from Figure 1 to be used in the trial runs. The goals, subgoals, and student characteristics which were selected allows 54 different combinations ($3 \times 3 \times 3 \times 2 = 54$) of student characteristics. This number combined with the five different program costs allows 270 ($5 \times 54 = 270$) different

student categories. This number of student categories was sufficient to demonstrate the flexibility of the model.

The results of the trial runs and pertinent and related data are contained in Appendix A through Appendix E. Table 1 of each appendix shows the goals, subgoals and student characteristics with their assigned weights and effective weights. Table 2 of each appendix shows the distribution of effective weights and the computation of the total worth scores for each of the student categories in which students are enrolled. Table 3 of each appendix displays the data involved in the computation and the resultant subsidies and student fees for each student in each student category.

In addition, Appendix F displays in one table the results of all five trial runs. It is suggested, however, that the reader read the appropriate sections in Chapter IV describing the trial runs before consulting Appendix F.

TABLE 3

DISTRIBUTION OF STUDENT CHARACTERISTICS
IN SAMPLE INSTITUTION

Degree Program	Number of FTE Enrolled	Student Characteristics										
		Income			Manpower Need			Residence		Ability		
		low	avg	high	critical	avg	surplus	in state	out-of state	high	avg	low
Accounting	19	3	13	3	19	0	0	18	1	3	15	1
Chemistry	21	4	14	3	0	21	0	20	1	1	17	3
Elementary Education	154	26	97	31	0	0	154	144	10	3	142	9
Management	8	1	6	1	0	8	0	7	1	0	7	1
History	57	10	34	13	0	57	0	54	3	0	56	1
Institution	259	44	164	51	19	86	154	243	16	5	239	15

CHAPTER IV

SATISFACTION OF DESIGN CRITERIA AND DEMONSTRATION OF THE STUDENT FEE MODEL

This chapter is devoted to showing satisfaction of the design criteria and displaying the results and analyses of the trial runs. As was indicated in the previous chapter, the design criteria can be shown to be satisfied by mathematical proofs. These proofs are contained in the next section. The data, calculations and results of the trial runs are contained in the appendices. Pertinent summaries, analyses and comments are contained in this chapter as aids to the understanding and application of the student fee model.

Satisfaction of Design Criteria

Design Criterion 1: The model must mathematically permit the consideration of an unlimited number of goals, subgoals, and student characteristics.

Since the weighting scheme is the same for goals, subgoals, and student characteristics, it will be sufficient to prove that the model will mathematically permit an unlimited number of either. The proof shall be for goals and will be by mathematical induction.

Given n goals ($n > 1$) with corresponding weights W_1, W_2, \dots, W_n where $0 < W_j < 1$ and $\sum_{j=1}^n W_j = 1$, prove there can exist $n + 1$ goals with weights G_j such that $0 < G_j < 1$ and $\sum_{j=1}^{n+1} G_j = 1$.

Obviously there exist two such weights. For example, $0.50 + 0.50 = 1$.

Assume for some particular $n = k$ that $W_1 + W_2 + \dots + W_k = 1$. Now pick any W_j , say W_s , then for any real number $m > 1$

$$W_s = \frac{m}{m} \cdot W_s = m \left(\frac{W_s}{m} \right) = \frac{W_s}{m} + (m - 1) \frac{W_s}{m}.$$

Therefore, $W_1 + W_2 + \dots + W_s + \dots + W_k = W_1 + W_2 + \dots$

$+ \frac{W_s}{m} + (m - 1) \frac{W_s}{m} + \dots + W_k = 1$, which means there exists $k + 1$ terms G_j where $0 < G_j < 1$ and $\sum_{j=1}^{k+1} G_j = 1$.

Therefore, if there exist an $n = k$ for which $\sum_{j=1}^k W_j = 1$ and

$0 < W_j < 1$, there also exist an $n = k + 1$ for which $\sum_{j=1}^{k+1} G_j = 1$

and $0 < G_j < 1$. Since it is true for $n = 2$, as shown above, it is true for $n = 2 + 1 = 3$, etc.

Design Criterion 2: The model must be designed such that a perceived ratio of relative importance between any two criteria in the same set can be multiplied by one criterion's weight in order to determine the weight of the other criterion.

Let $\{G_n\}$ represent a sequence of n criteria ranked in descending order of importance. Let $\{m_i \mid i = 2, 3, \dots, n\}$ represent the perceived ratios of relative importance between any two criteria G_p and G_q such that $m_p = \frac{G_p}{G_q}$ and where $0 < m_i \leq 1$. Proof is needed that there exists a sequence of real numbers $\{a_n\}$ corresponding to $\{G_n\}$, where $0 < a_j < 1$ and $a_p = m_p \cdot a_q$ such that $\sum_{j=1}^n a_j = 1$.

Pick any real number $X > 0$.

Then there exists a sequence $X, Xm_2, Xm_3, \dots, Xm_n$ whose sum can be denoted as a positive number K ;

$$X + Xm_2 + Xm_3 + \dots + Xm_n = K,$$

$$\text{then } \frac{X}{K} + \frac{Xm_2}{K} + \frac{Xm_3}{K} + \dots + \frac{Xm_n}{K} = 1.$$

Since $0 < \frac{X}{K} < 1$ and $0 < m_i \leq 1$ then $0 < \frac{Xm_i}{K} < 1$ for all i .

Therefore, if we let $a_1 = \frac{X}{K}$ and $a_j = \frac{Xm_i}{K}$ for $j = i$, then there does exist a sequence of real numbers $\{a_n\}$ such that $a_p = m_p a_q$

and $0 < a_j < 1$ and where $\sum_{j=1}^n a_j = 1$.

Design Criterion 3: Each student's subsidy should vary proportionately with the cost of his degree program.

From equation (2) in Chapter 3, the subsidy S_p for all students in student category p is given by

$$S_p = \frac{C_p W_p}{\sum_{j=1}^m N_j C_j W_j} \cdot A.$$

but

$$\frac{C_p W_p}{\sum_{j=1}^m N_j C_j W_j} \cdot A = \frac{C_p W_p \cdot A}{\sum_{j=1}^{p-1} N_j C_j W_j + N_p C_p W_p + \sum_{j=p+1}^m N_j C_j W_j}.$$

There are two limits on the program cost: it can increase indefinitely (i.e., $C_p \rightarrow \infty$) or it can approach zero (i.e., $C_p \rightarrow 0$). Therefore, if $C_p \rightarrow 0$, then

$$\begin{aligned} \lim_{C_p \rightarrow 0} S_p &= \lim_{C_p \rightarrow 0} \frac{C_p W_p A}{\sum_{j=1}^{p-1} N_j C_j W_j + N_p C_p W_p + \sum_{j=p+1}^m N_j C_j W_j} \\ &= \frac{0}{\sum_{j=1}^{p-1} N_j C_j W_j + 0 + \sum_{j=p+1}^m N_j C_j W_j} = 0. \end{aligned}$$

If $C_p \rightarrow \infty$, then

$$\begin{aligned} \lim_{C_p \rightarrow \infty} S_p &= \lim_{C_p \rightarrow \infty} \frac{C_p W_p A}{\sum_{j=1}^{p-1} N_j C_j W_j + N_p C_p W_p + \sum_{j=p+1}^m N_j C_j W_j} \\ &= \lim_{C_p \rightarrow \infty} \frac{W_p A}{\left(\sum_{j=1}^{p-1} N_j C_j W_j \right) \div C_p + N_p W_p + \left(\sum_{j=p+1}^m N_j C_j W_j \right) \div C_p} \\ &= \frac{W_p A}{0 + N_p W_p + 0} = \frac{A}{N_p}. \end{aligned}$$

Therefore, as the program cost of a particular student category varies from zero to infinity, the subsidy for each student in the student category will vary from zero to an equal share of the total non-student-fee revenue with other students

in the same category.

Design Criterion 4: Each student's subsidy should vary proportionately as his total worth score varies.

Since the total worth score W_p for student category p has the same type of influence in equation (2) of Chapter 3 as the program cost, C_p , this proof would be identical to the proof for design Criterion 3 and will not be repeated here. See the proof of design Criterion 7 for the range of subsidy values as W_p varies.

Design Criterion 5: Each student's subsidy should vary proportionately as the amount of non-student fee revenue varies.

The amount of non-student-fee revenue, A , can increase indefinitely (i.e., $A \rightarrow \infty$) or it can approach zero (i.e., $A \rightarrow 0$). From equation (2) in Chapter 3, if $A \rightarrow 0$ then

$$\lim_{A \rightarrow 0} S_p = \lim_{A \rightarrow 0} \frac{C_p W_p A}{\sum_{j=1}^m N_j C_j W_j} = 0 .$$

If $A \rightarrow \infty$, then

$$\lim_{A \rightarrow \infty} S_p = \lim_{A \rightarrow \infty} \frac{C_p W_p A}{\sum_{j=1}^m N_j C_j W_j} = \frac{C_p W_p \cdot \infty}{\sum_{j=1}^m N_j C_j W_j} = \infty .$$

Therefore, as the non-student-fee revenue decreases towards zero each student's subsidy will approach zero. Similarly, as the non-student-fee revenue increases indefinitely, each student's subsidy will increase indefinitely.

Design Criterion 6: Each student's fee should vary proportionately as the number of enrolled students varies.

From equation (1) in Chapter 3, the student fee for student category p is

$$SF_p = C_p - \frac{C_p W_p}{\sum_{j=1}^m N_j C_j W_j} \cdot A.$$

Conceptually, the number of enrolled students can increase indefinitely (i.e., $\sum_{j=1}^m N_j \rightarrow \infty$) or it can decrease towards one (i.e., $\sum_{j=1}^m N_j \rightarrow 1$).¹ Furthermore, if $\sum_{j=1}^m N_j \rightarrow \infty$ then $N_j \rightarrow \infty$ for at least one j ; and if $\sum_{j=1}^m N_j \rightarrow 1$ then $N_j \rightarrow 1$ for some one j , call it p .

Therefore, if $\sum_{j=1}^m N_j \rightarrow \infty$, then

$$\begin{aligned} \lim_{\sum_{j=1}^m N_j \rightarrow \infty} SF_p &= \lim_{\sum_{j=1}^m N_j \rightarrow \infty} \left(C_p - \frac{C_p W_p A}{\sum_{j=1}^m N_j C_j W_j} \right) \\ &= \lim_{\sum_{j=1}^m N_j \rightarrow \infty} C_p - \lim_{\sum_{j=1}^m N_j \rightarrow \infty} \frac{C_p W_p A}{\sum_{j=1}^m N_j C_j W_j} \\ &= C_p - \frac{C_p W_p A}{\infty} = C_p - 0 = C_p. \end{aligned}$$

¹If the student fee model is to allocate subsidies to students and assess student fees, there needs to exist at least one student.

If $\sum_{j=1}^m N_j \rightarrow 1$, then

$$\begin{aligned} \lim_{\sum_{j=1}^m N_j \rightarrow 1} SF_p &= \lim_{\sum_{j=1}^m N_j \rightarrow 1} C_p - \lim_{\sum_{j=1}^m N_j \rightarrow 1} \frac{C_p W_p A}{\sum_{j=1}^m N_j C_j W_j} \\ &= C_p - \frac{C_p W_p A}{1 \cdot C_p W_p} = C_p - A \end{aligned}$$

Therefore, as the number of enrolled students increases indefinitely, each students' fee approaches the program cost of his student category. As the number of enrolled students decreases toward one, each enrolled student's fee approaches a subsidy which is equal to the difference in his program cost and the amount of non-student-fee revenue.

Design Criterion 7: The model must combine the weighting system and the allocation system so that the decision-maker can vary the amount of subsidy toward any combination of student characteristics.

Each student category represents a unique combination of student characteristics. Any particular student category p is represented by the total worth score of W_p and the minimum and maximum values for W_p are zero and one respectively. Before proving the design criteria, proof is needed of:

if $W_p \rightarrow 1$ then $W_j \rightarrow 0$ where $j \neq p$,
and if $W_p \rightarrow 0$ then $W_j \rightarrow 1$ for at least one $j \neq p$.

Suppose the sequence of all n effective weights is

$\{e_n\}$ where $\sum_{i=1}^n e_i = 1$ and where $\{e_n\}$ represents the weight of n possible student characteristics. Partition $\{e_n\}$ into t sets of student characteristic effective weights such that from each set one and only one effective weight can be assigned to any student in student category p such that:

$$S_1 = e_1, e_2, \dots, e_{a_1},$$

$$S_2 = e_{a_1+1}, \dots, e_{a_2},$$

$$\vdots$$

$$S_s = e_{a_{s-1}+1}, \dots, e_{a_s},$$

$$\vdots$$

$$S_t = e_{a_{t-1}+1}, \dots, e_n \text{ where } 1 \leq a_s \leq n, \text{ for } s = 1, 2,$$

$$\dots, t.$$

When $W_p = \sum_{s=1}^t e_s$ where e_s is the effective weight assigned

to student category p from partition S_s . It is easily seen, there-

fore, that if $W_p \rightarrow 1$ then $\sum_{s=1}^t e_s \rightarrow 1$ and since $\sum_{i=1}^n e_i = 1$ then

$\sum_{i=1}^n e_i \rightarrow 0$ for all $i \neq s$ and $W_j \rightarrow 0$ for all $j \neq p$.

Similarly, if $W_p \rightarrow 0$ then $\sum_{s=1}^t e_s \rightarrow 0$ and since $\sum_{i=1}^n e_i = 1$

then $\sum_{i=1}^n e_i \rightarrow 1$ for all $i \neq s$. If $\sum_{i=1}^n e_i \rightarrow 1$ for $i \neq s$, then

there must exist at least one W_q , $q \neq p$ such that W_q increased toward one (i.e., $W_q \rightarrow 1$).

Therefore, to prove design Criterion 7, from equation (2) of Chapter 3, if $W_p \rightarrow 1$, then

$$\begin{aligned}
\lim_{W_p \rightarrow 1} S_p &= \lim_{W_p \rightarrow 1} \frac{C_p W_p A}{N_p C_p W_p + \sum_{j=1}^{p-1} N_j C_j W_j + \sum_{j=p+1}^m N_j C_j W_j} \\
&= \frac{C_p \cdot 1 \cdot A}{N_p C_p \cdot 1 + 0 + 0} = \frac{C_p A}{N_p C_p} = \frac{A}{N_p} .
\end{aligned}$$

Similarly, if $W_p \rightarrow 0$, then

$$\begin{aligned}
\lim_{W_p \rightarrow 0} S_p &= \lim_{W_p \rightarrow 0} \frac{C_p W_p A}{N_p C_p W_p + \sum_{j=1}^{p-1} N_j C_j W_j + \sum_{j=p+1}^m N_j C_j W_j} \\
&= \frac{0}{0 + N_q \cdot C_q \cdot 1 + 0} = 0 .
\end{aligned}$$

Therefore, as the worth score for any particular combination of student characteristics approaches one, the subsidy for each student in the student category approaches an equal share of the non-student-fee revenue with the other students in the same student category. As the worth score for any particular combination of student characteristics approaches zero, each student's subsidy in the student category approaches zero.

Demonstration of the Student Fee Model

The intent of this section is to provide guidance in the application of the student fee model. Guidance is needed particularly in the adjustment of weights to produce the desired range of student fees.

The trial runs contained in the appendices are examples of the effects of differently assigned weights. The reader should be cautioned in trying to trace the effect of a particular shift in weights from one trial run to another because of the "trade-off effect." The "trade-off effect" originates from the fact that to add weight to one criteria means the weight has to be subtracted from another. Since every student category contains four student characteristics, it is possible, from one trial to another, for the expected effect on a particular student category to be muted because of the offsetting effect of another characteristic's decreased weight.

Properties of the Model

The weighting system can be adjusted more effectively and the "trade-off effect" used to an advantage if the following properties of the weighting system are understood:

- 1) Each goal and subgoal have imbedded in them opposing student characteristics so that the weights for the goals and subgoals have to be adjusted in conjunction with the weights for the student characteristics.
- 2) The allocation of subsidies and the subsequent assessment of student fees in a particular student category is determined by the relative impact of the student category.
- 3) The relative impact of a student category is affected by: its program cost; its FTE enrollment; its total worth score; the total impact of all student categories.

- 4) The total impact of all student categories will change as the criteria weights are adjusted because of the distribution of students with new total worth scores.

Explanation and Demonstration of Model Properties

Property 1: The student fee model is designed to allow decision-makers the opportunity of targeting the allocations at particular types or groups of students (low-income students, for example). An opposing student characteristic of low-income students would be high-income students. Thus, if the weight assigned to the goal of equality of opportunity is raised, with the purpose of lowering fees for low-income students, without a concurrent lowering of student characteristic weight for high-income students, the net effect is likely to assess lower student fees for high-income students also.

For example, Trial A assigned weights of 0.50 to both of the primary goals while Trial B assigned weights of 0.40 and 0.60 to the goals of efficiency and equality of opportunity, respectively. All other weights and factors were held constant so that the effect of this adjustment could be analyzed. As shown in Table 4, all low income students did have lower fees in Trial B as compared to Trial A. But so did three high-income students. Furthermore, sixty-five average income students suffered higher fees in Trial B than in Trial A.

TABLE 4

THE EFFECT ON FEES PER STUDENT CREDIT HOUR (SCH)
OF ADJUSTING WEIGHTS IN TRIAL B TO
FAVOR EQUALITY OF OPPORTUNITY^a

Student Characteristic	No. of FTE	Trial A			Trial B		
		lowest fee	average fee	highest fee	lowest fee	average fee	highest fee
low income	44	\$-1.00	\$3.70	\$14.27	\$-2.67	\$1.80	\$10.83
average income	164	8.17	11.37	33.10	8.67	11.50	30.00
high income	51	10.83	14.87	26.33	13.10	15.93	26.33

^aData compiled from Appendix F.

The average fees in Table 5 indicate an adequate response to the weighting system even though the weights for the goals or subgoals were not adjusted--only the student characteristic weights. The highest fees for the student characteristics of critical degree and in-state residence did not steadily decrease, however, as might have been expected.

The increasing highest fees for the critical degree characteristic are the result of the "trade-off effect." Each of the highest fees are the fees of student category number one (see Appendix F) which includes the additional characteristics of average income, out-of-state residence, and average ability. Each of these additional characteristics lost weight in the adjustments to the extent that it negated the added weight

TABLE 5

EFFECTS IN STUDENT FEES PER STUDENT CREDIT HOUR^a OF WEIGHTS INCREASING
IN TRIAL D AND E TO FAVOR STUDENT CHARACTERISTICS OF
LOW-INCOME, CRITICAL DEGREE AND IN-STATE STUDENTS^b

Student Characteristic	No. of FTE	Trial C			Trial D			Trial E		
		lowest fee	average fee	highest fee	lowest fee	average fee	highest fee	lowest fee	average fee	highest fee
low income	44	\$0.57	\$5.37	\$17.17	\$-9.93	\$-0.33	\$17.13	\$-19.00	\$-4.33	\$15.77
critical degree	19	0.57	11.13	28.67	-9.93	9.30	36.17	-19.00	5.97	38.40
in- state	241	0.57	10.03	22.60	-9.93	9.67	26.50	-19.00	9.50	25.43

^aData compiled from Appendix F.

^bSee Appendices C, D, and E for the weights assigned in trials C, D, and E, respectively.

assigned for the critical degree characteristic.

The fluctuation of the highest fee in the student characteristic of in-state is caused by the second weighting system property.

Property 2: The impact of a student category in the allocation system is the result of the product of the number of students, the total worth score, and the program cost. In the various trial runs, however, the total worth score is the only varying factor since program cost and number of students are held constant throughout the trials. When the total worth score of a student category changes, its impact changes. As the impact of each student category changes, the total of all the impacts also changes. Therefore, in the allocation system, a slight change in the impact of a particular student category may be offset by a relatively larger change in the total impact.

For example, as shown in Table 6, the highest fee in the student characteristic of in-state fluctuated from \$22.60 in Trial C to \$26.50 in Trial D to \$25.43 in Trial E. The corresponding student category impacts for each of the trials was 852, 846, and 852 respectively--very little change. The total impact for each trial was, however, 148,637, 160,697 and 157,807, respectively. The ratios of each of the category impacts with the corresponding total impact times the appropriation of \$250,000 gave the resultant subsidy. The subsidy subtracted from the program cost of \$2,110 resulted in the total student fee. It is easily seen in Table 6 that the impact

of the student category relative to the total impact as measured by the ratio of impacts is basic to the determination of the student fee in each trial run. A larger ratio means a larger subsidy and a lower fee. It should be noted that this is a problem only on comparisons of trial runs. Within each trial run the desired effect took place--the student categories with more impact received more subsidy.

TABLE 6

A COMPARISON OF THE EFFECT OF THE TOTAL IMPACT
ON THE ASSESSMENT OF STUDENT FEES IN
STUDENT CATEGORY NUMBER 20

Trial	Worth Score	Category Impact	Total Impact	Ratio of Impacts	Subsidy per FTE	Fee per FTE	Fee/ SCH
C	0.404	852	148,637	0.00573	\$1432	\$678	\$22.60
D	0.401	846	160,697	0.00526	1315	795	26.50
E	0.404	852	157,807	0.00540	1347	763	25.43

Note: Data compiled from Table 3 of Appendices C, D, and E and from Appendix F.

Property 3: The results of the five trial runs and the explanation in the preceding section effectively explain the changes in the relative impact as adjustments occur in the total worth scores. If, in other trial runs, similar adjustments were made in program cost or enrollment while holding constant the remaining factors, the relative impacts would similarly change because of the effect of the change in the total impact.

In the actual application of the student fee model, program costs would change from year to year as enrollments, efficiency of operation, and inflation changed and as programs were added and deleted. Hopefully, the appropriations from government and other non-student-fee revenues would keep pace with the increasing enrollments and inflation. The net effect would be a degree of uncertainty of the required fees from year to year until the enrollment process was completed and all data in. Unless an administrative procedure is devised to curtail the uncertainty (such as possibly a guarantee to each student to not raise his fees for a four-year period--if his characteristics did not change; or standard program costs), the students would need to be convinced that the student fee model would treat them more equitably than the former system. Institutions without program cost data would not be faced with this problem since they would be using an average cost per student applied all programs.

Seemingly, students are constantly changing programs in the present system of higher education. This type of enrollment fluctuation would not adversely affect the use of the model since most changes of this nature tend to cancel each other. It is hypothetically possible, however, with the use of the model, to create a mass migration of students from high cost programs to low cost programs. If this happened, the decision-makers could easily adjust the weighting system to impede the flow of students.

Property 4: This property is fairly obvious after reviewing the five trials and Table 6. In all five trials the total impacts changed as the total worth scores changed.

To an applicator of the student fee model, this property will have one meaning as he adjusts the goal and student characteristic weights: a percentage variance in the total worth score of a student category does not mean a like percentage variance in the assessment of student fees. The applicator will have to know enrollments, program costs and total worth scores for all student categories and the amount of funds to be allocated as subsidies before he can precisely assess the fees to be paid by students. He should, however, with proper historical profiles of student characteristics, be able to predict the student fees for the various student categories with some degree of accuracy.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

In a time of financial crisis in higher education, planning for efficiency and economy must be demonstrated at all levels. The proposed student fee model establishes a financing structure for higher education which will encourage planning at all levels and which will encourage the efficient use of all available resources.

The proposed student fee model promotes efficiency and planning at the societal level because it encourages the assessment of societal higher education goals and provides the structure for directing societal funds toward the achievement of those goals. The proposed model should prove to be more efficient in the allocation process and to involve more planning than the present low-tuition system which distributes aid equally but indiscriminately to all students and indiscriminately with regard to the goals of society.

Under widespread use of the model, institutions will be encouraged to plan and to promote economies since they will be competing with other institutions for students. With the use of the model, it is possible to envision a system whereby

each institution would have its own unique cost for each program which would be based on its actual costs and the institution's plan for improvement. The students, as they would complete enrollment at a particular institution, would pay the difference between the unique institutional program cost and their subsidy for the particular program in which they would enroll. Since the subsidy to a student would be essentially the same regardless of the institution in which he enrolled, each institution with comparative higher cost programs would have to be prepared to defend them (on perhaps a quality basis) or would have to initiate economies to align their program costs with other competing institutions.

It should also be noted that the proposed student fee model should not infringe either on individual citizen's freedom of choice, or on diversity, or on institutional autonomy--but rather it should encourage all three since it will provide full funding for instructional programs. The proposed student fee model does, however, imply rather forcefully that societal funds will be directed toward the achievement of goals of society rather than being allocated indiscriminately. The students, their parents, and institutions can pursue their own goals if they are willing to pay their own way for the portion of their goals which are incompatible with societal goals.

The student fee model offers an advantage over other financial aid programs because of its flexibility. Almost all other financial aid programs are single-purposed;

that is, they are designed to direct aid to only one segment of society. The student fee model, however, can be single or multiple-purposed depending upon the desires of the decision-makers. The model can be adapted so that any educational entity, (Federal, State, or institutional) with the appropriate central agency can use the model to implement the unique decisions of that entity relative to the goals of higher education they wish to fund.

Implementation of the student fee model could possibly release funds from other student aid programs to aid students with unusual financial problems (costly and extended sickness, for example) and to aid students with their living expenses or other education-related expenses. Widespread use of the student fee model with a concurrent redirection of existing student aid programs could achieve a compromise version of universal higher education. Hausman relates:

Assuming that society chooses universal higher education as the best means for meeting certain goals it selects, there are a number of ways to achieve and pay for universal higher education. Any method (or combination of methods) must face at least these tests: efficiency, affordability, equity, and effectiveness. And, far from least, it must be politically realistic.¹

Efficiency, equity, and effectiveness have already been discussed. Since the student fee model utilizes existing non-student-fee revenues through more efficient allocation of subsidies, it passes the test of affordability. Whether the student fee model is politically realistic

¹Hausman, "Pressures, Benefits, and Options," p. 14.

remains for the decision-makers evaluation.

The primary assumption of the student fee model is that, ideally, society should provide full funding for higher education. If, however, sufficient funds are not available for full funding, society should strive to direct its limited funds toward higher education goals that are beneficial to society and not allocate the funds indiscriminately. This obviously requires an increased planning effort. The Carnegie Commission urges more state-wide planning in higher education and then adds comments consistent with the thrust of the proposed student fee model.

In its broadest sense, state-wide planning must first be concerned with sets of goals: the economic and social goals of the state, the goals of the educational system and its institutions, the goals of the individuals within the system, and the interaction among these sets of goals. Then planning must be addressed to the optimum allocation of resources to accomplish the desired ends.¹

Conclusions

Based upon the satisfaction of the design criteria and the results of the trial runs, the following are the conclusions of this study:

- 1) The proposed student fee model will permit the incorporation of an unlimited number of student related criteria and allocate subsidies and assess student fees toward their achievement.

¹Carnegie Commission, "Capitol and the Campus," p. 31.

- 2) The proposed student fee model will permit and encourage the establishment of priorities and relative importance of student-related criteria and allocate subsidies and assess student fees toward their achievement.
- 3) The proposed student fee model will vary each student's subsidy proportionately with the cost of his degree program.
- 4) By varying the assignment of relative importance of criteria priorities, the proposed student fee model will vary the allocation of subsidies from non-student-fee revenue from zero to equal shares for all students possessing a particular combination of student characteristics.
- 5) The proposed student fee model will vary each student's subsidy proportionately with the amount of non-student-fee revenue.
- 6) The proposed student fee model will vary each student's fee proportionately with the number of enrolled students.

Implications

Implementation of the student fee model will have implications for American higher education in two vital directions. First, it will restructure higher education in a way which will: (1) allow pressures to intensify for accountability, (2) localize responsibility, (3) add new pressures

for additional financing of higher education, (4) provide a mechanism for the optimum merger of public and private higher education. Secondly, the student fee model will have implications for further research and planning.

Implications for Restructuring Higher Education

Lawrence describes the three aspects of the new concept of accountability as: intention, effectiveness, and efficiency.¹ Effectiveness and efficiency are well known terms but intention is elaborated on by Lawrence as: "Intention appears to be an important aspect in the new accountability since the shortage of resources has dictated that not all desirable things can be done, thus requiring priorities to be set."²

The proposed student fee model opens the prospect of accountability in all three aspects. Since the goals, sub-goals, and student characteristics are clearly stated and weighted, the aspect of intention can be realized. By allocating resources toward the stated goals, efficiency can be realized. And by gathering data on individual students, effectiveness can be evaluated and achieved more quickly.

Furthermore, if the institutions are competing with each other for students, the institutions will have to be accountable to students. Since the student fee model stresses

¹Lawrence, "Issues Related to Purposes," p. 12.

²Ibid.

decision-making in the realm of responsibility of the decision-makers, responsibility and accountability will be localized. Henry establishes the guidelines for localized responsibility as:

Planning should not be left to politics, internal or external. Furthermore, it is not a democratic process. Ideas and suggestions should come from all sides, but the analysis should rest in professional hands. Final judgements should be left to those who are responsible for living with the results of their recommendations and for exercising their accountability to the broad public, . . .¹

The student fee model will also add new pressures for additional financing of public higher education since it will define legislative appropriations as subsidies to reduce the student's expenses. For example, instead of a legislature deciding on the addition of \$5 million to an abstract entity like higher education, it will be deciding on the additional average subsidy to each full time student of, say, \$100. It is presumed that students and their parents would be more inclined to call or write their legislator in the latter situation than in the former.

The weighting system of the student fee model is particularly adaptable to the merger of private and public higher education. Federal or State agencies considering such a merger, can add goals or subgoals for attendance in private institutions at any desired level of importance

¹David D. Henry, "Accountability: To Whom, For What, By What Means," in Educational Record, (Fall, 1972), p. 290.

Implications for Further Research and Planning

The implementation of the student fee model will accelerate the planning and research necessary to initiate economies in institutions of higher education. As was stated earlier, a student faced with a high cost degree program at one institution and a low cost but similar degree program at another institution may have to be convinced to enroll in the high cost program. The institutions with high cost programs will probably either have to sell their programs as high quality or initiate economies to become more competitive with other institutions. In either case, self-evaluation and more precise planning of budget needs will be initiated.

Research should also be accelerated in areas involving needs and goals of higher education. Particularly, the goals and needs of the prospective students in the area of influence or realm of responsibility of the institution. In addition, research will be needed on individual student characteristics. For example, in any particular geographical area: what should the per capita family income levels be in the model to insure equality of opportunity; or, what degree programs should be subsidized to fill a critical manpower need; or, what are the critical manpower needs?

Localized enrollment procedures will have to be established and refined. Appendix G demonstrates an administrative

procedure for a particular state network of higher education institutions; but every educational entity with different laws may have different procedures and refinements.

Finally, evaluation will be accelerated to test the effectiveness of the student characteristic measures in the achievement of the goals. New data bases containing precise student information will enable evaluators and researchers the opportunity to collect historical data and to have a broader data base for their future research.

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APPENDIX A

Data, Information, and Results
of
TRIAL A

Criteria Weights and Effective Weights
Student Characteristic Distribution, Effective
Weights, and Total Worth Scores
Computation of Subsidies and Student Fees

TABLE A-1

CRITERIA WEIGHTS AND EFFECTIVE WEIGHTS FOR TRIAL A

<u>Criteria</u>	<u>Criteria Weights</u>	<u>Effective Weights</u>
Equality of Opportunity	.50	
Income less than or equal to \$3,000	.50	0.250
Income between \$3,000 and \$5,000	.30	0.150
Income greater than or equal to \$5,000	<u>.20</u>	0.100
	1.00	
Efficiency	.50	
Degree Program	.30	
Very critical need	.50	0.075
Average need	.40	0.060
Surplus of available manpower	<u>.10</u>	0.015
	1.00	
Probability of Remaining In-State	.50	
In-state residents	.80	0.200
Out-of-state residents	<u>.20</u>	0.050
	1.00	
Ability	.20	
ACT score greater than or equal to 30	.50	0.050
ACT score between 10 and 30	.40	0.040
ACT score less than or equal to 10	<u>.10</u>	0.010
	1.00	
	<u>1.00</u>	<u>1.000</u>

TABLE A-2

DISTRIBUTION OF STUDENT CHARACTERISTICS TO STUDENT CATEGORIES
EFFECTIVE WEIGHTS AND TOTAL WORTH SCORES
FOR TRIAL A

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	
1	Accounting	critical	.075	out-of-state	.050	avg.	.040	avg.	.150	.315
2		critical	.075	in-state	.200	high	.050	low	.250	.575
3		critical	.075	in-state	.200	avg.	.040	avg.	.150	.465
4		critical	.075	in-state	.200	avg.	.040	high	.100	.415
5		critical	.075	in-state	.200	low	.010	avg.	.150	.435
6	History	avg.	.060	out-of-state	.050	avg.	.040	low	.250	.400
7		avg.	.060	out-of-state	.050	avg.	.040	avg.	.150	.300
8		avg.	.060	out-of-state	.050	avg.	.040	high	.100	.250
9		avg.	.060	in-state	.200	avg.	.040	low	.250	.550
10		avg.	.060	in-state	.200	avg.	.040	avg.	.150	.450
11		avg.	.060	in-state	.200	avg.	.040	high	.100	.400
12		avg.	.060	in-state	.200	low	.010	avg.	.150	.420
13	Chemistry	avg.	.060	out-of-state	.050	avg.	.040	avg.	.150	.300
14		avg.	.060	in-state	.200	high	.050	avg.	.150	.460
15		avg.	.060	in-state	.200	avg.	.040	low	.250	.550
16		avg.	.060	in-state	.200	avg.	.040	avg.	.150	.450
17		avg.	.060	in-state	.200	avg.	.040	high	.100	.400
18		avg.	.060	in-state	.200	low	.010	low	.250	.520
19		avg.	.060	in-state	.200	low	.010	avg.	.150	.420
20		avg.	.060	in-state	.200	low	.010	high	.100	.370

(continued)

TABLE A-2--Continued

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Et.	
21	Management	avg.	.060	out-of-state	.050	avg.	.040	avg.	.150	.300
22		avg.	.060	in-state	.200	avg.	.040	low	.250	.550
23		avg.	.060	in-state	.200	avg.	.040	avg.	.150	.450
24		avg.	.060	in-state	.200	avg.	.040	high	.100	.400
25		avg.	.060	in-state	.200	low	.010	avg.	.150	.420
26	Elem Educ	surplus	.015	out-of-state	.050	avg.	.040	low	.250	.355
27		surplus	.015	out-of-state	.050	avg.	.040	avg.	.150	.255
28		surplus	.015	out-of-state	.050	low	.010	high	.100	.175
29		surplus	.015	in-state	.200	high	.050	avg.	.150	.415
30		surplus	.015	in-state	.200	high	.050	high	.100	.365
31		surplus	.015	in-state	.200	avg.	.040	low	.250	.505
32		surplus	.015	in-state	.200	avg.	.040	avg.	.150	.405
33		surplus	.015	in-state	.200	avg.	.040	high	.100	.355
34		surplus	.015	in-state	.200	low	.010	low	.250	.475
35		surplus	.015	in-state	.200	low	.010	avg.	.150	.375
36		surplus	.015	in-state	.200	low	.010	high	.100	.325

^aSee Chapter 4 and Table A-1 for an explanation of these criteria and their effective weights.

^bThe Total Worth Score is the sum of the effective weights for the student category.

TABLE A-3

SUBSIDY AND FEE COMPUTATION PAGE FOR TRIAL A

Student Category Number	Number of FTE N_j	Program Cost Per FTE C_j	Total Worth Score W_j^a	$C_j W_j$	Subsidy Per FTE	Net Fee Per FTE
1	1	\$1842	.315	580	\$1025	\$817
2	3	1842	.575	1059	1872	-30
3	11	1842	.465	856	1512	330
4	3	1842	.415	764	1350	492
5	1	1842	.435	801	1415	427
6	1	1190	.400	476	840	350
7	1	1190	.300	357	630	560
8	1	1190	.250	297	525	665
9	9	1190	.550	654	1155	35
10	32	1190	.450	535	945	245
11	12	1190	.400	476	840	350
12	1	1190	.420	499	882	308
13	1	2110	.300	633	1117	993
14	1	2110	.460	970	1715	395
15	3	2110	.550	1160	2050	60
16	11	2110	.450	949	1677	433
17	2	2110	.400	844	1492	618
18	1	2110	.520	1097	1940	170
19	1	2110	.420	886	1565	545
20	1	2110	.370	780	1377	733
21	1	1300	.300	390	687	613
22	1	1300	.550	715	1262	38
23	4	1300	.450	585	1032	268
24	1	1300	.400	520	917	383
25	1	1300	.420	546	965	335
26	2	1140	.355	404	712	428
27	6	1140	.255	290	512	628
28	2	1140	.175	199	350	790
29	2	1140	.415	473	835	305
30	1	1140	.365	416	735	405
31	23	1140	.505	575	1015	125
32	84	1140	.405	461	815	325
33	27	1140	.355	404	712	428
34	1	1140	.475	541	955	185
35	5	1140	.375	427	755	385
36	1	1140	.325	370	652	488

^aFrom Table A-2

Note: Total Impact = 141,308

APPENDIX B

Data, Information, and Results of TRIAL B

Criteria Weights and Effective Weights
Student Characteristic Distribution, Effective
Weights, and Total Worth Scores
Computation of Subsidies and Student Fees

TABLE B-1

CRITERIA WEIGHTS AND EFFECTIVE WEIGHTS FOR TRIAL B

<u>Criteria</u>	<u>Criteria Weights</u>	<u>Effective Weights</u>
Equality of Opportunity	.60	
Income less than or equal to \$3,000	.50	0.300
Income between \$3,000 and \$5,000	.30	0.180
Income greater than or equal to \$5,000	<u>.20</u>	0.120
	1.00	
Efficiency	.40	
Degree Program	.30	
Very critical need	.50	0.060
Average need	.40	0.048
Surplus of available manpower	<u>.10</u>	0.012
	1.00	
Probability of Remaining In-State	.50	
In-state residents	.80	0.160
Out-of-state residents	<u>.20</u>	0.040
	1.00	
Ability	.20	
ACT score greater than or equal to 30	.50	0.040
ACT score between 10 and 30	.40	0.032
ACT score less than or equal to 10	<u>.10</u>	0.008
	<u>1.00</u>	
	<u>1.00</u>	<u>1.000</u>

TABLE B-2

DISTRIBUTION OF STUDENT CHARACTERISTICS TO STUDENT CATEGORIES
EFFECTIVE WEIGHTS AND TOTAL WORTH SCORES
FOR TRIAL B

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	
1	Accounting	critical	.060	out-of-state	.040	avg.	.032	avg.	.180	.312
2		critical	.060	in-state	.160	high	.040	low	.300	.560
3		critical	.060	in-state	.160	avg.	.032	avg.	.180	.432
4		critical	.060	in-state	.160	avg.	.032	high	.120	.372
5		critical	.060	in-state	.160	low	.008	avg.	.180	.408
6	History	avg.	.048	out-of-state	.040	avg.	.032	low	.300	.420
7		avg.	.048	out-of-state	.040	avg.	.032	avg.	.180	.300
8		avg.	.048	out-of-state	.040	avg.	.032	high	.120	.240
9		avg.	.048	in-state	.160	avg.	.032	low	.300	.540
10		avg.	.048	in-state	.160	avg.	.032	avg.	.180	.420
11	Chemistry	avg.	.048	in-state	.160	avg.	.032	high	.120	.360
12		avg.	.048	in-state	.160	low	.008	avg.	.180	.396
13		avg.	.048	out-of-state	.040	avg.	.032	avg.	.180	.308
14		avg.	.048	in-state	.160	high	.040	avg.	.180	.428
15		avg.	.048	in-state	.160	avg.	.032	low	.300	.540
16		avg.	.048	in-state	.160	avg.	.032	avg.	.180	.420
17		avg.	.048	in-state	.160	avg.	.032	high	.120	.360
18		avg.	.048	in-state	.160	low	.008	low	.300	.516
19		avg.	.048	in-state	.160	low	.008	avg.	.180	.396
20		avg.	.048	in-state	.160	low	.008	high	.120	.336

(continued)

TABLE B-2--Continued

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Et.	
21	Management	avg.	.048	out-of-state	.040	avg.	.032	avg.	.180	.300
22		avg.	.048	in-state	.160	avg.	.032	low	.300	.540
23		avg.	.048	in-state	.160	avg.	.032	avg.	.180	.420
24		avg.	.048	in-state	.160	avg.	.032	high	.120	.360
25		avg.	.048	in-state	.160	low	.008	avg.	.180	.396
26	Elem Educ	surplus	.012	out-of-state	.040	avg.	.032	low	.300	.384
27		surplus	.012	out-of-state	.040	avg.	.032	avg.	.180	.264
28		surplus	.012	out-of-state	.040	low	.008	high	.120	.180
29		surplus	.012	in-state	.160	high	.040	avg.	.180	.392
30		surplus	.012	in-state	.160	high	.040	high	.120	.332
31		surplus	.012	in-state	.160	avg.	.032	low	.300	.504
32		surplus	.012	in-state	.160	avg.	.032	avg.	.180	.384
33		surplus	.012	in-state	.160	avg.	.032	high	.120	.324
34		surplus	.012	in-state	.160	low	.008	low	.300	.480
35		surplus	.012	in-state	.160	low	.008	avg.	.180	.360
36		surplus	.012	in-state	.160	low	.008	high	.120	.300

^aSee Chapter 4 and Table B-1 for an explanation of these criteria and their effective weights.

^bThe Total Worth Score is the sum of the effective weights for the student category.

TABLE B-3

SUBSIDY AND FEE COMPUTATION PAGE FOR TRIAL B

Student Category Number	Number of FTE N_j	Program Cost Per FTE C_j	Total Worth Score W_j^a	$C_j W_j$	Subsidy Per FTE	Net Fee Per FTE
1	1	\$1842	.312	574	\$1070	\$772
2	3	1842	.560	1031	1922	-80
3	11	1842	.432	795	1482	360
4	3	1842	.372	685	1277	565
5	1	1842	.408	751	1400	442
6	1	1190	.420	499	930	260
7	1	1190	.300	357	665	525
8	1	1190	.240	285	530	660
9	9	1190	.540	642	1197	-7
10	32	1190	.420	499	930	260
11	12	1190	.360	428	797	393
12	1	1190	.396	471	877	313
13	1	2110	.308	649	1210	900
14	1	2110	.428	903	1682	428
15	3	2110	.540	1139	2125	-15
16	11	2110	.420	886	1652	458
17	2	2110	.360	759	1415	695
18	1	2110	.516	1088	2027	83
19	1	2110	.396	835	1557	553
20	1	2110	.336	708	1320	790
21	1	1300	.300	390	727	573
22	1	1300	.540	702	1307	-7
23	4	1300	.420	546	1017	283
24	1	1300	.360	468	872	428
25	1	1300	.396	514	957	343
26	2	1140	.384	437	815	325
27	6	1140	.264	300	557	583
28	2	1140	.180	205	380	760
29	2	1140	.392	446	830	310
30	1	1140	.332	378	705	435
31	23	1140	.504	574	1070	70
32	84	1140	.384	437	815	325
33	27	1140	.324	369	687	453
34	1	1140	.480	547	1020	120
35	5	1140	.360	410	762	378
36	1	1140	.300	342	637	503

^aFrom Table B-2

Note: Total Impact = 134,000

APPENDIX C

Data, Information, and Results of TRIAL C

Criteria Weights and Effective Weights
Student Characteristic Distribution, Effective
Weights, and Total Worth Scores
Computation of Subsidies and Student Fees

TABLE C-1

CRITERIA WEIGHTS AND EFFECTIVE WEIGHTS FOR TRIAL C

<u>Criteria</u>	<u>Criteria Weights</u>	<u>Effective Weights</u>
Equality of Opportunity	.40	
Income less than or equal to \$3,000	.50	0.200
Income between \$3,000 and \$5,000	.30	0.120
Income greater than or equal to \$5,000	<u>.20</u>	0.080
	1.00	
Efficiency	.60	
Degree Program	.30	
Very critical need	.50	0.090
Average need	.40	0.072
Surplus of available manpower	<u>.10</u>	0.018
	1.00	
Probability of Remaining In-State	.50	
In-state residents	.80	0.240
Out-of-state residents	<u>.20</u>	0.060
	1.00	
Ability	.20	
ACT score greater than or equal to 30	.50	0.060
ACT score between 10 and 30	.40	0.048
ACT score less than or equal to 10	<u>.10</u>	0.012
	<u>1.00</u>	
	<u>1.00</u>	<u>1.000</u>

TABLE C-2

DISTRIBUTION OF STUDENT CHARACTERISTICS TO STUDENT CATEGORIES
EFFECTIVE WEIGHTS AND TOTAL WORTH SCORES
FOR TRIAL C

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	
1	Accounting	critical	.090	out-of-state	.060	avg.	.048	avg.	.120	.318
2		critical	.090	in-state	.240	high	.060	low	.200	.590
3		critical	.090	in-state	.240	avg.	.048	avg.	.120	.498
4		critical	.090	in-state	.240	avg.	.048	high	.080	.458
5		critical	.090	in-state	.240	low	.012	avg.	.120	.462
6	History	avg.	.072	out-of-state	.060	avg.	.048	low	.200	.380
7		avg.	.072	out-of-state	.060	avg.	.048	avg.	.120	.300
8		avg.	.072	out-of-state	.060	avg.	.048	high	.080	.260
9		avg.	.072	in-state	.240	avg.	.048	low	.200	.560
10		avg.	.072	in-state	.240	avg.	.048	avg.	.120	.480
11	Chemistry	avg.	.072	in-state	.240	avg.	.048	high	.080	.440
12		avg.	.072	in-state	.240	low	.012	avg.	.120	.444
13		avg.	.072	out-of-state	.060	avg.	.048	avg.	.120	.300
14		avg.	.072	in-state	.240	high	.060	avg.	.120	.492
15		avg.	.072	in-state	.240	avg.	.048	low	.200	.560
16		avg.	.072	in-state	.240	avg.	.048	avg.	.120	.480
17		avg.	.072	in-state	.240	avg.	.048	high	.080	.440
18		avg.	.072	in-state	.240	low	.012	low	.200	.524
19		avg.	.072	in-state	.240	low	.012	avg.	.120	.444
20		avg.	.072	in-state	.240	low	.012	high	.080	.404

(continued)

TABLE C-2--Continued

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	
21	Management	avg.	.072	out-of-state	.060	avg.	.048	avg.	.120	.300
22		avg.	.072	in-state	.240	avg.	.048	low	.200	.560
23		avg.	.072	in-state	.240	avg.	.048	avg.	.120	.480
24		avg.	.072	in-state	.240	avg.	.048	high	.080	.440
25		avg.	.072	in-state	.240	low	.012	avg.	.120	.444
26	Elem Educ	surplus	.018	out-of-state	.060	avg.	.048	low	.200	.326
27		surplus	.018	out-of-state	.060	avg.	.048	avg.	.120	.246
28		surplus	.018	out-of-state	.060	low	.012	high	.080	.170
29		surplus	.018	in-state	.240	high	.060	avg.	.120	.438
30		surplus	.018	in-state	.240	high	.060	high	.080	.398
31		surplus	.018	in-state	.240	avg.	.048	low	.200	.506
32		surplus	.018	in-state	.240	avg.	.048	avg.	.120	.426
33		surplus	.018	in-state	.240	avg.	.048	high	.080	.386
34		surplus	.018	in-state	.240	low	.012	low	.200	.470
35		surplus	.018	in-state	.240	low	.012	avg.	.120	.390
36		surplus	.018	in-state	.240	low	.012	high	.080	.350

^aSee Chapter 4 and Table C-1 for an explanation of these criteria and their effective weights.

^bThe Total Worth Score is the sum of the effective weights for the student category.

TABLE C-3

SUBSIDY AND FEE COMPUTATION PAGE FOR TRIAL C

Student Category Number	Number of FTE N_j	Program Cost Per FTE C_j	Total Worth Score W_j^a	$C_j W_j$	Subsidy Per FTE	Net Fee Per FTE
1	1	\$1842	.318	585	\$982	\$860
2	3	1842	.590	1086	1825	17
3	11	1842	.498	917	1540	302
4	3	1842	.458	843	1417	425
5	1	1842	.462	851	1430	412
6	1	1190	.380	452	760	430
7	1	1190	.300	357	600	590
8	1	1190	.260	309	517	673
9	9	1190	.560	666	1120	70
10	32	1190	.480	571	960	230
11	12	1190	.440	523	877	313
12	1	1190	.444	528	887	303
13	1	2110	.300	633	1062	1048
14	1	2110	.492	1038	1745	365
15	3	2110	.560	1181	1985	125
16	11	2110	.480	1012	1700	410
17	2	2110	.440	928	1560	550
18	1	2110	.524	1105	1857	253
19	1	2110	.444	936	1572	538
20	1	2110	.404	852	1432	678
21	1	1300	.300	390	655	645
22	1	1300	.560	728	1222	78
23	4	1300	.480	624	1047	253
24	1	1300	.440	572	960	340
25	1	1300	.444	577	970	330
26	2	1140	.326	371	622	518
27	6	1140	.246	280	470	670
28	2	1140	.170	193	322	818
29	2	1140	.438	499	837	303
30	1	1140	.398	453	760	380
31	23	1140	.506	576	967	173
32	84	1140	.426	485	815	325
33	27	1140	.386	440	740	400
34	1	1140	.470	535	897	243
35	5	1140	.390	444	745	395
36	1	1140	.350	399	670	470

^aFrom Table C-2

Note: Total Impact = 148,637

APPENDIX D

Data, Information, and Results of TRIAL D

Criteria Weights and Effective Weights
Student Characteristic Distribution, Effective
Weights, and Total Worth Scores
Computation of Subsidies and Student Fees

TABLE D-1

CRITERIA WEIGHTS AND EFFECTIVE WEIGHTS FOR TRIAL D

<u>Criteria</u>	<u>Criteria Weights</u>	<u>Effective Weights</u>
Equality of Opportunity	.40	
Income less than or equal to \$3,000	.70	0.280
Income between \$3,000 and \$5,000	.25	0.100
Income greater than or equal to \$5,000	<u>.05</u>	0.020
	1.00	
Efficiency	.60	
Degree Program	.30	
Very critical need	.60	0.108
Average need	.30	0.054
Surplus of available manpower	<u>.10</u>	0.018
	1.00	
Probability of Remaining In-State	.60	
In-state residents	.90	0.324
Out-of-state residents	<u>.10</u>	0.036
	1.00	
Ability	.10	
ACT score greater than or equal to 30	.60	0.036
ACT score between 10 and 30	.35	0.021
ACT score less than or equal to 10	<u>.05</u>	0.003
	<u>1.00</u>	
	1.00	<u>1.000</u>

TABLE D-2

DISTRIBUTION OF STUDENT CHARACTERISTICS TO STUDENT CATEGORIES
EFFECTIVE WEIGHTS AND TOTAL WORTH SCORES
FOR TRIAL D

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	
1	Accounting	critical	.108	out-of-state	.036	avg.	.021	avg.	.100	.265
2		critical	.108	in-state	.324	high	.036	low	.280	.748
3		critical	.108	in-state	.324	avg.	.021	avg.	.100	.553
4		critical	.108	in-state	.324	avg.	.021	high	.020	.473
5		critical	.108	in-state	.324	low	.003	avg.	.100	.535
6	History	avg.	.054	out-of-state	.036	avg.	.021	low	.280	.391
7		avg.	.054	out-of-state	.036	avg.	.021	avg.	.100	.211
8		avg.	.054	out-of-state	.036	avg.	.021	high	.020	.131
9		avg.	.054	in-state	.324	avg.	.021	low	.280	.679
10		avg.	.054	in-state	.324	avg.	.021	avg.	.100	.499
11	Chemistry	avg.	.054	in-state	.324	avg.	.021	high	.020	.419
12		avg.	.054	in-state	.324	low	.003	avg.	.100	.481
13		avg.	.054	out-of-state	.036	avg.	.021	avg.	.100	.211
14		avg.	.054	in-state	.324	high	.036	avg.	.100	.514
15		avg.	.054	in-state	.324	avg.	.021	low	.280	.679
16		avg.	.054	in-state	.324	avg.	.021	avg.	.100	.499
17		avg.	.054	in-state	.324	avg.	.021	high	.020	.419
18		avg.	.054	in-state	.324	low	.003	low	.280	.661
19		avg.	.054	in-state	.324	low	.003	avg.	.100	.481
20		avg.	.054	in-state	.324	low	.003	high	.020	.401

(continued)

TABLE D-2--Continued

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Et.	
21	Management	avg.	.054	out-of-state	.036	avg.	.021	avg.	.100	.211
22		avg.	.054	in-state	.324	avg.	.021	low	.280	.679
23		avg.	.054	in-state	.324	avg.	.021	avg.	.100	.499
24		avg.	.054	in-state	.324	avg.	.021	high	.020	.419
25		avg.	.054	in-state	.324	low	.003	avg.	.100	.481
26	Elem Educ	surplus	.018	out-of-state	.036	avg.	.021	low	.280	.355
27		surplus	.018	out-of-state	.036	avg.	.021	avg.	.100	.175
28		surplus	.018	out-of-state	.036	low	.003	high	.020	.077
29		surplus	.018	in-state	.324	high	.036	avg.	.100	.478
30		surplus	.018	in-state	.324	high	.036	high	.020	.398
31		surplus	.018	in-state	.324	avg.	.021	low	.280	.643
32		surplus	.018	in-state	.324	avg.	.021	avg.	.100	.463
33		surplus	.018	in-state	.324	avg.	.021	high	.020	.383
34		surplus	.018	in-state	.324	low	.003	low	.280	.625
35		surplus	.018	in-state	.324	low	.003	avg.	.100	.445
36		surplus	.018	in-state	.324	low	.003	high	.020	.365

^aSee Chapter 4 and Table D-1 for an explanation of these criteria and their effective weights.

^bThe Total Worth Score is the sum of the effective weights for the student category.

TABLE D-3

SUBSIDY AND FEE COMPUTATION PAGE FOR TRIAL D

Student Category Number	Number of FTE N_j	Program Cost Per FTE C_j	Total Worth Score W_j^a	$C_j W_j$	Subsidy Per FTE	Net Fee Per FTE
1	1	\$1842	.265	488	\$ 757	\$1085
2	3	1842	.748	1377	2140	-298
3	11	1842	.553	1018	1582	260
4	3	1842	.473	871	1355	487
5	1	1842	.535	985	1530	312
6	1	1190	.391	465	722	468
7	1	1190	.211	251	390	800
8	1	1190	.131	155	240	950
9	9	1190	.679	808	1255	-65
10	32	1190	.499	593	922	268
11	12	1190	.419	498	772	418
12	1	1190	.481	572	887	303
13	1	2110	.211	445	690	1420
14	1	2110	.514	1084	1685	425
15	3	2110	.679	1432	2227	-117
16	11	2110	.499	1052	1635	475
17	2	2110	.419	884	1375	735
18	1	2110	.661	1394	2167	-57
19	1	2110	.481	1014	1577	533
20	1	2110	.401	846	1315	795
21	1	1300	.211	274	425	875
22	1	1300	.679	882	1370	-70
23	4	1300	.499	648	1007	293
24	1	1300	.419	544	845	455
25	1	1300	.481	625	970	330
26	2	1140	.355	404	627	513
27	6	1140	.175	199	307	833
28	2	1140	.077	87	135	1005
29	2	1140	.478	544	845	295
30	1	1140	.398	453	702	438
31	23	1140	.643	733	1140	0
32	84	1140	.463	527	817	323
33	27	1140	.383	436	677	463
34	1	1140	.625	712	1107	33
35	5	1140	.445	507	787	353
36	1	1140	.365	416	645	495

^aFrom Table D-2

Note: Total Impact = 160,697

APPENDIX E

Data, Information, and Results of TRIAL E

Criteria Weights and Effective Weights
Student Characteristic Distribution, Effective
Weights, and Total Worth Scores
Computation and Subsidies and Student Fees

TABLE E-1

CRITERIA WEIGHTS AND EFFECTIVE WEIGHTS FOR TRIAL E

<u>Criteria</u>	<u>Criteria Weights</u>	<u>Effective Weights</u>
Equality of Opportunity	.40	
Income less than or equal to \$3,000	.80	0.320
Income between \$3,000 and \$5,000	.15	0.060
Income greater than or equal to \$5,000	<u>.05</u>	0.020
	1.00	
Efficiency	.60	
Degree Program	.30	
Very critical need	.75	0.135
Average need	.20	0.036
Surplus of available manpower	<u>.05</u>	0.009
	1.00	
Probability of Remaining In-State	.60	
In-state residents	.95	0.342
Out-of-state residents	<u>.05</u>	0.018
	1.00	
Ability	.10	
ACT score greater than or equal to 30	.50	0.030
ACT score between 10 and 30	.40	0.024
ACT score less than or equal to 10	<u>.10</u>	0.006
	<u>1.00</u>	<u>1.000</u>
	1.00	

TABLE E-2

DISTRIBUTION OF STUDENT CHARACTERISTICS TO STUDENT CATEGORIES
EFFECTIVE WEIGHTS AND TOTAL WORTH SCORES
FOR TRIAL E

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	
1	Accounting	critical	.135	out-of-state	.018	avg.	.024	avg.	.060	.237
2		critical	.135	in-state	.342	high	.030	low	.320	.827
3		critical	.135	in-state	.342	avg.	.024	avg.	.060	.561
4		critical	.135	in-state	.342	avg.	.024	high	.020	.521
5		critical	.135	in-state	.342	low	.006	avg.	.060	.543
6	History	avg.	.036	out-of-state	.018	avg.	.024	low	.320	.398
7		avg.	.036	out-of-state	.018	avg.	.024	avg.	.060	.138
8		avg.	.036	out-of-state	.018	avg.	.024	high	.020	.098
9		avg.	.036	in-state	.342	avg.	.024	low	.320	.722
10		avg.	.036	in-state	.342	avg.	.024	avg.	.060	.462
11	Chemistry	avg.	.036	in-state	.342	avg.	.024	high	.020	.422
12		avg.	.036	in-state	.342	low	.006	avg.	.060	.444
13		avg.	.036	out-of-state	.018	avg.	.024	avg.	.060	.138
14		avg.	.036	in-state	.342	high	.030	avg.	.060	.468
15		avg.	.036	in-state	.342	avg.	.024	low	.320	.722
16		avg.	.036	in-state	.342	avg.	.024	avg.	.060	.462
17		avg.	.036	in-state	.342	avg.	.024	high	.020	.422
18		avg.	.036	in-state	.342	low	.006	low	.320	.704
19		avg.	.036	in-state	.342	low	.006	avg.	.060	.444
20		avg.	.036	in-state	.342	low	.006	high	.020	.404

(continued)

TABLE E-2--Continued

Student Category Number	Degree Program	Manpower Need		Probability of Remaining In State		Ability Level ^a		Family Income Level ^a		Total Worth Scores ^b
		Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Wt.	Stud. Char.	Effec. Et.	
21	Management	avg.	.036	out-of-state	.018	avg.	.024	avg.	.060	.138
22		avg.	.036	in-state	.342	avg.	.024	low	.320	.722
23		avg.	.036	in-state	.342	avg.	.024	avg.	.060	.462
24		avg.	.036	in-state	.342	avg.	.024	high	.020	.422
25		avg.	.036	in-state	.342	low	.006	avg.	.060	.444
26	Elem Educ	surplus	.009	out-of-state	.018	avg.	.024	low	.320	.371
27		surplus	.009	out-of-state	.018	avg.	.024	avg.	.060	.111
28		surplus	.009	out-of-state	.018	low	.006	high	.020	.053
29		surplus	.009	in-state	.342	high	.030	avg.	.060	.441
30		surplus	.009	in-state	.342	high	.030	high	.020	.401
31		surplus	.009	in-state	.342	avg.	.024	low	.320	.695
32		surplus	.009	in-state	.342	avg.	.024	avg.	.060	.435
33		surplus	.009	in-state	.342	avg.	.024	high	.020	.395
34		surplus	.009	in-state	.342	low	.006	low	.320	.677
35		surplus	.009	in-state	.342	low	.006	avg.	.060	.417
36		surplus	.009	in-state	.342	low	.006	high	.020	.377

^aSee Chapter 4 and Table E-1 for an explanation of these criteria and their effective weights.

^bThe Total Worth Score is the sum of the effective weights for the student category.

TABLE E-3

SUBSIDY AND FEE COMPUTATION PAGE FOR TRIAL E

Student Category Number	Number of FTE N _j	Program Cost Per FTE C _j	Total Worth Score W _j ^a	C _j W _j	Subsidy Per FTE	Net Fee Per FTE
1	1	\$1842	.237	436	\$ 690	\$1152
2	3	1842	.827	1523	2412	-570
3	11	1842	.561	1033	1635	207
4	3	1842	.521	959	1517	325
5	1	1842	.543	1000	1582	260
6	1	1190	.398	473	747	443
7	1	1190	.138	164	257	933
8	1	1190	.098	116	182	1008
9	9	1190	.722	859	1360	-170
10	32	1190	.462	549	867	323
11	12	1190	.422	502	795	395
12	1	1190	.444	528	835	355
13	1	2110	.138	291	460	1650
14	1	2110	.468	987	1562	548
15	3	2110	.722	1523	2412	-302
16	11	2110	.462	974	1542	568
17	2	2110	.422	890	1407	703
18	1	2110	.704	1485	2352	-242
19	1	2110	.444	936	1482	628
20	1	2110	.404	852	1347	763
21	1	1300	.138	179	282	1018
22	1	1300	.722	938	1485	-185
23	4	1300	.462	600	950	350
24	1	1300	.422	548	867	433
25	1	1300	.444	577	912	388
26	2	1140	.371	422	667	473
27	6	1140	.111	126	197	943
28	2	1140	.053	60	95	1045
29	2	1140	.441	502	795	345
30	1	1140	.401	457	722	418
31	23	1140	.695	792	1252	-112
32	84	1140	.435	495	782	358
33	27	1140	.395	450	712	428
34	1	1140	.677	771	1220	-80
35	5	1140	.417	475	752	388
36	1	1140	.377	429	677	463

^aFrom Table E-2

Note: Total Impact = 157,807

APPENDIX F

COMPARISON OF RESULTS OF TRIAL RUNS, SUBSIDIES AND STUDENT FEES
PER STUDENT-CREDIT-HOUR BY STUDENT CHARACTERISTIC COMBINATIONS

Student Category	Number of FTE	Income	Manpower Need	Residence	Ability	Trial A		Trial B		Trial C		Trial D		Trial E	
						Subsidy	Fee	Subsidy	Fee	Subsidy	Fee	Subsidy	Fee	Subsidy	Fee
1	1	Avg.	Critical	Out-of state	Avg.	\$34.17	\$ 27.23	\$35.67	\$ 25.73	\$32.73	\$28.67	\$25.23	\$ 36.17	\$23.00	\$ 38.40
2	3	Low	Critical	In-state	High	62.40	- 1.00	64.07	- 2.67	60.83	0.57	71.33	- 9.93	80.40	-19.00
3	11	Avg.	Critical	In-state	Avg.	50.40	11.00	49.40	12.00	51.33	10.07	52.73	8.67	54.50	6.90
4	3	High	Critical	In-state	Avg.	45.00	16.40	42.57	18.83	47.23	14.17	45.17	16.23	50.57	10.83
5	1	Avg.	Critical	In-state	Low	47.17	14.23	46.47	14.73	47.67	13.73	51.00	10.40	52.73	8.67
6	1	Low	Critical	Out-of-state	Avg.	28.00	11.67	31.00	8.67	25.33	14.33	24.07	15.60	24.90	14.77
7	1	Avg.	Avg.	Out-of-state	Avg.	21.00	18.67	22.17	17.50	20.00	19.67	13.00	26.67	8.57	31.10
8	1	High	Avg.	Out-of-state	Avg.	17.50	22.17	17.67	22.00	17.23	22.43	8.00	31.67	6.07	33.60
9	9	Low	Avg.	In-state	Avg.	38.50	1.17	39.90	- 0.23	37.33	2.33	41.83	- 2.17	45.33	- 5.67
10	32	Avg.	Avg.	In-state	Avg.	31.50	8.17	31.00	8.67	32.00	7.67	30.73	8.93	28.90	10.77
11	12	High	Avg.	In-state	Avg.	28.00	11.67	26.57	13.10	29.23	10.43	25.73	13.93	26.50	13.17
12	1	Avg.	Avg.	In-state	Low	29.40	10.27	29.23	10.43	29.57	10.10	29.57	10.10	27.83	11.83
13	1	Avg.	Avg.	Out-of-state	Avg.	37.23	33.10	40.33	30.00	35.40	34.93	23.00	47.33	15.33	55.00
14	1	Avg.	Avg.	In-state	High	57.17	13.17	56.07	14.27	58.17	12.17	56.17	14.17	52.07	18.27
15	3	Low	Avg.	In-state	Avg.	68.33	2.00	70.83	- 0.50	66.17	4.17	74.23	- 3.90	80.40	-10.07
16	11	Avg.	Avg.	In-state	Avg.	55.90	14.43	55.07	15.27	56.67	13.67	54.50	15.83	51.40	18.93
17	2	High	Avg.	In-state	Avg.	49.73	20.60	47.17	23.17	52.00	18.33	45.83	24.50	46.90	23.43
18	1	Low	Avg.	In-state	Low	64.67	5.67	67.57	2.77	61.90	8.43	72.23	- 1.90	78.40	- 8.07
19	1	Avg.	Avg.	In-state	Low	52.17	18.17	51.90	18.43	52.40	17.93	52.57	17.77	49.40	20.93
20	1	High	Avg.	In-state	Low	45.90	24.43	44.00	26.33	47.73	22.60	43.83	26.50	44.90	25.43
21	1	Avg.	Avg.	Out-of-state	Avg.	22.90	20.43	24.23	19.10	21.83	21.50	14.17	29.17	9.40	33.93
22	1	Low	Avg.	In-state	Avg.	42.07	1.27	43.57	- 0.23	40.73	2.60	45.67	- 2.33	49.50	- 6.17
23	4	Avg.	Avg.	In-state	Avg.	34.40	8.93	33.90	9.43	34.90	8.43	33.57	9.77	31.67	11.67
24	1	High	Avg.	In-state	Avg.	30.57	12.77	29.07	14.27	32.00	11.33	28.17	15.17	28.90	14.43
25	1	Avg.	Avg.	In-state	Low	32.17	11.17	31.90	11.43	32.33	11.00	32.33	11.00	30.40	12.93
26	2	Low	Surplus	Out-of-state	Avg.	23.73	14.27	27.17	10.83	20.73	17.27	20.90	17.10	22.23	15.77
27	6	Avg.	Surplus	Out-of-state	Avg.	17.07	20.93	18.57	19.43	15.67	22.33	10.23	27.77	6.57	31.43
28	2	High	Surplus	Out-of-state	Low	11.67	26.33	12.67	25.33	10.73	27.27	4.50	33.50	3.17	34.83
29	2	Avg.	Surplus	In-state	High	27.83	10.17	27.67	10.33	27.90	10.10	28.17	9.83	26.50	11.50
30	1	High	Surplus	In-state	High	24.50	13.50	23.50	14.50	25.33	12.67	23.40	14.60	24.07	13.93
31	23	Low	Surplus	In-state	Avg.	33.83	4.17	35.67	2.33	32.23	5.77	38.00	0.00	41.73	- 3.73
32	84	Avg.	Surplus	In-state	Avg.	27.17	10.83	27.17	10.83	27.17	10.83	27.23	10.77	26.07	11.93
33	27	High	Surplus	In-state	Avg.	23.73	14.27	22.90	15.10	24.67	13.33	22.57	15.43	23.73	14.27
34	1	Low	Surplus	In-state	Low	31.83	6.17	34.00	4.00	29.90	8.10	36.90	1.10	40.67	- 2.67
35	5	Avg.	Surplus	In-state	Low	25.17	12.83	25.40	12.60	24.83	13.17	26.23	11.77	25.07	12.93
36	1	High	Surplus	In-state	Low	21.73	16.27	21.23	16.77	22.33	15.67	21.50	16.50	22.57	15.43

APPENDIX G

AN EXAMPLE ADMINISTRATIVE PROCEDURE AS APPLIED TO A STATE NETWORK

The proposed model for assessing student fees must be administratively and politically feasible. The political feasibility must be determined by the appropriate higher education and political leaders but the administrative feasibility can be generally outlined at this time. In order for this system to be most effective in a state network of institutions, the state should have a central agency responsible for the determination of budgetary needs in higher education on a statewide basis and responsible for the allocation of funds to the institutions. The State of Oklahoma has such an agency-- The Oklahoma State Regents for Higher Education. This example will, therefore, be applied to the Oklahoma State System of Higher Education for a typical fall semester enrollment period.

The Oklahoma State Regents for Higher Education, then, would follow the following proposed timetable of implementative steps:

FALL

The State Regents determine the instructional budgetary support needed for the upcoming fiscal year at each institution

in the approved educational programs. As this information is compiled for each institution and submitted to the Oklahoma Legislature for the State System, it should be emphasized to the Legislature that this is the expenditure level at which the institutions will operate their educational programs and that the State appropriation will be: (1) used to subsidize and reduce the costs to the students to the extent that funds are made available and, (2) allocated to students according to the student fee model.

SPRING THROUGH LATE-SUMMER

The students pre-enroll as normal. During pre-enrollment each student completes a State Regents Data Card. Each institution keypunches and validates the information on the Data Cards and transmits them to the State Regents office by a specified date. The student does not pay any fees at this time.

LATE SUMMER

The State Regents office applies the student fee model to the data cards and transmits to each institution a computer listing which includes for each pre-enrolled student the following type of information:

<u>Student's Name</u>	<u>Total Program Cost</u>	<u>Total State Subsidy</u>	<u>Net Student Fee</u>	<u>Net Student Fee Per SCH</u>
John Doe	\$800	\$575	\$225	\$15

The computer run could not be undertaken until essentially all the data cards were in. It would, therefore, be delayed until the start of school. This would allow students all spring and summer to pre-enroll. The primary concern with timing would be that a majority of students pre-enroll early enough to allow sufficient time for keypunching by the institutions.

BEGINNING OF SCHOOL

Each student validates his pre-enrollment by paying the Net Student Fee as shown on the computer listing. Since the Net Student Fee per Student Credit Hour for any particular student is the same regardless of the courses in which he enrolls, dropping and adding courses will not constitute a problem. If the student drops credit hours, he is refunded by credit hour according to the Net Student Fee per Student Credit Hour. If the student adds credit hours, he pays additional fees per credit hour according to the same technique.