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ABSTRACT

This report provides the technical documentation and detail supporting the policy paper of the same title. The study reported here examined the relationship between various state financing policies for postsecondary education to graduate and professional education in Minnesota. Following an overview of the Coordinating Board recommendations, giving their background and the rationale and impact of each, the report is organized into the following chapters: (1) introduction (reassessing graduate and professional education, mandate and purpose, approach and organization); (2) nature and costs of graduate and professional education (diversity of purpose, degrees and costs); (3) financing of systems and institutions in Minnesota (financing policies, University of Minnesota funding, state university system funding, policy impacts, and alternative policies); (4) financing of programs related to advanced study in Minnesota; (5) financing of graduate and professional students in Minnesota; (6) status of graduate and professional education in Minnesota; (7) importance of graduate and professional education in the United States; (8) national market conditions; and (9) conclusions (issues and alternatives). Forty-three tables provide data on funding, expenditures, revenues, tuition, enrollment, student finances, and degrees. A list of advanced degree programs is appended. (KM)

THE FINANCING OF GRADUATE AND PROFESSIONAL EDUCATION IN MINNESOTA

With

Coordinating Board Recommendations

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THE FINANCING OF GRADUATE AND PROFESSIONAL EDUCATION IN MINNESOTA

W·`h

Coordinating Board Recommendations

Minnesota Higher Education Coordinating Board

February 19, 1987

DATE: FEBRUARY 19, 1987 AND APRIL 16, 1987

SUBJECT: THE FINANCING OF GRADUATE AND PROFESSIONAL EDUCATION IN MINNESOTA

ACTION: THE HIGHER EDUCATION COORDINATING BOARD RECOMMENDED THAT:

1. The legislature continue the general, unrestricted financing of systems as the basic means of supporting graduate and professional education in Minnesota's public institutions of higher education.

2. In cases when institutions propose termination of graduate and professional programs or seek special funding for them, the Higher Education Coordinating Board examine need for those programs and determine the suitable response to address that need.

3. The legislature approve the University of Minnesota's request for funds to provide graduate fellowships.

4. The staff immediately begin working with the University of Minnesota to explore assistance for students in the health professions in financing their education, and that such exploration focus on targeted grant programs.

5. The Higher Education Coordinating Board explore more creative ways to assist graduate and professional students in financing their education.

6. The post-secondary community explore further issues emerging from this study related to the quantity of graduate and professional education in Minnesota.

7. The Higher Education Coordinating Board, in concert with the post-secondary education community, explore the establishment of guidelines for outcomes of graduate and professional education programs in Minnesota.

OVERVIEW OF COORDINATING BOARD RECOMMENDATIONS

Background and Rationale

In 1984, the Higher Education Coordinating Board included in its Management Plan an initiative to assess the relationship of various state policies for post-secondary education to graduate and professional education. The staff report, The Financing of Graduate and Professional Education in Minnesota, identifies principal financing issues for the Board's advice to state policy makers. A separate technical paper provides expanded information on the topics discussed in this policy paper.

The study explores state financing policies by posing three questions.

- What methods does state government employ to support advanced study?
- How appropriate are these methods of support for fulfilling the state's interests?
- Could alternative methods be more effective in pursuit of the state's interests?

The study does not indicate how much the state should spend or what specific programs or areas of advanced study should receive financial support. Results of the study, however, may help determine the appropriate state role and methods of financing particular types of programs to meet the state's objectives.

APPROACH

Five purposes of graduate and professional education are preparation of knowledge producers, production of knowledge, preparation of first professionals, preparation of graduate professionals, and provi-

national population but 1.2 percent of master's degrees, 1.5 percent of doctoral degrees, and 2.2 percent of first professional degrees in 1982-83.

Graduate and professional education in America, as known today, emerged in the late 1800s and early 1900s with roots in research, undergraduate education, and public service. Students, business, and federal and state governments share the benefits from advanced study. They also share responsibility for financing it.

Market conditions affect demand for instruction, expertise, and knowledge generated by advanced study. Unfavorable conditions have deterred individuals from pursing the Ph.D. in many fields even though demand for Ph.D.s may increase during the 1990s and demand for the knowledge they produce exists today. In first professional fields, particularly in the health sciences, projected surpluses of practitioners might deter talented individuals from pursuing studies. The time and costs involved in establishing programs and preparing students in many areas of advanced study make swift response to changing market conditions difficult.

USIONS

The study led to the following conclusions.

General Financing Issues

- Separate, non-enrollment driven funding for graduate and professional education could be more stable than the general, system-wide approach now employed, but it would intrude into governing board autonomy and would pose academic, staffing, and budgetary difficulties.

collegiate systems is based largely on enrollments and costs by level of instruction. The state appropriates funds to cover two-thirds of instructional costs and expects systems to raise the remaining one-third through tuition revenue. Governing boards have the authority to allocate state funds and to set specific tuition rates within systems. The state addresses demand for specific instructional programs and research through special appropriations and contracting arrangements. State support for graduate and professional students is virtually limited to authorized loans to help cover costs of attendance, of which tuition is a small proportion. The University of Minnesota, however, does use general appropriations for fellowships.

Graduate and professional education in Minnesota date back to at least 1880. The University of Minnesota has been the leading provider of advanced instruction in the state, though the State University System and the state's private colleges and professional schools have expanded their offerings in recent decades. Advanced study and related research have contributed to the state's economic vitality and to provision of professional services to its residents. Currently, 25 institutions in Minnesota offer advanced instruction in 607 degree programs. Nearly 25,000 students, nine percent of the state's post-secondary enrollment, pursue graduate and professional study. While over 70 percent of students in master's and first professional programs are Minnesota residents, over 50 percent of students pursuing academic doctorates are nonresidents. This reflects the greater mobility among doctoral students than among other graduate and professional students. Minnesota's share of advanced degrees conferred is disproportionately low compared to its share of the population: 1.8 percent of the

RECOMMENDATIONS:

Based on the findings and conclusions of the study, the Board adopted the following recommendations:

1. That the legislature continue the general, unrestricted financing of systems as the basic means of supporting graduate and professional education in Minnesota's public institutions of higher education.

   Rationale: General financing for all levels of instruction combined is advantageous for two reasons. First, institutions and their governing boards have the autonomy to allocate funds in response to changing demand for instruction and other services. Erosion of autonomy through the dedication and restriction of funds to particular endeavors such as graduate and professional instruction could limit institutional responsiveness to changing conditions. Second, unrestricted general support enables institutions to maintain the integration of the educational enterprise. Although graduate and professional education are distinct from undergraduate education, separation is difficult for both academic and budgetary purposes. Moreover, individual programs may be less vulnerable to cuts in unrestricted institutional financing than in dedicated program financing. Reduced vulnerability allows flexibility for institutions to build and sustain quality of programs in the long-term.

   Impact: Reliance on unrestricted systemwide financing methods for supporting graduate and professional education would continue.

2. That in cases when institutions propose termination of graduate and professional programs or seek special funding for them, the Higher Education Coordinating Board examine need for those programs and determine the suitable response to address that need.

Rationale: Unrestricted financing of institutions is the preferred approach to supporting advanced study. Circumstances, however, may

- o Reducing the state's tuition expectations from graduate and professional instruction could reduce the financial burden on students, but it would encroach on governing board authority to set tuition without making a great reduction in students' total costs of attendance.

- o Expanded use of restricted program funding could promote activities desired by the state, but it would intrude into institutional autonomy and would risk misdirected or unstable support.

- o State-funded, merit-based fellowships and other grants could be an incentive to pursue advanced education despite unfavorable, short-term market conditions for prospective students.

- o State-funded, need-based grants could increase financial access for students, but they would be difficult to administer and would not be targeted to the most talented students.

- o Creative financing methods sponsored by the state could help students overcome risks involved in pursuing advanced studies.

Specific Financing Issues

- o To be nationally competitive for highly talented students in Ph.D. programs, Minnesota institutions not only need to offer outstanding programs but also might have to offer financial incentives.

- o Projected surpluses of practitioners in some first professional fields could lead to declining enrollments, which might make special support from the state desirable to sustain the quality of programs.

Nonfinancing Issues

- o Reassessment of institutional roles in providing graduate and professional education in Minnesota might be necessary as circumstances change.

- o The state's role in contributing Minnesota's "fair share" nationally to graduate and professional education deserves attention.

- o The apparent imbalance between Minnesota's share of national population and advanced degrees conferred deserves attention.

and administratively distinct from graduate and undergraduate programs. dedicating funds to them might be easier than to others.

In cases when study in a field is desirable but financial support for an entire program is not feasible, the state could contract directly with educational institutions within or outside Minnesota to provide instruction for certain students. Contracting would allow flexibility in responding to perceived state needs.

Special funding would require determination of need, careful planning to assure proper levels and methods of support, and proper implementation by an institution. A decision to undertake special funding should be based on criteria such as appropriateness of method, responsiveness in addressing need, avoidance of unnecessary duplication of effort, cost effectiveness, and consistency with the state's educational goals and philosophy. Special funding, moreover, is not a sound approach for long-term financing. It is, rather, a method for coping with adverse conditions in the short-term. To avoid perpetuation of special funding for programs, sunset provisions would be desirable.

Precedent exists for special support from the state for health science instruction. For many years, the state made deliberate decisions to expand health science programs at the University of Minnesota and to provide special appropriations for medical instruction. State government also was instrumental in establishing and supporting the Mayo Medical School. Beyond this, the state has maintained contracting programs in optometry and osteopathy.

Impact: Coordinating Board staff would be required to examine need for programs and to determine appropriate mechanisms for supporting programs.

arise where special, dedicated funding is desirable despite the obvious intrusion by the state into institutional decisions and operations. Options for special funding include special appropriations and contracting.

The health sciences provide examples of instances when state intervention might be appropriate. National projections indicate that surpluses of practitioners in fields such as dentistry, medicine, and veterinary medicine could occur within the coming decade. Uncertain prospects for establishing practices could deter many qualified persons from entering these fields. A shortage of qualified applicants in professional or graduate programs could result in enrollments that are too low to maintain current levels of resources from enrollment-related funds.

Without special funding, three alternatives for institutions with programs in difficulty would be to sustain the programs with funds siphoned from other units, to adjust admission standards in programs in order to maintain enrollments, and to terminate the programs. The first alternative could threaten the overall quality of an institution. The second could threaten the quality of the particular programs in question. The third could deprive the state of an educational resource.

By providing special funding, the state could relieve an institution's burden of sustaining a program while insuring the continuation of that program. The state could provide funds for a certain level of enrollment even if actual enrollments were lower. Admission standards would not have to be adjusted, and funds from other units would be protected. Because first professional programs tend to be academically

3. The legislature approve the University of Minnesota's request for funds to provide graduate fellowships.

Rationale: Minnesota benefits from the presence of its strong, research oriented graduate programs. The research undertaken by doctoral students in many fields contributes directly to the health and diversity of the state's economy. Many recipients of Ph.D.s from Minnesota institutions remain in the state to make further contributions. Others enhance the reputation of Minnesota by virtue of their identification with the state.

Major doctoral institutions operate in a highly competitive, national market for the recruitment of talented graduate students. In addition to providing outstanding programs, institutions often need to offer financial inducements to attract talented students who may receive other offers of financial support.

The legislature and governor in recent years have made efforts to strengthen graduate education at the University of Minnesota. So far, much of the focus has been on the quality of the faculty through funding for retention and recruitment of highly regarded faculty members. The state also has provided general, unrestricted operating funds that the University uses for graduate student fellowships. The University is requesting additional appropriations for this purpose. Through provision of special funds for fellowships, the state would continue and extend its commitment through the recruitment of talented students in pursuing state interests.

Impact: Additional appropriations for the University of Minnesota would be necessary to provide fellowships.

4. That the Board staff immediately begin working with the University of Minnesota to explore assistance for students in the health profes-

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4. That the Board staff immediately begin working with the University of Minnesota to explore assistance for students in the health profes-

7. That the Higher Education Coordinating Board, in concert with the post-secondary education community, explore the establishment of guidelines for outcomes of graduate and professional education programs in Minnesota.

Rationale: Concern over standards in some advanced programs, particularly at the master's level, has arisen nationally. A specific concern is whether the master's degree should simply reflect the accumulation of credit hours or whether it should reflect the attainment of certain levels of knowledge and skills. Clear and generally agreed upon standards for graduate and professional education would provide criteria by which to assess the quality of proposed and existing programs.

Impact: Efforts to establish guidelines would require commitment of staff resources by the Coordinating Board.

CONTENTS

TABLES

CHAPTER I. INTRODUCTION

Advanced study and related research in critical areas have contributed significantly to the development of Minnesota's resources and human talent. Direct consequences have been new and rejuvenated industries, improved agricultural production, expanded commerce, and improved professional services. These have provided Minnesota with jobs, a productive labor force, a diverse economy, good health care, and an attractive quality of life. Because of its importance to the state's future, leaders in government, education, business, and labor have a stake in the status of advanced study in Minnesota. Vibrant and financially sound graduate and professional education help to improve the state's chances for creativity and growth. The alternative leads to stagnation or decline. Through government policy decisions, Minnesotans can influence the future of advanced education in the state.

Many parties have interests in graduate and professional education. Individuals pursue advanced study for financial, professional, intellectual, and other rewards. Business and industry sponsor it for the knowledge and expertise that directly benefit firms through increased productivity. Governments at various levels support it to implement public policies, to address labor force demands, to promote economic development, and to provide educational opportunities. Each party brings its own perspective to a wide range of policy questions about the quality, quantity, financing, and other issues related to advanced study.

This report focuses on the interests and policies of state government in financing graduate and professional education. In Minnesota, state government plays a major role in supporting advanced study. It appropriates funds for the

general operation of public institutions that provide advanced instruction and for specific instructional programs and research projects. Through loan programs, it helps students pay the costs of attending both public and private institutions.

BACKGROUND: REASSESSING GRADUATE AND PROFESSIONAL EDUCATION

Across the nation as well as in Minnesota, graduate and professional education are being reassessed for several reasons. One issue is how to maintain a capacity for providing balanced, high-quality advanced study while meeting changing patterns of demand. Related issues are how to prepare for anticipated changes in demand and how to maintain an adequate level of accessibility for students in the face of these circumstances. Some areas of advanced study have experienced considerable vitality and expansion in recent years. Others have experienced depressed enrollments and underused resources because positions for persons with advanced degrees exist, but the rewards are not competitive with other careers. More often, depressed demand for persons with advanced degrees is the cause for low enrollments. Projected low demand, at least in the short-term, may lead to low enrollment in yet more fields. This could lead to future shortages if, as anticipated, demand for persons with advanced degrees increases.

In Minnesota, proposed clarifications in mission among the post-secondary systems promise greater commitment of institutional resources to advanced study. At the same time, concern has arisen that state financing policies for post-secondary education may impede change. The University of Minnesota, the state's largest provider of graduate and professional instruction, is implementing A Commitment to Focus. Through this plan, the University is placing more emphasis on graduate and professional programs and improvement in its national position as a graduate institution. A Commitment to Focus also has contributed to an

examination of mission differentiation among the state's other post-secondary systems to reduce duplication of effort. A major element is a request that state government change its financing policies for post-secondary education to help the University achieve its goals.

The state's current policies for financing post-secondary education were adopted in 1983. Through them, the state determines levels of instructional expenditures for each public post-secondary system based on cost of instruction, level of instruction, and enrollment. Within this framework, the state appropriates funds equal to two-thirds of these expenditures to each public collegiate system and three-fourths to the system of area vocational-technical institutes. Tuition revenue is expected to cover the remainder of instructional expenditures, thereby relating tuition to costs of instruction for the entire system. To help undergraduate students pay their cost of attendance, the state has increased funding for the need-based Scholarship and Grant Program. To help both graduate and undergraduate students, the state created a new loan program. The 1985 Legislature established an income-contingent loan repayment program to help graduates of some advanced programs offered at Minnesota institutions.

MANDATE AND PURPOSE

In 1984, the Higher Education Coordinating Board adopted an initiative to assess the relationship of various state policies for post-secondary education to graduate and professional education. This report identifies principal financing issues for the Board's advice to state policy makers on matters directly affecting economic development, labor force needs, institutional mission, student access, and quality of education.

The report explores state financing policies by posing three questions:

o What methods does state government employ to support advanced study?

- o How appropriate are these methods of support for fulfilling the state's interests?
- o Could alternative methods be more effective in pursuit of the state's interests?

Chapters III, IV, and V respond to the first question. Answers to the other questions appear in the conclusion based on material developed in the remainder of the report.

The study does not indicate how much the state should spend or what specific programs or areas of advanced study should receive financial support. Results of the study, however, may help determine the appropriate state role and methods of financing particular types of programs to meet the state's objectives.

APPROACH

Five purposes of graduate and professional education are preparation of knowledge producers, production of knowledge, preparation of first professionals, preparation of graduate professionals, and provision of continuing education. Each purpose has unique characteristics and circumstances that make a uniform approach to advanced education both difficult and undesirable.

Selecting the appropriate method of support for advanced study also is important. Three broad concepts explored are:

- o General financing of institutions that offer graduate or professional education.
- o Financing of specific programs, projects, or activities that are related to advanced study.
- o Financing of students who undertake advanced study.

These approaches are not mutually exclusive. However, the implications of each differ. Providing general support for institutions leaves discretion over specific programs and level of funding for them largely to the institution.

Financing of specific programs allows for greater initiatives by the financing source in setting institutional priorities and resource allocations. Financing of students rather than institutions or programs focuses responsibility for educational choices on students and their sources of support.

Sound financing policy involves using the most appropriate method or methods to address a specific purpose of advanced study. Appropriateness depends on the nature of a particular objective and circumstances. This study assesses the applicability of the various financing methods to the challenges facing diverse elements of graduate and professional education in Minnesota.

ORGANIZATION

The narrative of this report begins in Chapter II by describing the nature of graduate and professional education and the costs associated with them. Analyses of the state's current support for advanced study in Minnesota through the financing of institutions, programs, and students are conducted in Chapters III, IV, and V. The development and extent of graduate and professional education in Minnesota are the subject of Chapter VI. Major developments shaping advanced study nationally are outlined in Chapters VII and VIII. Conclusions about the appropriateness of state financing policies in view of the nature and conditions of graduate and professional education are presented in Chapter IX.

CHAPTER II. NATURE AND COSTS OF GRADUATE AND PROFESSIONAL EDUCATION

Understanding the nature, diversity, and costs associated with graduate and professional education is necessary to assess the effects of state policies. A definition of graduate and professional education leads this chapter, followed by a discussion of their diverse purposes. The next section reviews the nature of advanced degrees. A discussion of costs associated with advanced study appears in the concluding section.

DEFINITION

For this study, graduate and professional education are defined as the formal, systematic study of a subject or field of applied expertise within an institutional setting at a level beyond the baccalaureate degree. This definition includes three distinct attributes: an institutional base, structured and supervised instruction, and use of high-order intellectual skills.

Institutional Base

Graduate and professional education are organized activities implying an ongoing institutional base. Institutions assemble faculties and other resources necessary for instruction. They also award credits, degrees, and other appropriate forms of recognition for satisfactory completion of work. To the extent that the institution is recognized as a legitimate provider of graduate or professional instruction, its graduates will find public acceptance.

An institutional base also fosters continuous contact among students and between students and faculty. Such contact occurs in classes, seminars, laboratories, advising sessions, and informal gatherings. It engenders a sense of shared experience that helps individuals develop common values and identifica-

tion within a field of study. This important socializing process complements the acquisition of knowledge and expertise.[1] Ultimately, it facilitates communication within a field by enabling dentists to think, listen, and speak like dentists, or economists to think, listen, and speak like economists. It also affects how individuals within a field relate to persons outside it.

The concept of an institutional base for graduate and professional education has been expanded in recent years. Many colleges and universities now offer external graduate degrees. As a result, concern has been raised over quality in terms of program content, faculty support, facilities, and transferability of off-campus programs.[2] Nova University, based in Fort Lauderdale, Florida, for example, offers doctoral programs in which students conduct most of their work and maintain contact with faculty from home on personal computers linked by telephone to a mainframe computer in Florida.[3] Several private companies and organizations have established their own educational enterprises with graduate programs in fields that directly address the needs of the firm. Examples include the Bell and Howell Education Group, the General Motors Institute, the Management Education Institute of the Arthur D. Little consulting

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1. Lester Anderson, Trends in Continuing Education for Professionals (American Association for Higher Education, 1974), pp. 15-18; Robert R. Bargar and Jane Mayo-Chamberlain, "Advisor and Advisee Issues in Doctoral Education," Journal of Higher Education, vol. 54 (July/August 1983), pp. 407-432; Howard S. Becker and others, Boys in White: Student Culture in Medical School (University of Chicago Press, 1961); Howard R. Bowen, "Graduate Education and Social Responsibilities," in Michael J. Pelczar, Jr. and Lewis C. Solmon, eds., Keeping Graduate Programs Responsive to National Needs (Jossey-Bass, 1984), pp. 113-19; Robert D. Brown and LuAnn Krager, "Ethical Issues in Graduate Education: Faculty and Student Responsibilities," Journal of Higher Education, vol. 56 (July/August 1983), pp. 403-18; Everett C. Hughes, "Higher Education and the Professions," in Carl Kaysen, ed., Content and Context: Essays on College Education (McGraw-Hill Book Company, 1973), pp. 767-91; and John Van Maanen, "Golden Passports: Managerial Socialization and Graduate Education," Review of Higher Education, vol. 6 (Summer 1983), pp. 435-55.
2. Council of Graduate Schools in the United States, "Non-Residential Graduate Degree Programs: A Policy Statement" (CGSUS, 1977).
3. The Chronicle of Higher Education, May 7, 1986, p. 30.

firm, and the Wang Institute of Graduate Studies.[4] A growing field of educational enterprise involves private entrepreneurs providing short-term instruction at an advanced level to businesses and other organizations.

Structure and Supervision of Instruction

Graduate and professional education involve coherent, structured study under the supervision of persons who have attained high levels of competence in a particular field. Coherence and structure provide the basis for systematic transmission of knowledge and expertise. Faculty members serve as mentors who assess, advise, and guide the development of students.

Individuals also may become self-educated. They may acquire knowledge and expertise independently without institutional affiliation and formal supervision. In some instances, such individuals successfully pursue careers in their fields. Lack of institutional affiliation, however, creates difficulties in gaining credibility among prospective peers. More pragmatically, self-educated individuals do not receive degrees, which are the typical, if not mandatory, entry requirements in many fields. The prerequisite of a degree for entry into some careers is a separate question.

High-Order Intellectual Skills

Graduate and professional education involve the use and transmission of intellectual skills that are of a higher order than typically required for undergraduate work. Advanced study consists not merely of the teaching and

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4. Robert A. Abramson, "Graduate Education in Industry," in Council of Graduate Schools in the United States, Research and Graduate Education. Proceedings of the Nineteenth Annual Meeting, Orlando, Florida (CGSUS, December 1979), pp. 33-44; K. Patricia Cross, "New Frontiers for Higher Education: Business and the Professions," in American Association of Higher Education, Partnerships with Business and the Professions (AAHE, 1981), pp. 1-6; and Suzanne W. Morse, Employee Educational Programs: Implications for Industry and Higher Education (Association for the Study of Higher Education, 1984), pp. 41-46.

learning of more information. It also involves the intense development and use of several skills: the ability to identify and analyze problems, the ability to resolve a problem through acquisition and application of appropriate knowledge, the ability to work independently, the ability to communicate findings to experts in the field, and the ability to examine critically the work that others in the field have produced. One observer has stated, "...graduate education is not an extension of a professor's undergraduate teaching, but an extension of a professor's research."[5]

Some educational leaders have voiced concern that some elements of graduate education are distinguished from undergraduate education on the basis of chronology, not intensity of effort. Some master's degree programs appear to consist of an additional year of undergraduate-level study, undertaken after receipt of a bachelor's degree, rather than a year of more intensive work. In certain circumstances, expectations and standards in programs appear to have been lowered to accommodate the abilities of persons enrolled for continuing education rather than advanced study.[6] Kenneth Keller, now president of the University of Minnesota, criticized the awarding of master's degrees simply on the basis of earned credit hours:

> A graduate degree program should not be simply a collection of courses, but a structured set of courses, providing information in depth and focused rather than random, a purposeful set of courses aimed not necessarily at rewarding additional

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5. Jaroslav Pelikan, Scholarship and Its Survival: Questions on the Idea of Graduate Education (The Carnegie Foundation for the Advancement of Teaching, 1983), p. 15.
6. W. H. Matchett, "Master's Degree Program in Computer Science Under Contract to a Large Electronics Firm," in Council of Graduate Schools in the United States, Industry/University Cooperative Programs: Proceedings of a Workshop Held in Conjunction with the 20th Annual Meeting (CGSUS, December 2, 1983), pp. 100-02.

work, but creating additional challenge, providing additional perspective as well as additional information.[7]

DIVERSITY OF PURPOSE

Graduate and professional education focus on one or more of at least five distinct endeavors:

- Preparation of **knowledge producers**--creators of new knowledge, new applications of knowledge, and new insights.
- Creation of new **knowledge** associated with the preparation of knowledge producers.
- Preparation of **first professionals**--practitioners in fields where formal training begins in programs beyond the baccalaureate degree.
- Preparation of **graduate professionals**--practitioners in fields where formal preparation is available in programs at the baccalaureate level.
- Provision of **continuing education** for the maintenance and enhancement of expertise.

Distinctions among these often are blurred. The preparation of knowledge producers almost always entails development of professional identity. Many professions depend on the creation of knowledge to expand and improve practice. Portions of a single program may be suitable for both the preparation of persons seeking to become knowledge producers and the preparation of those seeking other occupational goals. Similarly, a program simultaneously may serve the need for continuing education and for advanced preparation.

Knowledge Producers

Knowledge producers engage in systematic inquiry and research. In doing so, they generate new information and insights and develop new applications of

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7. Kenneth H. Keller, "The View from Academia," in Council of Graduate Schools in the United States and the Graduate Record Examination Board, Recent Developments in Graduate Programs, New Opportunities Through Versatility: Broadening the Mold. Proceedings of Conference/Workshop, Minneapolis, Minnesota, CGSUS, October 1982), p. 78. See also Maurice Mandelbaum, "The College, the University, and Society," in William K. Frankena, ed., The Philosophy and Future of Graduate Education (University of Michigan Press, 1981), pp. 10-11.

knowledge. Pursuit of knowledge in scientific and technological fields enables society to cope with its physical environment. In the social sciences and humanities, the results of inquiry and research helps humanity understand itself and, by doing so, enrich and ennoble the human spirit. Besides providing the fruits of their work, many knowledge producers also are the scientific and intellectual "seed corn" for society, as they have the responsibility for preparing subsequent generations of scientists and scholars.

The preparation of knowledge producers has four components.[8] The first is a grounding in the subject matter and literature in a field. The second is the acquisition of skills necessary to conduct research within the field. The third is the development of critical skills to examine assumptions and challenge authority. The final component is the undertaking of a research project that demonstrates the capacity to work independently with acquired knowledge, critical abilities, and research skills while contributing new information or insights.

The process is time consuming, highly individualized, and costly. Programs generally vary in length from four to seven years of full-time study beyond the baccalaureate degree, depending on subject matter and institutional or departmental requirements. Part-time pursuit of studies, due to work or other commitments by students, increases the duration, which could create difficulties for students who may lower their diligence because of the reduced intensity. Preparation is highly individualized as student and mentor often work together closely. Faculty members often have the latitude to select students, while students often select institutions in order to study under certain faculty

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8. Joseph Katz, "Development of the Mind," in Joseph Katz and Rodney T. Hartnett, eds., Scholars in the Making: The Development of Graduate and Professional Students (M. A. Ballinger Publishing Company, 1976), pp. 107-26; Anne Robinson Taylor, "Becoming Observers and Specialists," in Katz and Hartnett, eds., Scholars in the Making, pp. 127-40.

members. Attention to individual students consumes much time of individual faculty advisors. Programs also may require intensive use of libraries, data processing facilities, and laboratories.

Knowledge and Research

Production of knowledge through research is related closely to graduate education. It is a necessary element in the preparation of knowledge producers. Conversely, research often depends upon graduate students who, as part of their training, implement experiments and gather information for their mentors' projects. Much research in the United States, including about half the basic scientific research, occurs in association with graduate schools.[9]

Research often is placed into one of two categories: basic or applied. Basic research is work undertaken to advance knowledge and the state of the art in a field of study. Applied research is work undertaken to make the application of existing knowledge possible.

Although research is necessary for graduate education, graduate education is not necessary for research, at least in the short term. A considerable amount of research in the United States does occur in industry, government agencies, and independent research organizations without the participation of graduate students.[10] Basic research outside universities is quite common in other countries, such as the Max Planck Institutes in Germany. In the long term, however, no research effort can endure without the training of new knowledge producers to replace the old.

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9. National Research Council, Outlook for Science and Technology: The Next Five Years (W. H. Freeman and Company, 1982), pp. 514-15.
10. Robert S. Friedman and Renee C. Friedman, "Managing the Organized Research Unit," Educational Record, vol. 65 (Winter 1984), pp. 27-30; "MIT Agonizes over Links with Research Unit," Science, vol. 214 (October 23, 1981), pp. 416-17; National Research Council, Outlook for Science and Technology, pp. 10, 514-15; Alvin M. Weinberg, "Scientific Teams and Scientific Laboratories," Daedalus, 99, pp. 1056-75.

Professionals

Professionals are persons who make available their acquired expertise for the assessment, treatment, or resolution of problems through application of learned principles and skills. Professional education involves the organized and systematic transmission of expertise from instructor to student. The focus of professional education typically is on the transmission and use rather than creation of knowledge and applications. Professionals, however, draw upon and incorporate into their work the knowledge, insights, and technology developed by researchers.

First Professionals. The term first professional refers to professionals in fields where instructional programs are first available beyond the baccalaureate level. Dentistry, law, medicine, and veterinary medicine are among the fields that fall within this category. One exception is pharmacy, which is offered at the bachelor's degree level but often considered a first professional field at advanced levels. Possession of a baccalaureate degree is a common but not universal requirement for entry into such programs.

The preparation of first professionals requires intensive use of laboratories, clinics, and libraries. All but the basic courses of instruction have low ratios of students to faculty. Students face the equivalent of three to four years of full-time, formal instruction. Completion of specialized programs, residencies, and clerkships may require several additional years.

Graduate Professionals. The term graduate professional refers to programs in fields where initial training is available at the baccalaureate level.[11] An undergraduate major in the field is not an entrance requirement for graduate

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11. At some institutions, such as the University of Minnesota, the term refers to instructional programs beyond first professional degrees. Programs leading to a master's or Ph.D. in medical specialties are examples.

study in some fields. Part-time study for professional development is common. Business administration, teacher education, and nursing are examples of graduate professional programs.

The nature of graduate professional programs varies considerably. Some programs involve mostly classroom instruction, while others include more costly laboratory or clinical experience. Programs commonly vary in length from one to two years of full-time equivalent study at the master's level and three to four years at the doctoral level.

Continuing Education

Continuing education is the enhancement of knowledge and skills for active practitioners. New knowledge and techniques continuously emerge in virtually all professional and scholarly fields. To maintain effectiveness in their fields, practitioners must keep abreast of these developments. Individuals may, on their own, acquire knowledge and skills. Organized instruction, however, has become a common means of obtaining continuing education. Continuing education is available in a variety of formats from a variety of providers. It can be in the form of regular, credit-bearing coursework at an educational institution, non-credit short courses, seminars, workshops, or directed independent study. At least seven types of providers are identifiable:[12]

- o Informal, autonomous groups
- o Professional and other formal associations
- o Professional schools
- o Universities
- o Employers

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12. Cyril O. Houle, Continuing Learning in the Professions (Jossey-Bass, 1980), ch. 6. See also Philip N. Nowlen and Milton R. Stern, "Partnerships in Continuing Education," in American Association for Higher Education, Partnerships with Business and the Professions, pp. 17-23.

- o Independent contractors
- o Purveyors of professional supplies and equipment

The variety of providers is a source of concern to several observers who believe that professional schools and universities should be the primary providers of continuing education. Some argue that educational institutions are the foremost and most reliable source of knowledge, while others view continuing education as a new business opportunity.[13]

GRADUATE AND PROFESSIONAL DEGREES

To a large extent, degree titles are related to the particular purpose of advanced study. Level of degree, however, is a complicating factor. Doctoral and master's level degrees are awarded in many fields. Master's level work typically involves one to two years of full-time study, with or without a research project. Doctoral level work typically involves several years of work beyond the master's level, including more intensive and individualized study and research. For knowledge producers the terminal degree, or highest available degree, generally is a doctorate, though many students earn a master's degree in the process of their doctoral work. For graduate professionals, the terminal degree commonly is a master's degree, and to a lesser extent, a doctorate.

Institutional mission is a major issue related to both nature of programs and level of degree. Institutions of advanced study may be classified according to the preparation that they provide--knowledge producer, first professional, or graduate professional. More typically, they are classified by highest level of

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13. Phillip E. Frandson, "Continuing Education of the Professions: Issues, Ethics and Conflicts" (paper presented at meeting of National Association of State University and Land Grant Colleges, 1975), p. 11; Israel Katz, "An Emerging Role for Universities," in Frederick C. Burgwardt and Joseph M. Bledenbach, eds., CES Directors Handbook, p. 46; and Kenneth E. Young, "Graduate Education and Continuing Education," in Pelczar and Solmon, eds., Keeping Graduate Programs Responsive to National Needs, pp. 91-95.

degree that they confer--doctorate, master's, or first professional. Level of degree is an important distinction. Doctoral preparation typically is more intensive than preparation at the master's level and, therefore, requires a greater commitment of faculty and other institutional resources.

Knowledge Producers

Degrees associated with knowledge producers are the Doctor of Philosophy (Ph.D.) at the doctoral level and the Master of Arts (M.A.) and Master of Science (M.S.) at the master's level. The Ph.D. is the highest research-oriented degree conferred in the United States. It is awarded in many fields. It signifies mastery not only of a body of knowledge, but also of the philosophical foundations of a discipline. In addition, it requires the ability to design and conduct an original research project that contributes new knowledge or insights. Such a research project usually terminates in a dissertation.

The distinction between the M.A. and M.S. is most commonly the field of study. The M.A. generally is conferred in humanities and social sciences while the M.S. generally is conferred in the natural sciences and technology fields. Both degrees signify mastery of a body of knowledge and the ability to undertake research in a discipline.[14]

First Professionals

First professional fields have unique, widely recognized degrees. These degrees include Doctor of Chiropractic (D.C.) in chiropractic, Doctor of Dental Surgery (D.D.S.) in dentistry, Juris Doctor or Doctor of Laws (J.D.) in law, Doctor of Medicine (M.D.) in allopathic medicine, Doctor of Osteopathy (D.O.) in

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14. Frequently, students have options within a degree program to focus more on research or more on coursework. The option of less coursework and one major research project often is labeled Plan A. The option of more coursework and several smaller research projections often is labeled Plan B.

osteopathic medicine, Doctor of Pharmacy (D.Pharm.) in pharmacy, and Doctor of Veterinary Medicine (D.V.M.) in veterinary medicine. The clergy often receive first professional degrees in divinity, though many of these are at the master's level. Although doctor appears in many titles, the degrees are not necessarily final or terminal degrees in the field. In most of these fields, further study leads to the M.A., M.S., Ph.D., or other degree.

Graduate Professionals

Study in graduate professional fields may lead to degrees at the doctoral or master's level. Unlike the Ph.D., M.A., and M.S., these degrees almost always contain the name of the specific field in their title. Examples of such degrees at the doctoral level include Doctor of Education (Ed.D.), Doctor of Engineering (D.Engr.), Doctor of Psychology (D.Psych.), Doctor of Business Administration (D.B.A.), and others. Among degrees at the master's level are Master of Business Administration (M.B.A.), Master of Forestry (M.F.), and Master of Social Work (M.S.W.). The Doctor of Arts (D.A.), a degree for the preparation of college teachers rather than researchers, generally is placed into this group.

While some specialized degrees such as the Ed.D., M.B.A., and M.S.W. have existed since at least 1920, a tendency toward further diversification has accelerated during the past 20 years. Examples of recent degrees include Master of Planning in Public Affairs (M.P.) and Master in Software Design and Development. These degrees, many of which meet specific occupational needs of students, are estimated to exceed 1,500 nationwide. The trend toward further distinction of subject areas meets personal, professional, and institutional needs.

Most graduate degrees are conferred by graduate schools within universities. This arrangement allows for consistency in the review and evaluation of

degree programs. In some instances, though, master's degrees are within institutions but outside the purview of the graduate school.[15]

Other Awards

Graduate education may lead to awards other than degrees. Several programs lead to a specialist's certificate for work at or beyond the master's level. Participants in many continuing education programs receive certificates for completion of their work.

COSTS

The costs of graduate and professional education fall into two categories, the costs of providing and the costs of receiving. Although considerable overlap exists between the two types of costs, they are not identical. The following discussion describes the costs associated with advanced study.

Costs of Providing Instruction

Institutions bear a variety of costs in providing graduate and professional instruction. The most immediate costs are the portions of expenditures for faculty and equipment directly attributable to graduate and professional instruction. Expenditures for research clearly related to the preparation of knowledge producers constitute additional direct costs. General administrative expenditures for items such as registration, executive management, physical plant operation, and, in some cases, debt service on facilities comprise the remaining instructional costs.

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15. This is the case of the Master of Agriculture in Food Technology (M.Ag.) offered through Continuing Education and Extension at the University of Minnesota.

Costs of Receiving Instruction--Cost of Attendance

The costs of receiving instruction are the costs incurred by students in attending a graduate or professional school. These costs continue for the duration of a program. The longer and more highly priced the program, the greater are the costs. Traditionally defined costs of attendance, used in analysis for financial aid programs, usually are limited to certain out-of-pocket expenditures incurred by undergraduates. Graduate and professional students, however, face additional costs.

Traditional Costs of Attendance. Traditional costs of attendance, as defined in the financial aid community, apply throughout higher education. They include direct educational and living expenditures. Because graduate and professional instruction generally are more expensive to provide than undergraduate instruction, the prices charged to advanced students are usually higher as well. Estimated living expenses also are higher for advanced students, many of whom are married, than for traditional college-age students, toward whom most need-based aid has been directed.

The traditional costs of attendance include the following elements:

- **Tuition and required fees** - Tuition is the price of instruction that institutions charge to students. The level of tuition may vary by enrollment status and, at public institutions, residency. Students enrolled full-time generally pay higher total tuition per term than part time students. Because part-time students have to be enrolled for a similar number of courses as full-time students to complete a program, total tuition costs per program are similar. In some instances, however, tuition per credit hour is higher for part-time students, resulting in higher overall tuition costs. Residency is a much greater factor in determining costs because public institutions usually charge higher tuition rates for non-resident students. Required fees include general student service fees and fees for supplies provided by the institution in laboratories and other courses.

- **Books, supplies, and miscellaneous items directly related to instruction.**

- **Living Expenses** - Living expenses include food, clothing, housing, transportation, and miscellaneous personal items.

Nontraditional Costs of Attendance. Graduate and professional students face costs not typically faced by undergraduates. Some costs arise by the nature of graduate and professional education. Others arise as a consequence of an undergraduate education or are consequences of a student's financial circumstances.

- **Research** - As part of their preparation, graduate students in doctoral programs must complete a major research project. Research may involve use of computers, consumption of laboratory materials, and travel to out-of-town libraries and archives. These activities take time and money. Some costs are included in regular instruction and are covered by the institutions. Other costs are left to the students. Often research is conducted as part of a research project funded by outside sources. In these cases, outside funds offset the cost of a student's research.

- **Professional Activities** - As part of their initiation into their chosen fields, graduate and professional students engage in professional activities outside regular instruction and related research. Joining professional organizations and attending conferences are examples of such activity. Costs vary, but the burden largely falls on students.

- **Repayment of Loans** - Many graduate and professional students have loans to repay because they had to borrow money to finance their undergraduate education. The major federal student loan programs, the National Direct Student Loan Program and the Guaranteed Student Loan Program, do not require repayments as long as a student is attending a higher education institution. This includes attendance at a graduate or professional school. Still, some government loan programs and private lenders do not provide for such deferments. Graduate and undergraduate students with non-deferred loans bear the immediate costs of repayment. Repayment of loans for housing, cars, and other items also constitute current costs.

- **Opportunity Costs** - Opportunity costs represent the loss in income that a student incurs by not participating in the labor force. These costs seldom are considered significant for younger undergraduates who traditionally do not have strong earning power and who still are perceived as maturing persons not yet ready for careers. Graduate and professional students, by virtue of their undergraduate preparation, have earning power and can compete in the labor force. Their opportunity costs are substantial and constitute a major element in the decision to pursue advanced study.

  To be a successful financial investment, graduate and professional education must yield additional income at least equal to income foregone

during attendance plus the direct educational costs, including loan repayments. Using the salaries of persons with recent bachelor degrees as a measure, opportunity costs might reasonably be about $20,000 annually.

CHAPTER III. FINANCING OF SYSTEMS AND INSTITUTIONS IN MINNESOTA

General financing of systems and institutions refers to the provision of unrestricted operating funds. These funds can be used for providing graduate and professional instruction and other functions. An institution may allocate these funds to whatever purpose it deems appropriate. Providers of general revenue have little or no authority over the use of funds for specific programs. In contrast, funds from an external body dedicated to a specific program or activity are classified as restricted. Confusion in making such distinctions may occur when some latitude exists in the use of dedicated funds or when dedicated funds may in effect release resources from the dedicated activity to other purposes.

This chapter describes the financing of Minnesota's post-secondary education systems and institutions that offer graduate and professional instruction. Topics include the sources of institutional financing, the state's financing policies for public post-secondary systems, the University of Minnesota's systemwide allocation and tuition policies, the State University System's allocation and tuition policies, and possible impacts of the state funding and tuition policies on graduate and professional education in the future. The concluding section identifies state funding and tuition policy options.

SOURCES OF OPERATING FUNDS

Higher education institutions obtain operating funds from a variety of sources. Some funds are unrestricted while others are restricted to specific purposes. Sources of funds include tuition and fees; federal, state and local appropriations; federal, state and local grants and contracts; private gifts,

grants, and contracts; endowment income; and sales of services and educational activities.[1]

Patterns of funding for operations vary among institutions that offer advanced instruction. As shown in Table 1, private institutions in Minnesota rely primarily on tuition revenue for current operations. Private gifts, grants, and contracts as a source of funds are a distant second. Public institutions, other than the University of Minnesota-Twin Cities, rely on state appropriations for slightly more than half their funds. Tuition and federal funds are the other important sources of funds. The University of Minnesota has more diverse sources of funds, reflecting its wider range of activities. State appropriations, the largest source of funds, account for less than half the University's operating funds.

STATE FINANCING POLICIES FOR PUBLIC POST-SECONDARY SYSTEMS

State financing policies for general operations of the public post-secondary systems recognize two categories of expenditures: instructional and noninstructional. Most support for instruction is derived by formula from an average cost funding policy and a tuition policy. The remaining funding for instruction and funding for noninstructional activities are made through adjustments in the budgetary base without the use of a formula.

State appropriations, generated by the average cost funding policy and the non-formula funding policy, tuition revenue, and other minor sources of revenue are recognized as general funds in the state budget. General fund instructional expenditures are those supported by general fund revenues. Significant levels

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1. Revenues from auxiliary enterprises and independent operations have been excluded because the nature and extent of such activities varies among institutions and because they are incidental to the provision of instruction. Hospital revenue also is excluded because it existed in only one of the 25 Minnesota institutions examined.

TABLE 1. PERCENTAGE OF SELECTED CURRENT FUNDS REVENUES BY SOURCE FOR PRIVATE AND PUBLIC INSTITUTIONS IN MINNESOTA THAT OFFER GRADUATE AND PROFESSIONAL INSTRUCTION, FISCAL YEAR 1984-85[1]

Source of Funds	Selected Current Funds Revenues		
	University of Minnesota-Twin Cities	Private Institutions[2]	Public Institutions[3]
Tuition	14%	61%	28%
State Appropriations	41	0	54
Federal Grants and Contracts	18	5	12
State and Local Grants and Contracts	1	4	3
Private Gifts, Grants and Contracts	11	13	1
Endowment Income	3	5	*
Other Sources	12	12	3
TOTAL[4]	100%	100%	100%

SOURCE: HEGIS, U.S. Department of Education.

[1]Selected current funds by source for 13 of 16 private institutions and eight public institutions that offered graduate or professional instruction.
[2]Excludes Mayo Graduate School of Medicine, Katz Graduate School of Business, and Walden University.
[3]Excludes University of Minnesota-Twin Cities.
[4]Totals may not add to 100 due to rounding error.
*Less than .5 percent.

of instructional expenditures, however, are supported by non-state funds, which are not reflected in the state budget. Reductions in these non-state funds could result in system requests to the state for their replacement.

The state's financing policies generate considerable revenue for the public post-secondary systems. Total general fund expenditures in the University of Minnesota and the State University System were $625 million in Fiscal Year 1986. State appropriations were $448 million, or 72 percent of the total, while tuition brought $163 million, or 26 percent. The remaining 2 percent came from other sources.

Financing of Instructional Expenditures

For state policy, instruction is defined as all courses offered for credit that count toward the requirements of a degree or certificate.[2] Most funds for instruction are provided through the average cost funding and tuition policies.

Average Cost Funding. Average cost funding relates state funds for instruction to a system's enrollment and its cost of providing instruction. The policy is used to suggest levels of state appropriations for instruction at Minnesota's public post-secondary education systems.

A system's cost of providing instruction is based on average costs per full-year equivalent (FYE) enrollment.[3] Average costs per FYE represent fully allocated expenditures incurred in providing instruction divided by the number of FYE generated by the instruction. Fully allocated expenditures include direct expenditures, such as those for classroom instruction and indirect expenditures attributable to instruction, such as those for library operations,

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2. Minnesota Department of Finance, Average Cost Funding Task Force Report (MDF, May 1984), p. 6.
3. Enrollment in collegiate systems is measured in full-year equivalencies (FYE), which gauge the volume of instruction provided in terms of student credit hours. One undergraduate or first professional FYE equals 45 student credit hours. One graduate FYE equals 30 student credit hours.

counseling, administration, physical plant operations, and other support services. Indirect expenditures also are attributed to research and public service based proportionally on their use of support services.

The suggested state appropriation for instruction to each of the collegiate systems is equal to 67 percent of total estimated instructional expenditures for that system.[4] The state funding policies yielded an estimated instructional expenditure level of $483 million in Fiscal Year 1986 for the University of Minnesota and the State University System. The state provided $323 million in appropriations to finance these instructional expenditures in the two systems during Fiscal Year 1986.[5]

The average cost funding policy buffers changes in funding from changes in enrollments by basing funding to each system on its enrollments two years earlier. Thus, the systems received funding for Fiscal Year 1987 based on Fiscal Year 1985 enrollments. Lagged funding gives systems time to plan changes in staffing and expenditures in response to changes in enrollment, and it avoids the uncertainties of funding based on projected enrollments.

The average cost funding policy is used only to determine state appropriations to systems. Governing boards have discretion in allocating funds to individual colleges, campuses, and programs. The governing boards have the authority to carry over any unexpended funds from one year to the next. Further, the state does not take non-state funds such as gifts, grants, bequests, or endowments into account in determining state appropriations for each system.

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4. Unlike the collegiate systems, the suggested state appropriation for instruction to the area vocational-technical institutes is equal to 75 percent of its estimated instructional expenditures.
5. These expenditure and appropriations figures are based on legislative intent.

Tuition Policy. State policy relates expected total tuition revenue to total instructional expenditures estimated through average cost funding. In the collegiate systems, the intent of the policy is to have tuition revenue finance the 33 percent of instructional expenditures not covered by state appropriations in the instructional budget.[6] Collectively, all students within a collegiate system are expected to finance one-third of the system's instructional expenditures through tuition. The policy yielded total estimated tuition revenue of $159 million in Fiscal Year 1986 for the University of Minnesota and the State University System.[7]

The state tuition policy is applied in the aggregate at the system level. The governing boards have discretion to set tuition rates that may vary by program and level of instruction. Tuition rates, thus, may or may not equal 33 percent of the cost of instruction per student. Moreover, system governing boards could raise more or less than the expected amount of tuition revenue.

Financing Noninstructional Expenditures and Supplemental Instructional Expenditures

The state provides funding for noninstructional activities, supplemental funding for instructional activities, and state special appropriations for the University of Minnesota without the use of formulas. Noninstructional activities include separately budgeted research, public service, and a category for miscellaneous activities. Supplemental funds for instruction typically result from system requests or from gubernatorial or legislative initiatives to improve, expand, or start programs. Special appropriations to the University of

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6. In the area vocational-technical institutes, the 25 percent of instructional expenditures not funded by appropriations is intended to be funded by tuition revenue.
7. The estimate is based on legislative intent.

Minnesota support primarily research and public service. The use of state special appropriations for the financing of programs is discussed in Chapter IV.

Starting with the previous year's funding level as a base, the state determines levels of funding based on a proposal's anticipated benefits, its relevance to perceived state needs, and the availability of state revenue. Except for state special appropriations, allocation of funds within a system is left to the governing boards. The incremental funding policy yielded an estimated $163 million in noninstructional expenditures for the University of Minnesota and the State University System in Fiscal Year 1986. State appropriations supported most of this amount.

UNIVERSITY OF MINNESOTA FUNDING AND ALLOCATIONS

This section focuses on three topics. The first is a description of the general fund resources made available to the University of Minnesota through state financing policies. Next is a description of system allocation and tuition policies used to deploy these resources. The expenditures and tuition rates for graduate and professional instruction that result from the state and system policies also are described.

System General Fund Resources

In Fiscal Year 1987, the University of Minnesota's estimated general fund expenditures are $486,227,600, while estimated appropriations to the University are $363,386,100. Although general fund expenditures rose 110 percent in current dollars between Fiscal Years 1977 and 1987, real growth during the period was 5 percent. Constant dollar state appropriations rose by 9 percent during the same period. The constant dollar growth in both spending and appropriations has occurred since Fiscal Year 1983, reversing the constant dollar declines in both categories between Fiscal Years 1977 and 1983 The earlier

declines were due primarily to the state fiscal crisis in the early 1980s. University of Minnesota general fund expenditures and revenues, including all system funds that result from or are recognized by state funding policies, are displayed in Table 2.

University of Minnesota spending for instruction was $327,205,900 in the aggregate and $5,754 per student in 1987. Constant dollar state spending for instruction in 1987 was slightly higher on a per student basis and virtually unchanged in the aggregate, compared to 1977. General fund instructional expenditures per student in constant dollars were 5 percent higher in 1987 than in 1977. This increase was due to a 14 percent increase in constant dollar spending per student since 1983 that reversed the earlier decline.

Expected tuition revenue at the University of Minnesota is $110,866,400 in Fiscal Year 1987. Between 1977 and 1987, tuition revenue rose by 153 percent in current dollars and by 27 percent in constant dollars. The increases in tuition revenue per student, 164 percent in current dollars and 32 percent in constant dollars, were larger. Tuition revenue as a percentage of instructional expenditures rose from 26.9 percent in 1977 to 33.5 percent in 1987. Virtually all of this increase occurred by Fiscal Year 1984, when the current tuition policy was implemented.

Funds for Program Improvements Related to Graduate and Professional Education

The 1985 Legislature made significant appropriations to the University of Minnesota for program improvements. Table 3 displays the items related to graduate and professional education. While most of these were supplemental appropriations, portions that are spent on instruction will become part of the expenditure base supported by average cost funding.

One item relates directly to graduate and professional studies. The $2.5 million for graduate student tuition fellowships, matched by an equal amount from University of Minnesota funds, was initiated in fall 1986. It provides fellowships to students with teaching or research assistantships. Students with appointments of 25 percent time or greater receive awards proportionally equal to twice their appointment percentage. Thus, a student with a 50 percent appointment receives a fellowship equal to 100 percent of tuition.[8] The remaining items were directed at improving the University's competitive position in attracting and retaining faculty and in improving support for certain programs.

System Allocation Policy

The University of Minnesota allocates general funds to its academic and service units using a process with two components. The first, undertaken annually, establish incremental or decremental changes in spending levels by unit. Allocations take into account changes in enrollments and prices, the availability of funds for program enhancement, external mandates that affect expenditures, and the overall availability of funds. The second component involves planning and reallocation to redirect funds within and across units. Redirection of funds reflects priorities based on assessments of quality, service to other departments, integration of functions, demand for instruction and research, cost effectiveness, uniqueness, and adequacy of funding compared to programs at peer institutions.

Expenditures for Graduate and Professional Instruction

The University of Minnesota spent over $11 million, more than one-third of its state-provided resources for instruction, on graduate and professional

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8. Nonresident graduate assistants already had been paying resident tuition rates.

TABLE 2. GENERAL FUND EXPENDITURES AND REVENUES IN CURRENT AND CONSTANT DOLLARS, UNIVERSITY OF MINNESOTA, FISCAL YEARS 1977 AND 1983 THROUGH 1987[1]

	F.Y. 1977	F.Y. 1983	F.Y. 1984
Total General Fund Expenditures			
Current Dollars	$231,831,600	$362,057,500	$398,161,600
Constant Dollars	231,831,600	221,441,900	231,086,200
State Appropriations			
Current Dollars	167,399,900	255,792,600	282,019,300
Constant Dollars	167,399,900	156,448,100	163,679,200
General Fund Instructional Expenditures			
Current Dollars	162,978,900	242,146,400	268,155,300
Constant Dollars	162,978,900	148,101,800	155,632,800
Instructional Expenditures Per FYE[3]			
Current Dollars	2,748	4,120	4,701
Constant Dollars	2,748	2,520	2,728
Tuition Revenue			
Current Dollars	43,798,100	83,392,000	91,185,700
Constant Dollars	43,798,100	51,004,000	52,922,600
Tuition Revenue Per FYE[3]			
Current Dollars	738	1,419	1,598
Constant Dollars	738	868	927
Tuition Revenue as a Percentage of Instructional Expenditures	26.9%	34.4%	34.0%

SOURCE: Minnesota Department of Finance and University of Minnesota.

[1]Higher Education Price Index, with base year 1977, was used to deflate expenditures and revenues. The F.Y. 1987 inflation rate was assumed to be 4.0%.

[2]Information for F.Y. 1987 is estimated

[3]Includes graduate and undergraduate.

CONTINUED

TABLE 2. CONTINUED

F.Y. 1985	F.Y. 1986	F.Y. 1987[2]	Percent Change F.Y. 1983 to F.Y. 1987	Percent Change F.Y. 1977 to F.Y. 1987
$428,955,500	$452,110,000	$486,227,600	34%	110%
233,381,700	235,596,700	243,601,000	10	5
307,743,400	329,545,500	363,386,300	42	117
167,433,800	171,727,700	182,057,500	16	9
293,449,400	307,553,200	327,205,900	35	101
159,656,900	160,267,400	163,930,800	11	1
5,251	5,480	5,754	40	109
2,857	2,856	2,883	14	5
99,852,600	108,848,400	110,866,400	33	153
54,326,800	56,721,400	55,544,300	9	27
1,787	1,940	1,950	37	164
972	1 011	977	13	32
34.0%	35.4%	33.9%		

TABLE 3. STATE APPROPRIATIONS TO THE UNIVERSITY OF MINNESOTA FOR PROGRAM IMPROVEMENTS RELATING TO GRADUATE OR PROFESSIONAL INSTRUCTION, 1985-87 BIENNIUM

Purpose	Amount
Restoration of Faculty Purchasing Power	$ 9,571,100
Faculty Special Market and Retention	4,224,200
Graduate Student Tuition Fellowships	2,500,000
Funding Rank Adjustment	8,000,000
Permanent University Fund Appropriation Offset (for creation of endowed chairs)	2,500,000
TOTAL	$26,795,300

SOURCE: University of Minnesota.

instruction in Fiscal Year 1985. Expenditures for professional instruction exceed those for graduate instruction, as shown in Table 4. The costs per FYE of providing graduate and professional instruction were twice those of providing undergraduate instruction at the University, as shown in Table 5.

Direct expenditures per FYE for graduate and professional instruction at the University of Minnesota declined slightly in constant dollars between Fiscal Years 1981 and 1985. Considerable variation, however, occurred by unit. Direct expenditures per FYE for graduate instruction declined by over 20 percent. In contrast, increases occurred in every professional program except dentistry. Within graduate and professional instruction, expenditures per FYE varied significantly. Veterinary medicine had the highest expenditure per FYE, more than triple the amount for graduate instruction. Most of the variation in expenditures per FYE among components of graduate and professional instruction appears to be due to variation in direct expenditures.

Tuition and Instructional Costs

While the state tuition policy expects that system tuition revenue will finance 33 percent of system instructional expenditures, governing boards need not apply this policy to each unit or program. In fact, some units generate tuition revenue in excess of 33 percent of their instructional expenditures while other units generate less than 33. Units generating more than 33 percent are, in effect, subsidizing units that generate less than 33 percent. A comparison of tuition revenue and instructional expenditures by enrollment unit is useful in determining which units receive and which units provide subsidies.

The provision of graduate and professional instruction at the University of Minnesota is subsidized by tuition revenue generated in undergraduate units. As shown in Table 6, tuition revenue generated in graduate and professional units constituted 22.6 percent of their instructional expenditures, while under-

TABLE 4. DIRECT, INDIRECT AND TOTAL GENERAL FUND INSTRUCTIONAL EXPENDITURES BY TEACHING UNIT AND LEVEL OF INSTRUCTION, FISCAL YEAR 1985 (DOLLARS IN THOUSANDS)[1]

Teaching Unit	Direct Expenditures	Indirect Expenditures	Total Expenditures	Percent of Total
Graduate - All Units	$ 32,072	$17,487	$ 49,559	17%
Professional - All Units[2]				
Upper Division/Professional	44,549	17,073	61,622	21
Subtotal Graduate and Professional	$ 76,621	$34,560	$111,181	38%
Undergraduate - All Units	117,249	64,788	182,037	62
TOTAL ALL UNITS AND LEVELS	$193,870	$99,360	$293,218	100%

SOURCE: University of Minnesota.

[1]Teaching unit refers to the academic unit at the University of Minnesota that provides the instruction. Graduate - All Units, for example, includes instruction at the graduate level provided by the College of Liberal Arts, the Institute of Technology and all other teaching units as well as graduate instruction provided through summer session and continuing education and extension. Expenditures for graduate instruction by teaching unit represents the expenditures incurred to produce graduate instruction. Graduate instruction in professional fields (dentistry, law, medicine, nursing, pharmacy, public health, and veterinary medicine) has been included in the graduate category.

[2]Includes dentistry, law, medicine, veterinary medicine nursing, pharmacy and public health.

TABLE 5. DIRECT, INDIRECT, AND TOTAL GENERAL FUND INSTRUCTIONAL EXPENDITURES PER FYE BY TEACHING UNIT AND LEVEL OF INSTRUCTION, UNIVERSITY OF MINNESOTA, FISCAL YEARS 1981 AND 1985

Teaching Unit	Current Dollars				Percent Change in Direct Expenditures Per FYE F.Y. 1981 to F.Y. 1985	
	F.Y. 1981 Direct Expenditures Per FYE	Fiscal Year 1985 Direct Expenditures Per FYE	Fiscal Year 1985 Indirect Expenditures Per FYE	Fiscal Year 1985 Total Expenditures Per FYE	Current Dollars	Constant[1] Dollars
Graduate						
All Units	$ 3,852	3,983	$2,189	$ 6,172	3%	-22%
Dentistry						
Upper Division/Professional	11,637	11,896	4,015	15,911	2	-23
Law						
Upper Division/Professional	3,573	4,898	2,588	7,486	37	3
Medicine						
Upper Division/Professional	4,749	9,218	3,099	12,317	94	46
Veterinary Medicine						
Upper Division/Professional	8,724	14,137	4,720	18,857	62	22
Other Professional[2]						
Upper Division/Professional	4,322	6,295	3,833	10,128	46	10
Subtotal Graduate and Professional	$ 4,676	$ 5,968	$2,682	$ 8,650	28%	-4%
Undergraduate[3]						
All Units	1,965	2,757	1,520	4,277	40	6
TOTAL ALL UNITS AND LEVELS	$ 2,613	$ 3,469	$1,778	$ 5,247	33%	0%

SOURCE: University of Minnesota, Instructional Cost Study, 1980-81 (June 1982); University of Minnesota, Management Planning and Information Services.

[1]Higher Education Price Index was used to deflate expenditures. The F.Y. 1987 inflation rate was assumed to be 4.0%.

[2]Includes Nursing, Pharmacy, and Public Health.

[3]Includes graduate instruction in Summer Session and Continuing Education and Extension.

TABLE 6. TUITION REVENUE AS A PERCENTAGE OF INSTRUCTIONAL EXPENDITURES BY LEVEL OF INSTRUCTION AND ENROLLMENT UNIT, UNIVERSITY OF MINNESOTA, FISCAL YEAR 1984[1]

Enrollment Unit	Tuition Revenue	Instructional Expenditures	Tuition Revenue as a Percentage Instructional Expenditures
Graduate School	$10,212,049	$ 41,554,000	24.6%
School of Dentistry	1,967,743	9,545,830	20.6
Law School	1,585,100	6,736,387	23.5
Medical School	4,680,221	20,928,700	22.4
College of Veterinary Medicine	1,139,645	6,683,932	17.1
Other Professional[2]	1,308,639	7,199,652	18.2
Subtotal Professional	$10,681,348	$ 51,094,501	20.9%
Subtotal Graduate and Professional	$20,893,397	$ 92,648,501	22.6%
Undergraduate	52,712,844	178,249,199	29.6
Total Regular Instruction	$73,606,241	$270,897,700	27.2%
Summer Session, Continuing Education and Extension, All Levels[3]	17,405,865	21,480,608	81.0
GRAND TOTAL	$91,012,106	$292,378,308	31.

SOURCE: University of Minnesota.

[1]Enrollment unit refers to the academic unit at the University of Minnesota in which the student is enrolled. Graduate expenditures represent the expenditures incurred by all teaching units to provide instruction to students enrolled in the Graduate School.

[2]Includes nursing, pharmacy, and public health.

[3]Expenditures are understated because proportionate amounts of the costs associated with scholarly effort in departments are not allocated to Summer Session and Continuing Education and Extension.

graduate units generated tuition revenue equal to 29.6 percent. The system average for regular instruction was 27.2 percent.

Graduate School Tuition Rates

A wide divergence exists in tuition rates for full-time graduate students at the University of Minnesota. As shown in Table 7, the rate in Fiscal Year 1987 is $2,397 per year for residents and $4,795 per year for nonresidents. Business students and medical fellow specialists, however, have higher rates.

Considerable variation also has occurred in trends in tuition rates between Fiscal Years 1980 and 1987. Rates for graduate students in business programs and for medical fellow specialists increased by a greater percentage in constant dollars than rates for most other graduate students.[9] Dentists, physicians, and veterinarians enrolled in clinical specialties, in contrast, experienced a constant dollar decline in tuition.[10] Nonresident tuition rates for graduate study either declined or rose modestly in constant dollars.

Reductions in posted tuition rates for graduate students are possible in three ways. First, students who fulfill the residency requirement for a degree may pay half the standard full-time or part-time tuition rate for all additional credits. Residency here refers to progress toward a degree, not state of residence. The residency requirement is fulfilled through registering as a graduate student for a specified number of quarters.[11] Second, nonresident

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9. This increase for medical fellow specialists, which occurred in Fiscal Years 1986 and 1987, was offset by fellowships provided to them.
10. The decline was due to a switch from charging these students tuition rates similar to those in the professional programs to charging them graduate school rates.
11. Doctoral students must register on a full-time basis for nine quarters to qualify. Master's students must register on a full-time basis for four quarters to qualify. Partial credit toward fulfillment of the residency requirement is granted for part-time registration.

TABLE 7. FULL-TIME ACADEMIC YEAR GRADUATE TUITION RATES IN CONSTANT DOLLARS FOR RESIDENTS AND NONRESIDENTS, UNIVERSITY OF MINNESOTA, FISCAL YEARS 1980 THROUGH 1987[1]

	F.Y. 1980	F.Y. 1987	Percent Change 1980 to 1987	Constant[2] Dollar Percent Change 1980 to 1987
Graduate - General				
Resident	$1,020	$2,397	135%	49%
Nonresident	2,805	4,795	71	8
Master of Business Administration				
Resident	1,020	3,496	243	117
Nonresident	2,805	5,660	102	28
MBA - Evening Program				
Resident and Nonresident	1,200	3,496	191	84
MBA - Managers Program				
Resident and Nonresident	-	7,000	-	-
Dentistry - Clinical Fields				
Resident	2,217	2,397	8	-32
Nonresident	6,096	4,795	-21	-50
Medicine - Clinical Fields				
Resident	2,217	2,397	8	-32
Nonresident	6,096	4,795	-21	-50
Medical Fellow Specialists				
Post M.D.	441	3,194	624	358
Veterinary Medicine - Clinical Fields				
Resident	2,217	2,397	8	-32
Nonresident	6,096	4,795	-21	-50

SOURCE: University of Minnesota.

[1]Graduate tuition rates based on 30 credit hours per year.
[2]Higher Education Price Index was used to deflate tuition rates. The F.Y. 1987 inflation rate was asumed to be 4.0%.

graduate students with 25 percent time or greater appointments as teaching assistant, research assistant, or administrative fellows pay resident tuition rates.[12] Graduate students with appointments as graduate assistants at a level of 25 percent time or greater also receive tuition fellowships, which in effect, reduces tuition by twice the percentage of their appointments. Third, students from states having tuition reciprocity agreements with Minnesota pay tuition at lower than nonresident rates.

Professional School Tuition Rates

Tuition rates and trends for full-time students in professional programs at the University of Minnesota vary widely, as shown in Table 8. In Fiscal Year 1987, the Law School has the lowest tuition. The highest tuition for residents is in dentistry and for nonresidents in medicine.

Resident tuition rates for full-time students in professional programs rose in constant dollars between Fiscal Years 1980 and 1987. These increases equaled or exceeded the system's overall 26 percent increase in revenue per FYE. In contrast, nonresident rates remained stable or declined.

System Tuition Policy

The state estimates an aggregate level of annual tuition revenue for the University of Minnesota. The system, however, has discretion regarding the amount of tuition revenue it raises and the method it uses to establish tuition rates. The University has chosen to raise at least the amount of tuition revenue estimated by state policy, and it has chosen to use instructional cost in differentiating tuition rates.

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12. Nonresident graduate students who have held appointments of 25 percent time or more for three academic quarters may continue to pay resident tuition rates for a maximum of six additional quarters.

TABLE 8. FULL-TIME ACADEMIC YEAR PROFESSIONAL TUITION RATES FOR RESIDENTS AND NONRESIDENTS, UNIVERSITY OF MINNESOTA, FISCAL YEARS 1980 AND 1987[1]

	F.Y. 1980	F.Y 1987	Percent Change 1980 to 1987	Constant[2] Dollar Percent Change 1980 to 1987
Dentistry				
Resident	$2,217	$5,029	127%	44%
Nonresident	6,096	7,543	24	-22
Law				
Resident	1,311	2,938	124	42
Nonresident	3,606	5,878	63	3
Medicine				
Resident	2,217	4,3[illegible]	98	26
Nonresident	6,096	8,796	44	-9
Veterinary Medicine				
Resident	2,217	4,482	102	28
Nonresident	6,096	6,723	10	-30

SOURCE: University of Minnesota.

[1]Professional and undergraduate tuition rates based on 45 credit hours per year.

[2]Higher Education Price Index was used to deflate tuition rates. The F.Y. 1987 inflation rate was assumed to be 4.0%.

The University of Minnesota's internal tuition policy is based on five principles that were recommended in 1979.[13] The principles include:

- changes in tuition rates should move those rates toward the systemwide level of tuition as a percentage of instructional cost;
- tuition rates should be differentiated by student level and unit of enrollment;
- rates should not be differentiated simply on the basis of time of day or year;
- undergraduate tuition should be charged on a per credit basis; and
- professional nonresident tuition rates should be equal to 2.0 times the comparable resident rates and undergraduate nonresident rates should be equal to 2.5 times the comparable resident rate.

Implementation of the University of Minnesota Tuition Policy

Although the University's principles guide its decisions regarding tuition, they are not strictly applied. In several instances, actual tuition levels have diverged from levels suggested by the principles.

Tuition increases in 1985-86 illustrate exceptions to the University's first principle. Changes in tuition rates, according to this principle, should move closer to the systemwide level of tuition as a percentage of instructional cost. In 1985-86, tuition revenue at the University increased by 5.2 percent. Application of the principle suggests that tuition rates above the system average, shown on the first page of Table 9, would have increased less than 5.2 percent. Conversely, it suggests that tuition rates below the system average, shown on the second page of Table 9, should have increased by more than 5.2 percent. Actual increases differed from the anticipated patterns.

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13. University of Minnesota, Recommendations and Rationale on Tuition Policy (U of M, July 25, 1979).

TABLE 9. TUITION RATES, PERCENTAGE OF INSTRUCTIONAL COST, AND PERCENTAGE INCREASE, UNIVERSITY OF MINNESOTA, FISCAL YEARS 1986 AND 1987

	1986		1987		
	Tuition Rate[1]	Estimated Percentage of Instructional Cost	Percentage Increase	Difference From System Average Percentage Increase	Variation From Expected Pattern
Continuing Education and Extension - Lower Division	$ 38.50	57.4%[2]	3.90%	-1.30%	
Summer Session - Graduate	85.00	54.3[2]	6.25	1.05	*
Summer Session - Lower Division	36.87	53.9[2]	6.25	1.05	*
UMD Education - Lower Division	42.21	51.4	2.00	-3.20	
Continuing Education and Extension - Graduate	89.75	47.5[2]	5.29	.09	*
Management - All	47.10	47.1[2]	5.20	0.00	*
Summer Session - Upper Division[3]	47.26	46.0[2]	6.25	1.05	*
General College - Upper Division	39.44	42.6	2.09	-3.11	
Duluth - Lower Division	38.90	42.0	3.04	-2.16	
Twin Cities - Lower Division	38.90	40.9	3.04	-2.16	
Continuing Education and Extension - Duluth	42.16	40.7[2]	5.20	0.00	*
Education - Upper Division	49.73	36.8	4.08	-1.12	
Public Health - All	52.44	36.5	4.23	-.97	
Institute of Technology - Upper Division	48.99	36.0	5.20	0.00	*
Law	1,396.85	35.8	5.20	0.00	*
College of Liberal Arts - Upper Division	40.54	35.0	4.87	-.33	
Morris - Lower Division	38.90	34.2	3.04	-2.16	
Home Economics - Upper Division	51.64	34.0	5.32	.12	*

CONTINUED

TABLE 9. TUITION RATES, PERCENTAGE OF INSTRUCTIONAL COST, AND PERCENTAGE INCREASE, UNIVERSITY OF MINNESOTA, FISCAL YEARS 1986 AND 1987 CONTINUED

	1986		1987		
	Tuition Rate[1]	Estimated Percentage of Instructional Cost	Percentage Increase	Difference From System Average Percentage Increase	Variation From Expected Pattern
UMD Business and Economics - Upper Division	$ 40.80	32.4%	6.09%	.89%	
Morris - Upper Division	44.46	31.7	6.48	1.28	
Medicine - 16+ credits	**1,828.43**	**30.9**	**6.91**	1.71	
UMD Fine Arts - Upper Division	44.87	30.6	7.09	1.89	
UMD Liberal Arts - Upper Division	42.54	30.4	7.21	2.01	
UMD Science and Engineering - Upper Division	42.54	30.4	7.21	2.01	
Biological Sciences - All	49.74	30.2	7.31	2.11	
Graduate	**759.60**	**27.5**	**5.20**	0.00	*
Mortuary Science - All	53.36	26.9	9.00	3.80	
Crookston - All	38.90	26.8	3.04	-2.16	*
Waseca - All	38.90	26.3	3.04	-2.16	*
UMD - Medicine	**1,828.43**	**25.4**	**6.91**	1.71	
Agriculture - Upper Division	50.98	24.9	9.00	3.80	
Occupational and Physical Therapy - All	58.10	23.9	3.30	-1.90	*
Pharmacy - BS	55.61	23.6	2.00	-3.20	*
Pharmacy - Doctoral	55.61	23.6	9.00	3.80	
Forestry - Upper Division	54.53	23.5	9.00	3.80	
Medical Technology - All	58.10	22.3	3.30	-1.90	*
UMD Graduate	**759.60**	**20.1**	**5.20**	0.00	*
Dentistry	**1,537.86**	**19.7**	**9.00**	3.80	
Nursing - All	58.10	19.6	3.30	-1.90	*
Veterinary Medicine	**1,370.68**	**15.9**	**9.00**	3.80	
Dental Hygiene - Upper Division	48.29	13.6	9.00	3.80	

SOURCE: University of Minnesota.

[1]Law is a semester rate. Graduate, medicine, dentistry, veterinary medicine and health science fellows are quarterly rates. All other are per credit hour.

[2]The percentages are somewhat overstated because a proportionate amount of departmental scholarly effort cost is not allocated to Summer Session or Continuing Education and Extension.

[3]Weighted average.

*Denotes variation from expected pattern under University of Minnesota tuition policy.

NOTE: Bold print denotes graduate or professional instruction.

Other instances in which the guidelines are not strictly applied include the following:

- o In response to market conditions for programs such as management, the University has made exceptions in moving tuition toward the systemwide level of tuition as a percentage of instructional costs.
- o Lower division students have the same tuition rate regardless of enrollment unit.
- o Undergraduates registering for 14 to 18 credit hours per term pay tuition at the rate of 14 hours, a departure from a straight per credit hour rate.
- o In a few instances, nonresident tuition rates are only 1.5 times or equal to comparable resident rates.

The designation of instructional units has considerable impact on estimation of instructional costs and tuition rates. Units vary in the number of programs or disciplines available and in the number of students enrolled. At one extreme, the Graduate School has instruction in dozens of departments and enrolls thousands of students. At the other extreme are units such as the School of Veterinary Medicine, which is comparable in size to a large academic department and enrolls hundreds of students. The costs of providing instruction in large units such as the Graduate School vary widely by discipline while the tuition rates do not. Consequently, the relationship of the tuition rate to the cost of instruction also varies widely.

Comparisons of University of Minnesota Tuition Rates With Those at Other Institutions

Comparisons of University of Minnesota tuition rates with those at institutions in other states are important because of competition for students. Two distinct comparisons are made here. One is a comparison of the University of Minnesota's tuition with institutions considered its peers.[14] The other is a

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14. The peer programs were selected by University of Minnesota staff.

comparison with other institutions including all public Big Ten, Big Eight, and selected other American Association of Universities institutions.

Resident graduate tuition and fees at the University of Minnesota ranked fifth among the annual rates charged at peer institutions and at other institutions in academic year 1985-86, as shown in Table 10. Five other institutions were clustered below the University of Minnesota with differences ranging from $180 to $319. In contrast, nonresident graduate tuition and fees at the University of Minnesota ranked 14th among the rates charged at other institutions, as shown in Table 11. The institutions with rates above those of the University of Minnesota had differences ranging from $4 to $3,186.

Resident tuition and fees in professional programs at the University of Minnesota ranked high among peer programs and in programs at other institutions during academic year 1985-86. The University's position was third in veterinary medicine, fourth in dentistry, and seventh in medicine, as shown in Table 12. Because the number of terms of study within the same field varies among institutions, the amounts shown indicate more clearly than tuition per term what a student would pay over the duration of the program.[15] Tuition rates for several peer programs in medicine were significantly higher than University of Minnesota rates with differences ranging up to $7,000. Tuition rates for dentistry and veterinary medicine at other institutions were well below those at the University of Minnesota. Nonresident tuition and fees in professional programs ranked lower than resident rates, as shown in Table 13. This indicates that the University of Minnesota nationally was in a more competitive position for students than other institutions. The figures shown here are for 1985-86 and,

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15. Tuition rates for program completion are displayed because the number of terms of study required varies among institutions.

TABLE 10. TWENTY HIGHEST RESIDENT GRADUATE TUITION AND FEE RATES AND DIFFERENCE FROM THE UNIVERSITY OF MINNESOTA, ACADEMIC YEAR 1985-86

Overall Rank	Institution	Tuition and Required Fees	Difference From University of Minnesota
1	Cornell University	$5,020	$2,468
2*	**University of Michigan**	3,789	1,237
3	University of Pittsburgh	3,592	1,040
4*	**Pennsylvania State University**	2,942	390
5	**University of Minnesota**	2,552	-
6	University of Illinois-Urbana	2,372	(180)
7	University of Washington	2,304	(248)
8	Michigan State University	2,271	(281)
9	Ohio State University	2,238	(314)
10	University of Maryland	2,233	(319)
11	University of Oregon	2,168	(384)
12	University of Virginia	2,036	(516)
13	University of Wisconsin	1,946	(606)
14	University of Colorado	1,812	(740)
15	University of Indiana	1,730	(822)
16	Purdue University	1,629	(923)
17	University of Missouri-Kansas City	1,626	(926)
18	University of Missouri-Columbia	1,594	(958)
19	University of Iowa	1,546	(1,006)
19	Iowa State University	1,546	(1,006)

SOURCE: University of Missouri, "Annual, Academic Year Tuition and Required Fees, Big Eight, Big Ten Public and Other AAU Public Universities, 1976-77 to 1985-86" (October 25, 1985).

*Denotes programs with higher tuition than the University of Minnesota selected as peers by the University of Minnesota staff.

TABLE 11. TWENTY HIGHEST NONRESIDENT GRADUATE TUITION AND FEE RATES AND DIFFERENCE FROM THE UNIVERSITY OF MINNESOTA, ACADEMIC YEAR 1985-86

Overall Rank	Institution	Tuition and Required Fees	Difference From University of Minnesota
1	University of Michigan	$8,017	$3,186
2	University of Pittsburgh	7,102	2,271
3	University of Illinois-Urbana	6,056	1,225
4	Pennsylvania State University	5,880	1,049
5	University of Wisconsin	5,795	964
6	University of Washington	5,760	929
7	University of Colorado	5,574	743
8	Ohio State University	5,388	557
9	University of California-Berkeley	5,223	392
10	University of California-Los Angeles	5,162	331
11	Cornell University	5,020	189
12	University of Virginia	4,886	55
13	Purdue University	4,835	4
14	**University of Minnesota**	4,831	-
15	University of Indiana	4,628	(203)
16	Michigan State University	4,611	(220)
17	University of Missouri-Kansas City	4,218	(613)
18	University of Missouri-Columbia	4,186	(645)
19	University of Iowa	3,996	(835)
19	Iowa State University	3,996	(835)

SOURCE: University of Missouri, "Annual, Academic Year Tuition and Required Fees, Big Eight, Big Ten Public and Other AAU Public Universities, 1976-77 to 1985-86" (October 25, 1985).

TABLE 12. TEN HIGHEST RESIDENT PROFESSIONAL TUITION AND FEE RATES FOR DURATION OF PROGRAMS AND DIFFERENCE FROM THE UNIVERSITY OF MINNESOTA, ACADEMIC YEAR 1985-86[1]

Overall Rank	Institution	Tuition and Required Fees	Difference From University of Minnesota
	DENTISTRY		
1	University of Pittsburg	$38,882	$17,868
2*	**University of Michigan**	25,419	4,405
3*	**University of Missouri-Kansas City**	22,189	1,175
4	**University of Minnesota**	21,014	-
5	University of Colorado-Denver	19,932	(1,082)
6	University of Maryland-Baltimore	19,228	(1,786)
7	University of Washington	14,952	(6,062)
8	University of Indiana-Indianapolis	14,840	(6,174)
9	Ohio State University	14,424	(6,590)
10	University of Illinois-Chicago	14,400	(6,614)
	MEDICINE		
1	University of Pittsburg	$53,528	$28,764
2	Pennsylvania State University-Hershey	38,840	14,076
3*	**University of Missouri-Kansas City**	31,764	7,000
4*	**University of Michigan**	31,742	6,978
5	University of Colorado-Denver	28,460	3,696
6*	**University of Wisconsin**	26,844	2,080
7	**University of Minnesota**	24,764	-
8	University of Missouri-Columbia	23,679	(1,085)
9	University of Maryland-Baltimore	23,650	(1,114)
10	Michigan State University	22,472	(2,292)
	VETERINARY MEDICINE		
1*	**University of Wisconsin**	$23,840	$4,984
2*	**Cornell University**	22,200	3,344
3	**University of Minnesota**	18,856	-
4	Michigan State University	17,905	(951)
5	University of Illinois-Urbana	14,984	(3,872)
6	Ohio State University	14,424	(4,432)
7	University of Missouri-Columbia	14,160	(4,696)
8	University of Florida	12,940	(5,916)
9	Purdue University	12,201	(6,655)
10	Iowa State University	11,848	(7,008)

SOURCE: University of Missouri, "Annual, Academic Year Tuition and Required Fees Big Eight, Big Ten Public and Other AAU Public Universities, 1976-77 to 1985-86" (September 1986).

[1]The rates represent the amount of tuition and required fees that a student would pay to complete the professional program based on 1985-86 tuition and fee rates.

*Denotes programs with higher tuition than the University of Minnesota selected as peers by the University of Minnesota staff.

TABLE 13. TEN HIGHEST NONRESIDENT PROFESSIONAL TUITION AND FEE RATES FOR DURATION OF PROGRAMS AND DIFFERENCE FROM THE UNIVERSITY OF MINNESOTA, ACADEMIC YEAR 1985-86[1]

Overall Rank	Institution	Tuition and Required Fees	Difference From University of Minnesota
	DENTISTRY		
1	University of Pittsburg	$58,870	$18,020
2	University of Colorado-Denver	56,466	15,616
3	University of Michigan	47,665	6,815
4	Ohio State University	42,840	1,990
5	University of Maryland-Baltimore	41,884	1,034
6	**University of Minnesota**	**40,850**	-
7	University of Washington	38,040	(2,810)
8	University of Illinois-Chicago	37,152	(3,698)
9	University of Missouri-Kansas City	34,898	(5,952)
10	University of Indiana-Indianapolis	31,240	(9,610)
	MEDICINE		
1	University of Colorado-Denver	$112,416	$64,067
2	University of Pittsburg	74,728	26,379
3	University of Michigan	60,139	11,790
4	University of Illinois-Urbana	58,775	10,426
5	University of Illinois-Chicago	58,766	10,417
6	Pennsylvania State University-Hershey	54,424	6,075
7	University of Missouri-Kansas City	49,908	1,559
8	Michigan State University	49,704	1,355
9	**University of Minnesota**	**48,349**	-
10	University of Maryland-Baltimore	45,683	(2,666)
	VETERINARY MEDICINE		
1	Ohio State University	$42,840	$ 6,303
2	University of Illinois-Urbana	40,712	4,175
3	Michigan State University	39,242	2,705
4	**University of Minnesota**	**36,537**	-
5	University of Wisconsin	$34,592	(1,945)
6	Purdue University	30,345	(6,192)
7	University of Florida	29,976	(6,561)
8	Iowa State University	28,416	(8,121)
9	Cornell University	26,460	(10,077)
10	University of Missouri-Columbia	26,256	(10,281)

SOURCE: University of Missouri, "Annual, Academic Year Tuition and Required Fees, Big Eight, Big Ten Public and Other AAU Public Universities, 1976-77 to 1985-86" (September 1986).

[1]The rates represent the amount of tuition and required fees that a student would pay to complete the professional program based on 1985-86 tuition and fee rates.

therefore, do not reflect the 18 percent reduction in nonresident tuition for dental students at the University in 1986-87.

STATE UNIVERSITY SYSTEM FUNDING AND ALLOCATIONS

The funding of graduate education in the State University System is the subject of this section. The first topic is a description of the general fund resources made available to the State University System through state financing policies. Next is a description of system allocation and tuition policies used to deploy these resources. The expenditures and tuition rates for graduate and professional instruction that result from the state and system policies also are described.

General Fund Resources

The State University System general fund expenditures were $184,060,400 and state appropriations were $118,180,700 in Fiscal Year 1987, as shown in Table 14. These figures include all system funds that result from or are recognized by state funding policies. Although system total general fund expenditures rose by 121 percent between Fiscal Years 1977 and 1987, real growth, after eliminating the effects of inflation, was 11 percent. The growth in constant dollar spending has occurred since Fiscal Year 1983. Constant dollar state appropriations to the system declined by nine percent between Fiscal Years 1977 and 1987. This pattern is the result of significant declines in appropriations during the state's fiscal crisis in the early 1980s and subsequent growth in constant dollar appropriations since Fiscal Year 1983.

State University System spending for instruction was $174,764,400 in the aggregate and $3,891 per student in Fiscal Year 1987. Since Fiscal Year 1977, constant dollar instructional spending in the system has risen in the aggregate and declined and then returned to about the 1977 level on a per student basis.

General fund instructional expenditures in constant dollars declined and then increased to a level in 1987 that is 13 percent above the 197, level. ; a result of steady enrollment increases, cons nt dollar spending per FYE declined significantly and returned to about 1977 levels.

Tuition revenue in the State Universitv System was $61,359,500 in 1987. Between Fiscal Years 1977 and 1987, system tuition revenue rose by 255 percent in current dollars and by 78 percent in constant dollars. Constan: dollar tuition revenue per FYE increased 54 percent, while the percentage of instructional expenditures financed by tuition revenue has risen from 22.3 percent in 1977 to 35.1 percent. This heavier reliance on tuition revenue is the result of the earlier funding policies, appropriations reductions in the early 1980s, and the state financing policies adopted in 1983.

System Allocation Policy

The State University System uses a process that recognizes fixed and variable costs in making its annual allocations of staff and funds to the seven state universities. The institutions have broad latitude in allocating their resources to departments and units. The objective of the system allocation process is to distribute resources equitably in a manner consistent with the intent of the appropriation and the priorities of the State University Board.

The allocation for fixed costs provides resources sufficient to accommodate 1,200 FYE students. The allocation includes classified and unclassified staff positions, funds for those positions, and funds for supplies, expenses and equipment. Staffing for physical plant operations is based on the size of the campus.

The allocation for variable costs recognizes economies of size in providing resources to accommodate enrollments above 1,200 FYE. The allocation is based on three enrollment ranges with fewer resources provided per student in the

TABLE 14. GENERAL FUND EXPENDITURES AND REVENUES IN CURRENT AND CONSTANT DOLLARS, STATE UNIVERSITY SYSTEM, FISCAL YEARS 1977 AND 1983 THROUGH 1987[1]

	F.Y. 1977	F.Y. 1983	F.Y. 1984
Total General Fund Expenditures			
Current Dollars	$83,340,300	$134,111,100	$151,027,500
Constant Dollars	83,340,300	82,025,100	87,653,500
State Appropriations			
Current Dollars	64,895,200	95,020,400	101,199,400
Constant Dollars	64,895,200	58,116,500	58,734,400
General Fund Instructional Expenditures			
Current Dollars	77,438,100	124,314,400	139,914,600
Constant Dollars	77,438,100	76,033,300	81,204,100
Instructional Expenditures Per FYE[3]			
Current Dollars	1,993	2,953	3,346
Constant Dollars	1,993	1,806	1,942
Tuition Revenue			
Current Dollars	17,290,500	35,389,600	45,471,900
Constant Dollars	17,290,500	21,645,000	26,391,100
Tuition Revenue Per FYE[3]			
Current Dollars	445	841	1,088
Constant Dollars	445	514	631
Tuition Revenue as a Percentage of Instructional Expenditures	22.3%	28.5%	32.5%

SOURCE: Minnesota Department of Finance and State University System Office.

[1]Higher Education Price Index, base year 1977 used to deflate expenditures and revenues. The F.Y. 1987 inflation rate was assumed to be 4.0%.
[2]Information for F.Y. 1987 is estimated.
[3]Includes graduate and undergraduate.

CONTINUED

TABLE 14. CONTINUED

F.Y. 1985	F.Y. 1986	F.Y. 1987[2]	Percent Change F.Y. 1983 to F.Y. 1987	Percent Change F.Y. 1977 to F.Y. 1987
$161,401,200	$172,839,700	$184,060,000	37%	121%
87,813,500	90,067,600	92,214,600	12	11
109,401,500	118,392,200	118,180,700	24	82
59,522,000	61,694,700	59,208,800	2	-9
153,497,100	163,822,300	174,764,400	41	126
83,513,100	85,368,600	87,557,300	15	13
3,673	3,794	3,891	32	95
1,998	1,977	1,949	8	-2
51,653,600	54,061,400	61,359,500	73	255
28,103,200	28,171,700	30,741,200	42	78
1,236	1,252	1,366	62	207
673	652	684	33	54
33.7%	33.0%	35.1%	-	-

higher ranges. Unclassified staffing is provided based on enrollments two years earlier. Classified staff and funds for supplies, expenses, and equipment are provided based on projected enrollments in the year for which the allocation is made.

Expenditures for Graduate Instruction

Expenditures for graduate instruction constituted seven percent of the State University System's instructional expenditures in Fiscal Year 1985, as shown in Table 15. State University System expenditures per FYE for graduate instruction were similar to those for undergraduate instruction in 1985. Graduate expenditures per FYE were $3,574 while undergraduate expenditures per FYE were $3,680. The difference between graduate and undergraduate expenditures per FYE as primarily due to a difference in indirect expenditures per FYE.

Tuition and Instructional Costs

Graduate instruction in the State University System received a small subsidy from tuition revenue generated by undergraduate instruction in Fiscal Year 1985. Tuition revenue generated at the graduate level constituted 31 percent of graduate instructional expenditures, as shown in Table 16. Tuition revenue generated at the undergraduate level constituted 34 percent of undergraduate instructional expenditures. The undergraduate percentage was only slightly over the systemwide figure of 33.5 percent.

Graduate Tuition Rates

Full-time resident tuition for graduate students in the State University System is $1,226 in 1987, as shown in Table 17. On-campus resident graduate tuition rose by 77 percent in constant dollars between Fiscal Years 1980 and 1987, in contrast to the 56 percent increase in system average tuition revenue per FYE not shown here. Tuition rates for off-campus resident graduate students

TABLE 15. DIRECT, INDIRECT, AND TOTAL GENERAL FUND INSTRUCTIONAL EXPENDITURES IN THE AGGREGATE AND PER FYE, BY LEVEL OF INSTRUCTION, STATE UNIVERSITY SYSTEM, FISCAL YEAR 1985[1]

Level of Instruction	Direct Expenditures	Indirect Expenditures	Total Expenditures	Percent of Total
Graduate	$ 6,187,700	$ 4,223,000	$ 10,410,700	7%
Undergraduate	83,167,400	59,919,000	143,086,400	93
TOTAL	$89,355,100	$64,142,000	$153,497,100	100%

Level of Instruction	Direct Expenditures Per FYE	Indirect Expenditures Per FYE	Total Expenditures Per FYE
Graduate	$2,124	$1,450	$3,574
Undergraduate	2,139	1,541	3,680
TOTAL	$2,138	$1,535	$3,673

SOURCE: State University System Office.

[1]Trends in expenditures per FYE over time are not examined because comparable data for an earlier year were not available. The earlier data were not available because of changes in the categories of instruction funded by the average cost policy and because of a change in the method used by system staff to allocate expenditures to levels of instruction. System staff also noted that the current method of allocating expenditures to levels of instruction may need additional refinement.

TABLE 2: TUITION REVENUE, INSTRUCTIONAL EXPENDITURES, AND TUITION REVENUE AS A PERCENTAGE OF INSTRUCTIONAL EXPENDITURES BY LEVEL OF INSTRUCTION, STATE UNIVERSITY SYSTEM, FISCAL YEAR 1985

Level of Instruction	Tuition Revenue	Instructional Expenditures	Tuition Revenue as a Percentage Instructional Expenditures
Graduate	$ 3,190,000	$ 10,410,700	30.6%
Undergraduate	48,169,000	143,086,400	33.7
TOTAL	$51,359,000	$153,497,100	33.5%

SOURCE: State University System Office.

TABLE 17. FULL-TIME ACADEMIC YEAR GRADUATE TUITION RATES FOR RESIDENTS AND NONRESIDENTS, STATE UNIVERSITY SYSTEM, FISCAL YEARS 1980 THROUGH 1987[1]

	F.Y. 1980	F.Y. 1981	F.Y. 1982	F.Y. 1983	F.Y. 1984
Graduate On-Campus					
Resident	$ 438	$ 498	$ 546	$ 678	$ 897
Nonresident	879	971	1,097	1,364	1,794
Graduate Off-Campus					
Resident	738	819	922	1,146	1,515
Nonresident	738	819	922	1,146	1,515

	F.Y. 1985	F.Y. 1986	F.Y. 1987	Percent Change 1980 to 1987	Constant[2] Dollar Percent Change 1980 to 1987
Graduate On-Campus					
Resident	$1,032	$1,177	$1,226	180%	77%
Nonresident	2,064	2,064	1,770	101	27
Graduate Off-Campus					
Resident	1,350	1,177	1,226	66	5
Nonresident	1,350	2,064	1,770	140	52

SOURCE: State University System Office.

[1]Graduate tuition rates based on 30 credit hours per year.
[2]Higher Education Price Index was used to deflate tuition rates. The F.Y. 1987 inflation rate was assumed to be 4.0%.

rose by five percent in constant dollars during the same period.[16] The nonresident graduate rate rose by 27 percent.[17]

State universities offer reduced tuition rates to some graduate students employed as graduate assistants. Nonresident graduate assistants at most state universities are entitled to pay resident tuition rates while they are employed. Mankato State University also offers all graduate assistants who register for 6 to 12 credits a stipend equal to half their tuition cost.

System Tuition Policy

The State University System has not formally adopted a policy for setting tuition rates. The practice of the system in setting tuition rates has been characterized by per-credit charges, proportional increases, and, recently, by a reduction in the differences for residents and nonresidents. Tuition for all categories of students in the State University System is set on a per-credit basis regardless of the number of credits for which a student registers. With few exceptions, tuition rates have been increased annually by the same percentage for all categories of students. This tendency has applied to graduate and undergraduate rates and, until recently, to nonresidents as well as residents. Prior to Fiscal Year 1986, nonresident tuition rates were set at about two times the comparable resident rate. Nonresident rates were not changed in 1986 and were reduced slightly in 1987. As a consequence, the graduate nonresident rate is about 40 percent higher than the resident rate compared to the undergraduate nonresident rate, which is about 60 percent higher than the resident rate.

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16. This small increase in the rate for off-campus programs is because these programs previously were self-supporting. Graduate tuition rates are uniform now that off-campus and on-campus programs are funded in the same manner.
17. This smaller increase is due to the reduction in the tuition differences for nonresidents.

Tuition Rates in Comparable Institutions

Resident graduate tuition and fees in the State University System ranked in the middle of the rates charged at comparable institutions in the United States and in the north central region during academic year 1985-86. Full-time graduate tuition and fees of $1,329 in Minnesota's State University System, as shown in Table 18, ranked 20th among the rates charged at comprehensive and general baccalaureate institutions. The national average rate of $1,295 was slightly less than the State University System rate. The nonresident rate ranked in the lower one-third. The Minnesota nonresident rate of $2,216 ranked 33rd, or $726 below the national average.

POSSIBLE IMPACTS OF FUNDING AND TUITION POLICIES

Projected graduate and professional enrollment and estimated expenditures between 1986 and 1991 illustrate the responsiveness of the state funding policy to enrollments. Estimated instructional spending and revenue levels for the University of Minnesota and for the State University System are used to suggest the impacts of current policies and practices as they currently exist. They are not intended to be projections of future expenditure levels.[18] Financial figures are expressed in constant dollars.

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18. The expenditures in each system were estimated using Fiscal Year 1986 legislative intent average costs and FYE enrollments in 1984 for 1986 expenditures and FYE enrollments in 1989 for 1991 expenditures. Legislative intent average costs are based on those included in the systems' biennial budget requests but modified to reflect legislative funding decisions. The costs reflect 1985 Legislative intent and have not been adjusted to reflect the appropriations reductions and unallotments that occurred in 1986. System budget requests were based on the University of Minnesota's spending patterns in 1985 or the State University System's spending patterns in 1983. Consequently, expenditures and revenues for both years are expressed in terms of Fiscal Year 1986 dollars. Actual 1984 enrollments were used to estimate 1986 expenditures. FYE enrollment projections for 1989 by the University of Minnesota's Management Planning and Information Services Division were used to estimate University of Minnesota expenditures in 1991. FYE enrollment projections for 1989 by the Higher Education Coordinating Board, were used to

TABLE 18. RESIDENT AND NONRESIDENT AVERAGE GRADUATE TUITION AND REQUIRED FEES, MINNESOTA STATE UNIVERSITY SYSTEM AND COMPARABLE INSTITUTIONS IN SELECTED STATES, AND DIFFERENCE FROM MINNESOTA, ACADEMIC YEAR 1985-86[1]

Rank	State	Resident Graduate Tuition and Fees	Difference from Minnesota	Rank	State	Nonresident Graduate Tuition and Fees	Difference from Minnesota
1	Ohio	$2,273	$944	1	Wisconsin	$4,735	$2,519
5	New Jersey	1,992	663	5	Ohio	4,220	2,004
10	Michigan	1,677	348	10	Illinois	3,744	1,528
12	Wisconsin	1,640	311	12	Michigan	3,562	1,346
13	Indiana	1,581	252	14	Indiana	3,465	1,249
14	Illinois	1,5[illegible]	173	15	Oregon	3,441	1,225
15	Maryland	1,412	83	17	Iowa	3,308	1,092
17	Iowa	1,386	57	20	Connecticut	3,119	903
20	**Minnesota**	**1,329**	-		**National Average**	**2,942**	**726**
	National Average	**1,295**	**(34)**	25	Texas	2,795	579
22	North Dakota	1,275	(54)	28	Kansas	2,580	364
24	Kansas	1,247	(82)	30	Utah	2,460	244
25	South Dakota	1,223	(106)	**33**	**Minnesota**	**2,216**	-
30	Missouri	1,126	(203)	34	Missouri	2,169	(47)
35	Arizona	990	(339)	35	North Dakota	2,163	(53)
40	Nevada	[illegible]20	(509)	38	South Dakota	2,023	(193)
42	Nebraska	757	(572)	40	Louisiana	1,913	(303)
46	Oklahoma	470	(859)	45	Nebraska	1,186	(1,030)

SOURCE: Tuition and Fee Rates--A National Comparison. State of Washington Council for Postsecondary Education.

[1]Average tuition and required fees at comprehensive and general baccalaureate institutions.

Estimated instructional expenditures and revenues in Minnesota public systems that offer advanced instruction decline slightly between 1986 and 1991, as shown in Table 19. Expenditures decline by five percent, while FYE enrollments decline by less than six percent between 1984 and 1989. Enrollments from 1984 and 1989 determine expenditures for 1986 and 1991 under the average cost funding policy. Estimated expenditures for graduate instruction rise by 33 percent between 1986 and 1991 while FYE enrollments increase by 28 percent. Spending for professional instruction declines by 11 percent, slightly more than the 9 percent decline in professional enrollments.[19]

University of Minnesota

Estimated instructional expenditures for the University of Minnesota decline slightly in the aggregate and increase slightly on a per FYE basis between 1986 and 1991, as shown in Table 20. The 5.1 percent decline in estimated instructional expenditures is the result of enrollment related declines in spending at the professional and undergraduate levels that are partially offset by enrollment related increases in spending at the graduate level. The four percent increase in expenditures per FYE is a result of the changes in graduate and professional expenditures per FYE and a shift in the mix of University of Minnesota enrollments among levels of instruction.

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estimate State University System expenditures in 1991. Where these projections did not include detail sufficient to classify categories of enrollments into funding cells, the current proportions of enrollments in cells were used. System instructional revenues were estimated using the proportions established in state funding policy. Appropriations for instruction were set equal to 67 percent of instructional expenditures. Tuition revenue was set equal to the remaining 33 percent of instructional expenditures.

19. The professional category includes expenditures for graduate instruction in professional fields. An earlier table included these expenditures in the graduate category. They are included in the professional category here to be consistent with the state funding policy.

TABLE 19. ESTIMATED INSTRUCTIONAL EXPENDITURES AND REVENUES IN CONSTANT DOLLARS AND FYE ENROLLMENTS, UNIVERSITY OF MINNESOTA AND STATE UNIVERSITY SYSTEM, FISCAL YEARS 1986 AND 1991[1]

	F.Y. 1986	F.Y. 1991	Percent Change
Estimated Instructional Expenditures			
Graduate	$ 47,265,100	$ 62,616,078	33%
Professional	84,305,300	75,139,841	-11
Undergraduate	350,951,300	320,339,745	-9
Total	$482,521,700	$458,095,664	-5%
Estimated Instructional Revenues			
State Appropriations	$323,289,539	$306,924,095	-5%
Tuition Revenue	159,232,161	151,171,569	-5
Total	$482,521,700	$458,095,664	-5%

	F.Y. 1984	F.Y. 1989	Percent Change
FYE Enrollment[2]			
Graduate	7,755	9,918	28%
Professional	7,343	6,665	-9
Undergraduate	83,764	76,662	-8
Total	98,862	93,245	-6%

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Estimated expenditures and revenues are based on F.Y. 1986 legislative intent average costs. They are not intended as projections of future expenditure levels.

[2]F.Y. 1984 enrollments are actual and F.Y. 1989 enrollments are projected. Enrollments from these two years are used to estimate funding for 1986 and 1991 respectively.

TABLE 20. ESTIMATED INSTRUCTIONAL EXPENDITURES AND REVENUES UNIVERSITY OF MINNESOTA, FISCAL YEARS 1986 AND 1991[1]

	F.Y. 1986	F.Y. 1991	Percent Change
Estimated Instructional Expenditures			
Graduate	$ 37,047,000	$ 50,870,300	37%
Professional[2]	84,305,300	75,139,841	-11
Undergraduate	197,347,100	176,377,770	-11
Total	$318,699,400	$302,387,911	-5%
Estimated Instructional Expenditures Per FYE			
Graduate	$ 5,794	$ 7,422	28%
Professional	11,857	11,517	-3
Undergraduate	4,679	4,705	*
Total	$ 5,724	$ 5,945	4%
Estimated Instructional Revenues			
State Appropriations	$213,528,598	$202,599,900	-5%
Tuition Revenue	105,170,802	99,788,011	-5
Tuition Revenue Per FYE	1,889	1,962	4

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Estimated expenditures and revenues are based on F.Y. 1986 legislative intent average costs. They are not intended as projections of future expenditure levels.

[2]The professional category includes expenditures for graduate instruction in professional fields.

*Less than 1 percent.

Estimated instructional expenditures for graduate instruction at the University of Minnesota rise by 37 percent, due primarily to the projected enrollment increases of 35 percent, not shown here, between 1984 and 1989. The rise of 28 percent in expenditures per FYE reflects two phenomena: lower expenditures in earlier years because of lagged funding and a shift of graduate enrollments toward higher-cost programs in later years.

Estimated aggregate expenditures for professional instruction at the University of Minnesota decline by 11 percent, due primarily to the decline in professional enrollments. The slight decline in expenditures per FYE is due to higher expenditures in earlier years because of lagged funding and a shift in professional enrollments toward lower-cost programs. Projected enrollment declines in several professional programs between 1984 and 1989 suggest that these programs also will experience reductions in expenditures. Professional and graduate professional enrollments are projected to decline by 16 percent in dentistry and veterinary medicine and by 11 percent in medicine.

State policies result in a five percent decrease in estimated total tuition revenue between 1986 and 1991, but an increase in tuition revenue per FYE of four percent adjusted for inflation. This suggests that a four percent increase in tuition rates would be sufficient to generate the tuition revenue expected by the state. The current University of Minnesota tuition policy suggests that increases larger than four percent would occur in graduate and professional tuition rates and increases smaller than four percent would occur in many undergraduate tuition rates by 1991. These differing increases would result from the principle that calls for changes in tuition rates to move these rates toward the systemwide level of tuition as a percentage of instructional costs. Additional declines in projected undergraduate enrollment after 1989, however, are likely to result in substantial increases in tuition rates.

State University System

Estimated system expenditures decline in the aggregate and increase on a per FYE basis between 1986 and 1991, as shown in Table 21. The aggregate decline of five percent is due to a decline in undergraduate enrollment System trends are heavily influenced by undergraduate enrollments since undergraduates constitute over 90 percent of system enrollments. The system increase on a per student basis is the result of lagged funding. Estimated expenditures for graduate instruction increase because of a rise in graduate enrollments.

State policies result in a slight decrease in estimated tuition revenue. Tuition revenue, however, increases by six percent. The system tuition practice of proportionate tuition increases suggests that graduate and undergraduate tuition rates would rise by the system average of six percent.

ALTERNATIVES FOR STATE POLICY

If graduate and professional instruction at public institutions face financial difficulty, alternatives to the current average cost policy and the tuition policy are possible. Two alternatives are discussed here.

Separately Determined Funding for Graduate and Professional Instruction

While average cost funding could continue to determine support for undergraduate instruction, support for graduate and professional instruction could b determined separately. Graduate and professional programs could be funded at their current levels regardless of enrollment. The intent of this approach would be to provide stable support for advanced study. Funding for graduate and professional instruction at the University of Minnesota, for example, could be part of the system's unrestricted appropriation to be allocated by the Board of Regents, or it could be restricted to graduate and professional instruction. Unrestricted funds might not be used exclusively for advanced study. Restricted

TABLE 21. ESTIMATED INSTRUCTIONAL EXPENDITURES AND REVENUES, STATE UNIVERSITY SYSTEM, FISCAL YEARS 1986 AND 1991[1]

	F.Y. 1986	F.Y. 1991	Percent Change
Estimated Instructional Expenditures			
Graduate	$ 10,218,100	$ 11,745,778	15%
Undergraduate	153,604,200	143,461,975	-7
Total	$163,822,300	$155,207,753	-5%
Estimated Instructional Expenditures Per FYE			
Graduate	$3,140	$3,549	13%
Undergraduate	3,847	4,063	6
Total	$3,794	$4,019	6%
Estimated Instructional Revenues			
State Appropriations	$109,760,941	$104,324,195	-5%
Tuition Revenue	54,061,359	51,383,558	-5
Tuition Revenue Per FYE	1,252	1,326	6

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Estimated expenditures and revenues are based on F.Y. 1986 legislative intent average costs. They are not intended as projections of future expenditure levels.

funding, however, would undermine the autonomy of governing boards. Further, it would not recognize the interrelationships between levels of instruction that exist in terms of faculty, curriculum, and administration.

Tuition Alternative: Higher Funding Percentage for Graduate and Professional Instruction

Funding collegiate undergraduate instruction at 67 percent of instructional expenditures could continue, but graduate and professional instruction could be funded at a higher percentage, for example 75 percent. A higher state and lower student funding percentage for graduate and professional instruction would allow the systems to stabilize or reduce tuition rates for graduate and professional instruction. The University of Minnesota has proposed this for several professional programs.

A higher funding percentage for graduate and professional instruction, however, would not insure stable or lower tuition rates for all graduate and professional students. The University of Minnesota tuition policy calls for changes in tuition rates to move those rates toward the systemwide level of tuition as a percentage of instructional cost. Tuition rates for dentistry and veterinary medicine are currently well below 25 percent of instructional cost. Consequently, the system policy would still call for additional real increases in tuition rates for these professional programs. In contrast, graduate and some professional tuition rates would decline in real dollars under the University of Minnesota tuition policy if graduate and professional instruction were funded at 75 percent of instructional expenditures.

CHAPTER IV. FINANCING OF PROGRAMS RELATED TO ADVANCED STUDY IN MINNESOTA

Financing of programs involves the dedication of funds to specific instructional or research programs. Funds may be in the form of special appropriations, contracts, or grants. Use of funds is restricted to the activity determined by the provider and is indirectly, if at all, for the general operation of an institution. Support for programs could occur regardless of student enrollment or participation if the sponsor simply wanted to sustain the program.

Support for programs through students occurs in the form of scholarships or fellowships. Financing of students, however, is discussed in Chapter V of this report. The focus here is on funds for advanced instructional programs or research that are provided directly to institutions, not to students.

Support for all university research programs is included here even though research may or may not involve graduate students. Graduate instruction and research are interrelated. A strong research program attracts good faculty and graduate students. Research provides graduate students with employment through research assistantships, and it results in acquisition of equipment that can be used for instruction. Finally, research contributes to faculty knowledge and the quality of faculty instruction.[1]

This chapter describes current sources and methods of financing specific graduate and professional programs and related activities in Minnesota. The first part analyzes the sources of graduate program funding. Current state policies for restricted program funding are described in the second part. The last part is a discussion of three program financing alternatives and how they

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1. Joseph L. McCarthy and William D. Garrison, The Costs and Benefits of Graduate Education: Estimation of Graduate Degree Program Costs, (Council of Graduate Schools in the United States, 1979).

might affect graduate and professional programs. Because so little special financing for graduate and professional education occurs in the state universities and private institutions, the focus is on the University of Minnesota.

SOURCES

Special financing for graduate and professional instruction or research comes to Minnesota institutions from the state government, the federal government, industry, foundations, and a variety of non-profit organizations. The interest of most external benefactors is the funding of research.[2] Support for specific instructional programs generally is limited to dealing with shortages of trained personnel or to promoting students' access to programs.

State Government

In addition to general legislative appropriations for instruction and departmental research, the legislature directly provides special funds for research programs at public institutions. Some research programs include instructional components. State "specials" are discussed in the next section under state policies for restricted financing of graduate programs. State funds--general appropriations and restricted funds--accounted for approximately 60 percent of all research expenses at the University of Minnesota in Fiscal Year 1984.[3] The state also sponsors research projects through state agencies and provides seed money for research sponsored by others. Special state funds in support of graduate programs go not only to public institutions in Minnesota but also to private and out-of-state institutions. Those policies are discussed later.

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2. Derek Bok, "Toward Education of Quality" Harvard Magazine, May/June 1986.
3. University of Minnesota, "Instructional Cost Study 1983-84" (July 17, 19), p. 75.

Federal Government

In Fiscal Year 1983, approximately $117,829,000 in restricted federal funds came to Minnesota institutions, of which about 63 percent, or $74,279,000, was earmarked for research and development in science and engineering.[4] Ninety-nine percent of those research and development funds, approximately $74,102,000, went to the University of Minnesota. The remaining one percent went to seven institutions, most of which do not offer graduate programs. The University of Minnesota ranked 13th nationally for total federal funding and 16th in research and development funding among colleges, universities, and non-profit institutions.[5] The majority of the federal funds for research and development came to Minnesota from the U.S. Department of Health and Human Services, which encompasses the National Institutes of Health, a prime sponsor of health research.[6] Among non-profit institutions, the Mayo Foundation, which operates the Mayo Medical School and the Mayo Graduate School of Medicine, ranked eighth nationally in restricted federal funding for Fiscal Years 1981-1983 when it received $26,737,000.[7]

The remaining 37 percent of restricted federal funds that came to Minnesota supported purposes that might or might not be related to graduate education. Some federal funds are used as seed money to encourage industry-university partnerships or to stimulate research consortia with industry, university, and government cooperation. Other purposes include Pell Grants for undergraduates, training grants, and construction of facilities.

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4. National Science Foundation, Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, FY 1983 (NSF, August 1985), Table B-34.
5. Ibid., Tables B-13 and B-16.
6. Ibid., Table B-35.
7. Ibid., Table B-52.

Private Industry

Universities increasingly have turned to industry for support as federal and state government funding for university research has dwindled over the last 10 to 15 years. Though small in relationship to overall research support, corporate and other private financing have played an important role in research at the University of Minnesota. Private funds also contribute heavily to efforts supported by state specials in agricultural, biological, medical engineering, and computer fields. The University of Minnesota ranked 11th in average annual industry funding for research and development between 1976 and 1980.[8] In academic year 1980-81, about 48 percent of the total corporate contribution to the University of Minnesota was earmarked for research. Private industry, however, supported only four percent of the University's total research effort.[9] This was close to industry's share of all research money to universities nationally in 1983.[10]

Other Minnesota colleges and universities receive support from private industry for research and instruction. The Northwestern College of Chiropractic, for example, conducts applied research for various equipment firms. Institutions in the State University System contract for research with Thinfilm, Inc., American Crystal Sugar, Honeywell, and E.F. Johnson, among others.

Foundations and Other Nonprofit Institutions

Minnesota institutions receive foundation support for specific instructional and research programs. Among these are the Hormel Foundation, which

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8. Lois S. Peters and Herbert I. Fusfield, "Current U.S. University/Industry Research Connections," in National Science Foundation, University-Industry Research Relationships (NSF, 1983).
9. National Science Foundation, University-Industry Research Relationships: Myths, Realities, and Potentials (NSF, 1982), p. 12.
10. Linda S. Wilson, "The Role of University-Based Research in Generating Human Capital for the Economy," Educational Record, vol. 64 (Fall 1983), p. 43.

provides approximately 25 to 30 percent of the annual budget for research at the Hormel Institute operated by the University of Minnesota, and the Mayo Foundation, which provides about half the funding for instructional costs at the Mayo Medical School. In addition to providing general support, foundations also distribute grant money for specific short-term research projects.

STATE POLICY AND PRACTICE

The state of Minnesota provides special funding for graduate and professional instruction and research in a variety of ways. These include contracting for educational services, capitation subsidies, and special appropriations. The section that follows describes these activities.

State "Specials"

State "specials" are direct legislative appropriations for specific programs at higher education institutions. These funds are separate from the biennial appropriations to public post-secondary educational systems for their regular operations and maintenance. Educational institutions receive this funding to achieve specific research or service objectives or to fulfill special legislative interests. Special appropriations are used for the direct costs of research or other activities. General appropriations and maintenance funds are used for indirect costs associated with the support of those activities.

Most specials are for research programs. Specials for hospitals, international business education, the Sea Grant program, summer session and continuing education, however, do include instructional components. In Fiscal Year 1985, the most recent year for which detailed data are available, the University of Minnesota received approximately $19,253,000 in state special

appropriations for research.[11] This was about a 16 percent increase over Fiscal Year 1984 expenditures. These funds covered the direct costs of specials that involve research. They also may have covered a limited amount of instruction and public service. Projects included general agricultural research, medical research, the Geological Survey, and funding of special research centers such as the Supercomputer Institute, the Hydropower Research Facility, the Mineral Resources Research Institute, the Biotechnology Center, and the Natural Resources Research Center. Expenditures from special appropriations ranged up to $11,048,300 for General Agricultural Research.

Over the years there has been a tendency to reduce the number of special appropriations by transferring some of the funds to operations and maintenance appropriations and by merging others when there is no longer a compelling reason for separate appropriations. In 1977, for example, several separate appropriations were combined to form the General Research special. This includes the Center for Urban and Regional Affairs, Business and Economic Research at the University of Minnesota-Duluth, and others. Many of the specials at the University of Minnesota campuses in Duluth, Crookston, and Waseca had been transferred to the operations and maintenance budget by Fiscal Year 1981.

Mayo Medical School Subsidy

The Mayo Medical School and the Mayo Graduate School of Medicine are operated by the Mayo Foundation, a non-profit organization. When the Mayo Medical School was founded in 1971, the legislature agreed to provide unrestricted capitation payments for 40 Minnesota students. This number was adjusted to 20 students in 1984. These payments were recognized as a means to respond to perceived shortages of physicians in Minnesota at a favorable cost to

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11. Minnesota Department of Finance, "University/Minnesota State Special Research Appropriations Direct Expenditures," April 1, 1986.

the state. Minnesota students at Mayo pay tuition comparable to students at the University of Minnesota Medical School while students from other states pay higher fees. Since 1978, similar arrangements have been made for four to six students annually in the Family Medicine Residency Program of the Mayo Graduate School of Medicine. In Fiscal Year 1987, the capitation cost was $8,690 per student in the medical school and $14,758 for the graduate program.

This policy could be viewed as a student subsidy because state residents pay a lower tuition rate than non-state residents. The immediate purpose, however, is to support the institution and its program. Direct state appropriations cover between 15 and 20 percent of instructional costs, according to Mayo Medical School's biennial budget figures. The Mayo Foundation covers about 50 percent of the instructional costs, and the remainder is made up in tuition. Most of the research programs at Mayo are supported by federal and private funding.

Contracting

The state has two contract programs for professional education, one in optometry, the other in osteopathy. No programs for optometry or osteopathy professional education exist in Minnesota. The state, through the Higher Education Coordinating Board, contracts with institutions located in other states for student spaces for Minnesota residents. The legislature established the programs in 1977 in response to projections of a diminishing supply of professionals in both health areas in Minnesota. Contracting is a flexible response to a perceived educational need that could not be filled easily within the state. Contract students must practice in Minnesota for at least three years following graduation. The Osteopathy and Optometry Contract Programs have two objectives: first, to provide Minnesota residents the opportunity to pursue an

education in these fields, and second, to ensure a stable supply of qualified professionals in the state.

STATE ALTERNATIVES AND ISSUES FOR PROGRAM FINANCING

Special program financing accomplishes three objectives: to provide access to programs for students, to assure a su ly of graduates with expertise in needed fields, and to provide support for desired instructional programs and researc projects. If unrestricted funding of systems and institutions leaves state objectives related to graduate and professional education unfulfilled, the state could expand the use of program financing. This could be accomplished through greater reliance on special appropriations and contracting.

Special Appropriations

Expanding the use of special appropriations could give the state more control over allocations for graduate and professional programs than it currently has under general institutional financing. In effect, this alternative would resemble earlier forms of program budgeting. In contrast to contracting, there would be little emphasis on predetermined outcomes.

Dedicated financing would provide support for an instructional program with enrollment below a level where the program can be self-sustaining. It would assure the existence of a program with sufficient support to maintain an expected degree of quality. Currently, the state does not provide funding for this purpose.

Expanding the use of special appropriations for graduate and professional programs would complicate the budget process. In recent years, an effort has been made to simplify the budget by eliminating as many special appropriations as possible. This policy would reverse that trend and also carry the administrative burden of budget review and allocation decisions.

Special funding could make programs more vulnerable to short-term state budget decisions. This could harm programs that need long-term support, which institutions can provide through internal allocation of general funds. Programs, moreover, would compete directly for state funds and, thus, would have to justify their appropriations biennially.

Contracting

Expanded use of contracting could give the state greater ability to predetermine the outcome to which funds are devoted. To some extent, Tennessee has pursued this through allocation of some state appropriations for higher education based on quality performance standards. Contracting also would give the state flexibility in choosing providers from public and private, in-state and out-of-state institutions.[12] Expanded use of contracting, however, likely would result in an increased administrative burden that would include needs analysis for recruiting minorities, contract monitoring, and biennial assessment for renewal or discontinuation of contracts.

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12. Minnesota Higher Education Coordinating Board, Contracting for Educational Services With Coordinating Board Recommendations (MHECB, August 1986).

CHAPTER V: FINANCING OF GRADUATE AND PROFESSIONAL STUDENTS IN MINNESOTA

The financing of students involves raising funds to pay the costs associated with attending a higher education institution. Financing of students may have two distinct purposes. One is to support particular students regardless of their field of study. The other is to influence students' choices of field of study or institution.

This chapter focuses on the financing of graduate and professional students from all sources of funds, including traditional programs of financial aid. Categories of financing sources and their relative importance nationally lead the discussion, followed by discussion of costs of attendance and patterns of student financing in Minnesota. The remaining material reviews the state's current financial aid policies and discusses policy options. Because of its extensive graduate and professional enrollments, the University of Minnesota-Twin Cities is used as a benchmark for student financing, except where noted otherwise. The data largely are derived from analysis of student financing patterns in 1984-85.

CATEGORIES OF FINANCING SOURCES

Sources for the financing of students fall essentially into two categories: income of students and funds from other sources.

Student Income

Student income is income earned by students and their immediate families. Income exists in three forms--past, present, and future--described as follows:

- Past income - savings from past earnings

- o Present income - earnings from current employment
- o Future income - loans to be repaid with anticipated income.

Grants

Grants come in a variety of forms. They include fellowships, traineeships, tuition waivers, employer's tuition assistance, and veterans educational benefits. Sources include government, private industry, foundations, employers, and higher education institutions. A true grant involves no obligation for repayment or employment.

Grants are a conspicuous feature in student financing. They often are important incentives to overcome uncertainties in the marketplace that might deter individuals from pursuing education and acquiring expertise that benefits society generally. Grants sometimes can cause problems in the marketplace by inducing enrollment in areas where little demand for expertise exists.

Importance of Financing Sources

The patterns of student financing by source are not clear. Available data nationally, displayed in Table 22, suggest loans constitute the greatest source of funds for graduate and professional students. The list of sources, however, is incomplete. It does not include current income earned from employment other than assistantships and work-study programs. It also does not include savings. Data on Minnesota students suggest that current income is the greatest source of support for students pursuing advanced study.

COSTS OF ATTENDANCE

A student's cost of attendance has several components, as discussed in Chapter II. Some are recognized in financial aid programs, which largely have been oriented to undergraduates. Other costs to graduate and professional students have been unrecognized in financial assistance programs. Neither

TABLE 22. SOURCES OF FINANCING OF STUDENTS ENROLLED IN PROGRAMS FOR ADVANCED DEGREES, 1984

	Amounts (in millions)
Student Sources	
Past Income (savings)	not listed
Current Income	
Federal College-Work Study	$ 65
Federal Research Assistantships	460
Institutional Research and Teaching Assistantships	1,100
Other Employment	not listed
Future Income (loans)	
Federal	2,500
State	100
Institutional	80
Private	70
Grants	
Federal	
Fellowships and Traineeships	140
Grants and Service Payback Obligation[1]	180
Veterans Educational Benefits	100
State Grants	30
Institutional Fellowships and Tuition Waivers	300
Private	
Fellowships	60
Employer Assistance	

SOURCE: Arthur M. Hauptman, Students in Graduate and Professional Education: What We Know and What We Need to Know (American Association of Universities, 1986), pp. 70-71.

[1]May be considered a loan because failure to fulfill service obligation may result in monetary repayment.

category acknowledges the instructional costs already covered by state subsidies through appropriations to institutions for support of instruction.

Traditionally Recognized Costs of Attendance

In 1984-85, mean costs of attendance, in traditional terms, for graduate students were about $22,600. Mean costs for professional students were about $19,800, as shown in Table 23.[1] The cost of attendance for graduate and professional students is considerably higher than for undergraduates. The largest part of this difference is living costs. For graduate students, these amounted to more than $20,000 and for professional students, over $15,000. In contrast, during the same year, undergraduate State Scholarship and Grant Program applicants in a single-member household had median living expenses of $4,324.[2] The major difference is the living expenses component, attributable to the large number of graduate students who are married and have dependents.

Tuition and Fees. Tuition and fees are a small part of the cost of attendance, especially at public institutions.[3] Among graduate and professional students, the average annual tuition and fees paid by students enrolled in the graduate school were $2,126, or 9 percent of the average costs of attendance; for students enrolled in the law school, $3,656, or 19 percent of the average; and for professional students enrolled in health science schools, $4,470, or 22 percent of the average. The large differences between reported tuition in the

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1. For a report of graduate and professional students' expenses, see Melissa Anderson, "A Survey of the Finances of Students Enrolled in University of Minnesota Graduate and Professional Programs" (University of Minnesota, September, 1986).
2. For a report of undergraduate students' expenses, see Minnesota Higher Education Coordinating Board, The Cost of Attendance in the State Scholarship and Grant Program With Coordinating Board Recommendations (MHECB, December 1985).
3. It is expected that tuition charges would be three times greater at private institutions that did not have an outside source of support.

TABLE 23. MEAN EXPENSES FOR GRADUATE, LAW, AND HEALTH SCIENCE STUDENTS AT THE UNIVERSITY OF MINNESOTA, 1984-85

Category	Graduate School		Law School		Health Sciences Schools	
	Mean	Percent[1]	Mean	Percent[1]	Mean	Percent[1]
Educational Expenses						
Tuition and Fees	$ 2,126	9%	$ 3,656	19%	$ 4,470	22%
Supplies, Other Fees	269	1	423	2	394	2
Subtotal: Educational Expenses	$ 2,395	11%	$ 4,079	21%	$ 4,864	24%
Living Expenses	$20,252	89%	$15,681	79%	$15,011	76%
TOTAL EXPENSES	$22,647	100%	$19,760	100%	$19,875	100%

SOURCE: Melissa Anderson, "A Survey of the Finances of Students Enrolled in University of Minnesota Graduate and Professional Programs" (University of Minnesota, September 1986).

[1]Percentages may not add to 100 due to rounding.

graduate school compared to the professional schools is partly attributable to the mix of part-time and full-time students enrolled in each. A larger proportion of graduate students than professional students register part-time.[4]

Other Direct Educational Expenses. In addition to facing the charges levied by the institution, graduate and professional students must pay other direct educational costs. Among these are books and supplies. Graduate students reported that these costs averaged $269, law students, $423, and professional students enrolled in one of the health science schools, $394.

Living and Miscellaneous Expenses. Graduate students incurred mean living expenses of $20,252; law students, $15,681; and professional students in a health science program, $15,011. Amounts of living expenses varied widely. For students in the graduate and law schools, 20 percent spent less than $9,262, and 20 percent spent $26,200 or more during the year on living expenses, as shown in Table 24. Variations in family situations and available resources explain much of the difference. The same pattern was noted for students enrolled in the health science schools. Of these students, 20 percent spent less than $8,505 and 20 percent spent more than $20,061 on living expenses for the year.

Costs Outside Traditionally Defined Costs of Attendance

Traditionally defined costs of attendance were used to place costs of graduate and professional students in the context of current financial aid policies. These students, however, face other expenses that should be noted in state policy for financing graduate and professional education. Other expenses, discussed in Chapter II, include research and professional activities, servicing prior loans, and opportunity costs.

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4. This occurs even though the Graduate School defines a full-time student at fewer credits than do the professional schools.

TABLE 24. PERCENTILE DISTRIBUTION OF LIVING EXPENSES FOR GRADUATE, LAW, AND HEALTH SCIENCE STUDENTS AT THE UNIVERSITY OF MINNESOTA, 1984-85

Percentile	Graduate and Law	Health Science
10	$ 7,776	$ 6,170
20	9,692	8,505
30	11,264	9,591
40	12,755	11,112
50	14,494	14,208
60	17,741	15,270
70	21,174	17,175
80	26,200	20,061
90	35,276	24,303

SOURCE: Melissa Anderson, "A Survey of the Finances of Students Enrolled in University of Minnesota Graduate and Professional Programs" (University of Minnesota, September 1986).

RESOURCES AVAILABLE TO COVER COSTS

A student can use income--past, current, and future--to cover the cost of attendance. Gift and grant aid from family, government, post-secondary institutions, and private sources can be used to supplement the resources that students invest in graduate or professional education. Graduate, law, and health science students at the University of Minnesota, on average, had between $19,000 and $27,000 available to cover the cost of attendance. These and other data on available resources for students appear in Table 25.

Student Income

Income to cover the costs of attendance can be in the form of savings, earnings from current employment, and loans to be repaid from future earnings.

Past Income. Students generally had limited resources from past income to finance the cost of attendance. Among graduate students, an average of $314, or one percent of their resources, came from savings. An additional $567, or two percent, came from interest income. Students enrolled in the law and health science schools relied more on savings and interest income than those enrolled in graduate school. The average amount of savings used by law school students was $1,786, about nine percent of their resources, while the average amount of interest income used during the year was $214. Professional students enrolled in the health science schools used an average of $1,067 of savings and $202 of interest income, which, combined, amounted to seven percent of the cost of attendance. The survey did not distinguish between the student's prior earnings and gifts received in a prior year.

Current Income. Current income is the major source of financing for graduate students. Current income includes both the earnings of the student and, if married, the spouse. On the average, 47 percent of the resources avail-

TABLE 25. MEAN LEVEL OF FUNDS BY SOURCE AMONG GRADUATE, LAW, AND HEALTH SCIENCE STUDENTS AT THE UNIVERSITY OF MINNESOTA, 1984-85

Category	Graduate School Students		Law School Students		Health Sciences Schools Students	
	Mean	Percent[1]	Mean	Percent[1]	Mean	Percent[1]
Past Income						
Interest Income	$ 567	2%	$ 214	1%	$ 202	1%
Savings	314	1	1,786	9	1,067	6
Total Past Income	$ 881	3%	$ 2,000	10%	$ 1,269	7%
Current Income						
Own Earnings	$ 8,052	30%	$ 3,310	17%	$ 1,813	10%
Spouse Support	12,493	47	6,334	32	6,689	35
Total Current Income	$20,545	77%	$ 9,644	48%	$ 8,502	45%
Future Income						
Educational Loans	$ 1,341	5%	$ 3,593	18%	$ 5,823	31%
Other Loans	200	1	1,214	6	853	4
Total Future Income	$ 1,541	6%	$ 4,807	24%	$ 6,676	35%
Gifts and Grants						
Grants	$ 2,141	8%	$ 143	1%	$ 1,226	6%
Other Support[2]	1,028	4	309	2	323	2
Total Gifts and Grants	$ 3,169	12%	$ 452	2%	$ 1,549	8%
Family Support	$ 650	2%	$ 3,036	15%	$ 1,029	5%
TOTAL	$26,786	100%	$19,939	100%	$19,025	100%

SOURCE: Melissa Anderson, "A Survey of the Finances of Students Enrolled in University of Minnesota Graduate and Professional Programs" (University of Minnesota, September 1986).

[1]Percentages may not add to 100 due to rounding.
[2]Other support is not necessarily limited to gifts and grants. It was a miscellaneous category in the survey.

able to graduate students was spouse income.[5] Students' earnings accounted for an additional 30 percent. Thus, an average of 77 percent of the resources invested by graduate students came from current income.

Professional students derived about half of total resources from their own and spouses' income. During 1984-85, spouses income constituted, on the average, 32 percent of the resources available to students enrolled in law school. Students' earnings accounted for an additional 17 percent. Spouses' income comprised an average of 35 percent of the resources available to the typical professional student enrolled in health science schools, while students' earnings accounted for an additional 10 percent.

Many graduate students attend part-time, especially those enrolled in graduate professional programs. The University of Minnesota-Twin Cities and the College of St. Thomas offer MBA programs that presume students will be employed full-time during the day and attend classes during the evening. This enables students to use current income to cover the cost of attendance and reduces the opportunity cost associated with attending a post-secondary institution. A study of MBA programs showed that the rate of financial return to students pursuing a program part-time while employed was higher than for students attending full-time.[6] The difference was due to the lower opportunity cost for part-time students who are building upon an existing salary base.

Graduate programs increasingly are being created or adapted to serve the needs of employed persons. These programs are designed to assist students in their current work environment. Graduate programs in education have long been

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5. This category could include other sources of spouse support besides current income. For the typical (stereotypical) graduate or professional students, spouse support is entirely current earnings.
6. Richard J. Agnello and Joseph W. Hunt, Jr., "The Impact of a Part-Time Graduate Degree and Early-Career Earnings on Late-Career Earnings," Journal of Human Resources, vol. 11 (1976), pp. 209-13.

designed for completion of the degree requirements while teachers are employed full-time.

Future Income. Graduate students, on the average, made loan commitments of $1,541 per year, as shown in Table 25. This is self-reported borrowing by students from all sources. Of this amount, $1,341, or 87 percent, was in the form of educational loans. Law students, on the average, reported borrowing $4,807 during the year. Of this, $3,593, or 75 percent, was in the form of educational loans. Professional students enrolled in a health science school reported mean borrowing of $6,676 during the year. Of this, $5,823, or 87 percent, was in the form of educational loans. If professional students in health science schools borrowed $6,676 for four years, the total debt burden at graduation would exceed $26,704 because of interest. This amount does not include previously incurred debt such as loans for undergraduate education.

While the data reported for students at the University of Minnesota could underestimate debt levels, they are consistent with the results found by the Coordinating Board in its survey of financial aid offices at the University. That study documented the borrowing of students in selected health science schools.[7] The average indebtedness of 1986 graduates who borrowed from one or more of nine government or institutional programs was as follows:

Dental School:	$31,947
Medical Schools:	$32,968
Veterinary Medical School:	$25,354
Pharmacy School:	$14,270

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7. Minnesota Higher Education Coordinating Board, Design for the Proposed Income Contingent Loan Repayment Program (MHECB, August 1986). The schools included were the dentistry, medical, pharmacy, and veterinary medicine schools at the University of Minnesota and the Mayo Medical School.

Gifts and Grants

Graduate and professional students at the University of Minnesota did not receive much support through reported grants and gifts, as shown in Table 25. Graduate students received an average of $2,141 in grants and $1,028 in other support.[8] This $3.169 was 12 percent of total resources reported for the year. Law school students received an average of $143 in grants and $309 in other support, a total of $452, or ? percent of resources reported for the year. Health sciences students received an average of $1,226 in grants and $323 in other support, a total of $1,549, or 8 percent of resources reported for the year. A form of grants that often goes unreported is reimbursement of some attendance costs from employers who encourage employees to attend school.

Family Support

Professional students relied more extensively on family support than did graduate students. Family in this context refers to the extended family beyond the student's spouse and dependents. As shown in Table 25, law school students received from family members an average of $3,036, or 15 percent; professional students enrolled in a health science school, $1,029, or 5 percent; and graduate students, $650, or 2 percent of the resources reported.

FACTORS AFFECTING PATTERNS OF FINANCING

The personal situations of students, the requirements of the educational programs, and the availability of funds interact to determine patterns of financing. Students pursuing first professional degrees were likely to attend

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8. Other support includes items such as alimony and public assistance. While these might not be considered gifts or grants, they are not classified separately because they are not a major source of financing for graduate and professional students.

full-time, rely more extensively on loans, and receive more support from extended family members. Graduate students relied more extensively on their own and spouses' income and received more grants and gifts.

Married students had greater expenses than single students. Married students with dependents had greater expenses than married students without dependents. Married students, however, had significantly more resources available than did single students. Whether married students had additional resources because a second earner was available or because their family situation required more resources is not known.

Part-time students had higher total expenses, lower educational expenses, and more resources available than full-time students. A part-time student, everything else being equal, has more time available to produce income. The option of attending part-time, however, depends on the requirements of the program. Part-time students also had more resources available from spouses' earnings than did full-time students.

Patterns of financing reflect program requirements and expectations as well as students' preferences. In some programs, part-time enrollment is either not permissible or not conventional. None of the medical, dental, veterinary medicine, and law students in the University of Minnesota survey were registered on a part-time basis.

Students enrolled in the health science schools used loans more extensively than students enrolled in the law school who used them more than students in the graduate school. The reverse pattern occurred in use of current earnings.

CURRENT FINANCIAL AID POLICY AND PROGRAMS

This section reviews financial aid currently available for graduate and professional students in Minnesota from three sources--the federal government,

state government, and educational institutions. Types of aid include grants, employment opportunities, and loans.

Federal Policies and Programs

Grants--Fellowships and Traineeships. The federal government awarded fellowships, traineeships, and grants through more than a dozen federal agencies in Fiscal Year 1984. The size of awards ranged from less than $1,000 to more than $12,000 per student per year.[9] Students in Minnesota are eligible for most awards. Among the agencies providing grants to graduate and professional students are:

- o U.S. Department of Agriculture
- o U.S. Department of Defense (Air Force, Army, and Navy)
- o U.S. Department of Education (Council on Legal Education, Education for the Public Service Program, Foreign Language and Area Studies Fellowship, Fulbright-Hays Doctoral, and Graduate and Professional Opportunities Program)
- o U.S. Department of Energy
- o U.S. Department of Health and Human Services (National Institutes of Health; Alcohol, Drug Abuse, and Mental Health; Health Resources and Services Administration--Nurse Traineeship Program)
- o U.S. Information Agency
- o National Aeronautics and Space Administration
- o National Institute of Justice
- o Smithsonian Institution.

Assistantships. An estimated 5 to 10 percent of federal research and development grant money is used to employ graduate research assistants.[10] The University of Minnesota spent about $83 million in federal research and develop-

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9. Arthur M. Hauptman, Students in Graduate and Professional Education: What We Know and What We Need to Know (Association of American Universities, 1986), pp. 58, 102-103.
10. Ibid., p. 58.

ment money in Fiscal Year 1985. In addition, the University spent about $2 million in state and local sponsored research funds and about $24 million in private research funds.[11] The total of $110 million would have generated between $5 and $11 million of graduate research salaries, if the national ratios held for the University of Minnesota.

Service Contingent Grants. Some federal programs allow graduate and professional students to trade future work for financial assistance. Usually, this requires the student to work in a specific locality, such as medically underserviced areas, or for a specific employer, such as the U.S. Army. The financial assistance can be in the form of a service contingent grant or loan forgiveness. The federal government has used both.

Loan Programs. The federal government has created several loan programs for post-secondary students. The Guaranteed Student Loan Program is the largest federal loan program for graduate and professional students. Students enrolled for graduate or professional degrees can borrow up to $7,500 per year. They can borrow up to a total of $54,750, including any Guaranteed Student Loans obtained as an undergraduate. Graduate and professional students also are eligible for National Direct Student Loans, a program administered by institutions. Students are eligible to borrow up to a cumulative limit of $18,000. Graduate and professional students can borrow up to $4,000 per year up to a total of $20,000 through the Supplemental Loans for Students Program.

The federal government administers the Health Education Assistance Loan Program that provides loans to students in the health professions. Private lenders provide the capital while the federal government guarantees the loans

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11. University of Minnesota, Office of Research and Technology Transfer Administration, Levels and Trends in Sponsored Programs at the University of Minnesota (U of M, May 1986), p. 40.

against loss. The maximum amount that a student can borrow is $20,000 per year and $80,000 cumulatively. The interest rate floats with Treasury Bill rates. Borrowers are responsible for interest payments while in school, though interest can be deferred and capitalized.

The Health Professions Student Loan Program permits institutions to lend federal funds to students in the health professions. The maximum loan for this program is tuition plus $2,500. The federal government has not provided new capital funds for this program in several years, although these loans continue to be made from repayments of previous loans.

Work-Study. Through the College Work Study Program, the federal government subsidizes employment opportunities for college students. Post-secondary institutions generally choose to direct these funds to support jobs for undergraduates. Graduate and professional students constituted five percent of recipients in recent years.[12]

State Policies and Programs

Grants. Graduate and professional students are not eligible for any state scholarship and grant programs. The state, however, does provide about $50,000 per year as a special appropriation to the University of Minnesota for fellowships for minority and disadvantaged graduate students, particularly in the sciences, mathematics, and engineering.

Service Contingent Loans. The Medical and Osteopathy Loan Program operated by the Coordinating Board is a loan forgiveness program for students who agree to practice in designated locations. This program, however, is being phased-out. No new loans have been made since 1981.

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12. Hauptman, Students in Graduate and Professional Education, p. 62.

Loans. The Coordinating Board operates two loan programs for which graduate and professional students are eligible. Both are funded through the sale of revenue bonds. Through the federal Guaranteed Student Loan Program, the Coordinating Board provides loan capital as a lender of last resort. The Board's Supplemental Educational Loan Fund provides floating interest loans to graduate and professional students.

The Coordinating Board also has established an income contingent loan repayment program for graduates of medical, dental, veterinary medical, and pharmacy schools in the state. This program enables graduates to consolidate their education loans and to repay them at a rate based on income. The Coordinating Board collects a single monthly payment from each participant and makes monthly payments for the participant. The participant is expected to make payments equal to 10 percent of gross salary.[13] If these payments do not cover the graduate's debt service, the Coordinating Board will pay the difference. As a participant's income increases, the Coordinating Board will eventually collect enough to cover the graduate's original loans and the advances made by the Coordinating Board.

Work-Study. Graduate and professional students are eligible to participate in the State Work Study Program, but they receive few of the supported jobs. Participating institutions direct most of these funds to support jobs for undergraduates.[14]

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13. The Coordinating Board will establish a monthly payment plan based on average salaries for each professional group at the time of graduatation. This saves the student and the Coordinating Board administrative expenses.
14. According to data from the Minnesota Higher Education Coordinating Board, graduate and professional students accounted for two percent of the recipients at the University of Minnesota and one percent in the State University System.

Institutional Policies and Practices

Employment. Institutions provide employment opportunities for graduate and professional students. The number and type of jobs vary by field of study. Fields that have active research programs provide employment opportunities as research assistants. Fields that attract large numbers of undergraduates typically provide teaching assistantships. Fields that provide extensive service to the public generate job opportunities.

Grants. Grants are more than a means of assisting students. They are used to accomplish other institutional objectives. By establishing a grant program, an institution can establish a sliding tuition scale without jeopardizing the integrity of the published price list. Grants sometimes are made to members of particular groups.

Loans. To assist students affected by limits of government supported loan programs, institutions offer loans. Typically, these loans are small or short-term. In aggregate, the institutional loan programs at the University of Minnesota-Twin Cities and Mayo Medical School provided five percent of the total loan capital used by the 1986 graduates of five health science schools, as shown in Table 26.

OPTIONS FOR STATE POLICY

If additional financing of graduate and professional students were desirable, the state could extend support in several ways. It could reduce tuition, provide merit-based grants, provide need-based grants, or provide adequate loan capital. These options are discussed below.

Reduced Tuition

The state could explicitly reduce tuition in graduate and professional programs. This would reduce the cost of attendance for graduate and profes-

TABLE 26. BORROWING FOR EDUCATIONAL PURPOSES BY STUDENTS IN THE CLASS OF 1986 AT HEALTH SCIENCE SCHOOLS IN MINNESOTA

Loan Program	Dental Graduates	Medical Graduates	Pharmacy Graduates	Veterinary Medicine Graduates	Total	Percent of Total
Guaranteed Student Loan Program	$1,321,134	$3,755,311	$410,663	$1,084,314	$6,571,422	68%
National Direct Student Loan Program	41,370	420,580	29,620	33,155	524,725	5
Health Professions Student Loan Program	229,794	360,814	134,595	123,815	849,018	9
Health Education Assistance Loans	87,033	427,532	0	12,000	526,565	5
Auxiliary Loans to Assist Students	125,273	542,090	2,767	25,028	695,158	7
University of Minnesota Trust Fund Loans	114,633	102,586	7,439	8,750	233,408	2
Minnesota Medical Foundation Loans	0	106 550	0	0	106,550	1
Student Education Loan Fund (SELF)	0	0	0	6,000	6,000	0
Mayo Foundation Loans	0	156,540	0	0	156,540	2
TOTAL LOANS	$1,919,237	$5,872,003	$585,084	$1,293,062	$9,669,386	100%
Total Institutional Loans	$114,633	$365,676	$7,439	$8,750	$496,498	
Institutional Loans as Percent of Total	6%	6%	1%	1%	5%	

SOURCE: Minnesota Higher Education Coordinating Board.

sional students, and it might make institutions in Minnesota more competitive with those in other states. Lower nonresident tuition, however, would raise questions about increased state subsidies to all nonresidents.

The effect of reduced tuition might be limited. Tuition is but one portion of the cost of attendance for graduate and professional students. A decrease in tuition, thus, might not greatly affect a student's cost of attendance and decision to attend school. If the state were concerned about students' costs, it could look beyond tuition and consider all costs of attendance, including those not normally recognized.

State policy of lower tuition for graduate and professional students would create a dilemma. If the state explicitly required lower tuition for one category of students, then the state would be adopting a separate financing policy for them. If the state lowered tuition for everyone, it would have to increase appropriations in order to make up for lost tuition revenue.

Provide Merit-Based Grants

The state could provide substantial, merit-based grants for persons pursuing advanced study at an institution in Minnesota. Such grants could enhance recruitment by making attendance financially attractive. By doing so, the grants would provide an advantage in the competition for talented individuals that exists not only among educational institutions, but also between school and the labor force. The presence of highly qualified students would improve the stature of institutions. This, in turn, would be an attraction to other students, to faculty, and to sponsors and consumers of research generated through advanced study.

Establishment of merit-based grants by the state would require resolution of some issues. Magnitude, number of awards, and administrative responsibility

for them would be major items. A sensitive issue would be the awarding of state funds to persons from outside Minnesota in order to attract the best persons possible.

Provide Need-Based Grants

Through need-based grants, the state could provide direct financial assistance for students and their families whose income would not cover costs of attendance. Responsibility for financial access to graduate and professional education would, thus, rest with the state. Guarantee of access to undergraduate education is the premise of the federal Pell Grant Program and Minnesota's State Scholarship and Grant Program.

Decisions on a number of issues would be necessary in the establishment of need-based grants. These include calculation of costs of attendance, expected contributions, residency requirements, mechanisms for need analysis, length of eligibility, registration criteria, and registration process. They are discussed below.

Costs of Attendance. A need-based grant program for graduate and professional students may require redefinition of costs of attendance. Grant programs for undergraduates recognize tuition and fees, books and supplies, and living expenses as costs of attendance. Graduate and professional students, however, have other real costs including research and professional obligations, servicing of previously incurred debts, and substantial opportunity costs. Graduate and professional students, moreover, are likely to have to provide for spouses and children.

Recognition of these costs could result in high amounts of support per student regardless of area of study. In fields with already tight labor markets, preparation of additional individuals could exacerbate a difficult situation. Substantial need-based grants for advanced study could induce

enrollments of lower ability students whose opportunities and, therefore, opportunity costs are limited.

Expected Contributions by Students and Families. Minnesota's current financial aid policy for undergraduates provides for a sharing of responsibility. It expects that students will cover half their costs of attendance through savings, current income, and loans. The state also expects parents to provide financial support to cover students' costs.

Application of these provisions to graduate and professional students may be questionable, especially if traditional definitions of costs are used. An expectation that graduate students cover half the costs of attendance may be unreasonably low. Through undergraduate education, graduate students are expected to have developed the human capital to obtain well-paying jobs. In fact, many graduate students and some professional students work full-time as they pursue advanced education. As for parental contributions, current state and federal laws set upper limits on the age of dependency when students are still required to include parental contributions in their financing package. Since most advanced students remain in school beyond those ages, expectation of parental contribution either would not apply or age of dependency on parents would have to be extended.

Residency Requirements. Pressure likely would exist to limit eligibility to Minnesota residents for a state program of direct, need-based grants. Determining who is a state resident, however, is frequently controversial. Because potential graduate and professional students are a mobile population, several questions would need to be answered:

- Would an undergraduate degree from a Minnesota institution define residence?
- Would the student have to maintain a continuous residence in the state since high school graduation in order for the student to be eligible?

- o Would the student's parents have to be residents of the state? Would residency in the past be sufficient?

- o Would the assistance be restricted to those attending Minnesota institutions? It is often recommended that graduate students should not attend the same institution for graduate study that they attended for undergraduate work. If this is good education policy, should not financial aid policy reinforce this policy?

Need Analysis. A system of need-based grants would require the selection or development of a need analysis model. This is complex because many technical and political issues would emerge. What financial resources should be considered? How much should be considered available for financing the cost of attendance?

The state has three evident options. It could select a national model, such as the Graduate and Professional School Financial Aid Service, but universal acceptance is doubtful. It could take the institution's budget, but campus officials might be biased in favor of enrollees. It could create a state formula, but this would require difficult decisions on definitions of cost, income, and other matters.

Length of Eligibility. Most graduate programs do not have a prescribed course of study and time limit. Rather, graduate students progress at their own pace. This might be good for the preparation of knowledge producers, but it raises questions about limitations on the duration of eligibility for a government program.

Registration Status. About half the graduate and professional students attending Minnesota institutions register for less than a half-time load. This raises the question of eligibility of part-time students for a graduate and professional student grant. It also requires a definition of full-time enrollment, which may differ by field.

Selection Criteria. Limitations exist on admission to graduate and professional schools. Each school has some admission requirements. Further, the

state may limit class size at public institutions based on its estimate of needed practitioners. These limitations simply mean that eligibility for grants depends on admission, which is a merit-based process.

Selection Process. The state could assign responsibility for selection at one of four different levels. The state itself could select the recipients. The State Scholarship and Grant Program is an example of this. The student supplies a state agency with all the required financial data plus the name of the program or school he or she will attend. The award is from the state to the student without the participation of the institution or program attended.

The state could adopt the federal model by delegating the responsibility to operating agencies promoting specific interests. Each agency would have a specified number of grants, fellowships, or traineeships that it could award in fields consistent with the agency's operating mission. This would enable the state to make decisions about the fields of study it wishes to support while leaving the administrative responsibility to those familiar with the selected fields.

The selection could be delegated entirely to the institutions. This would be a campus-based financial aid program similar to the program for fellowships for minority and disadvantaged students at the University of Minnesota supported by a special appropriation. The state's role would be to specify the selection criteria and other rules that the institutions must follow. The only state level decision would be the allocation of funds to the various institutions with graduate and professional programs.

The selection could be made by the departments and schools providing graduate and professional education. This option is similar to the previous one except the problem of allocating grant funds to each department would be

more complex. Not even the institution would be able to redirect funds among fields in response to changing demand.

Provide Adequate Loan Capital

Government intervention is necessary to ensure the general availability of loans for graduate and professional students. A major policy issue is how much students should be able to borrow. The answer depends on the types of costs recognized as costs of attendance and the willingness of the state to place limits on accumulated debt.

Recognized Costs of Attendance. Expanding the recognized costs of attendance to include research and professional obligations, debt service obligations, care of spouse and children, and opportunity costs would likely increase the permissible size of loans. This increase in resources would make attendance at a graduate or professional school more attractive to potential students. As with need-based grants, however, greater availability of money might induce enrollments when other market conditions and student ability might not warrant them.

Limits on Accumulated Debt. Increased size of loans can result in greater accumulation of debt by graduate and professional students. Size of debt could become quite large if students were able to borrow money to cover opportunity costs and to live in a style similar to persons working and not attending school. Without the restraint of good sense by students or of regulation by the state, accumulated debt could exceed amounts students would be able to repay based on expected earnings in their fields, assuming jobs were available.

CHAPTER VI. STATUS OF GRADUATE AND PROFESSIONAL EDUCATION IN MINNESOTA

Background on several topics provides perspective on the financing of graduate and professional education in Minnesota. Following an historical sketch of graduate and professional education in Minnesota, several of the state's major interests in advanced study are discussed. Subsequent sections survey institutions that provide advanced instruction, the range of advanced degree programs they offer, and recent trends in enrollment and degrees conferred.

HISTORY

Graduate and professional education in Minnesota date back to at least 1880. The University of Minnesota has been dominant in these endeavors and until the 1950s, was virtually the state's sole provider of advanced education. Over the past 30 years other institutions, public and private, have joined in providing advanced instruction. The following material briefly traces the history of advanced study at the University of Minnesota, the State University System, and private institutions.

University of Minnesota

Although the University was founded in 1851 during Minnesota's territorial era, it did not enroll students on a continuous basis until 1869.[1] Four years later it conferred its first undergraduate degrees. In 1880, with a total enrollment of 304, the University conferred its first earned master's degree.

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1. For a history of the University, see James Gray, The University of Minnesota 1851-1951 (The University of Minnesota Press, 1951).

Eight years later, in 1888, it entered the ranks of doctoral institutions when it conferred its first earned Ph.D.

The emergence of the University of Minnesota as a major graduate and research institution was gradual. The Graduate School was established formally in 1905 as a financially self-sustaining unit. In 1912, it enrolled 159 students.

The appointment of Guy Stanton Ford as dean of the Graduate School in 1913 was a major turning point. During his 25 years in that position, Ford increased enrollment, improved the quality and diversity of students, and turned the Graduate School into an instrument for improving the University's scholarly reputation. Graduate enrollment grew to 464 by 1917, to 2,164 by 1928, and to 3,299 by 1938. The University of Minnesota emerged as a major graduate institution and preparer of Ph.D.s.

Ford also made research by faculty a high priority. Whereas research had been spotty among departments and individual faculty members, Ford used the Graduate School to stimulate and organize it in all fields. He obtained funds from the University for the Graduate School and invested those and other funds in research. By 1940, the University had established itself both as a national center for basic research and as a state center for applied research.

Professional programs took firm root as well. In 1888, the same year that it conferred its first Ph.D., the University of Minnesota established a law school and a medical school. Dentistry, which was part of the medical curriculum, was organized as a separate school within the University in 1891. A school of veterinary medicine did not appear as a distinct entity until 1947. Creation of the medical school resulted from the assimilation of four private medical colleges in the Twin Cities into the University. This left the University as the sole provider of formal medical education in the state until 1972.

In the early 1900s, the programs in dentistry, medicine, and law participated in the nationwide movement toward standards of professional education. In the pursuit of quality, professional organizations successfully imposed higher academic standards and limited the size of classes. Over the decades, these programs changed from undergraduate programs, requiring a high school diploma for admission, to first professional programs, requiring prior undergraduate preparation.

State Universities

In the early 1950s, the then state teachers colleges also began offering graduate instruction. After unsuccessful attempts in 1945 and 1951 to gain legislative approval to confer master's degrees, the institutions received this authority in 1953. Shortly thereafter, the colleges began offering programs leading to the Master of Science in Education.[2]

In 1957, the legislature changed state teachers colleges into state colleges as the nature of the institutions expanded from teacher preparation to more comprehensive education. The transformation soon affected graduate education. By the early 1960s, the state colleges were offering Master of Arts and Master of Science degrees in the liberal arts, sciences, and business.[3]

Minnesota's state colleges participated in the national expansion of higher education during the 1960s. As rising undergraduate enrollments brought increased demand for Ph.D.s and other doctorates, the colleges wished to respond to these needs by becoming universities preparing Ph.D.s. In 1964, Mankato

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2. Edwin H. Cates, A Centennial History of St. Cloud State College (Dillon Press, 1968), pp. 221-22.
3. G. Theodore Mitau, Minnesota's Colleges of Opportunity. From Normal School to Teachers College and State University System - A Century of Academic Change in Minnesota (Alumni Association of the State University System, 1977), p. 39.

State College officials and local civic leaders started a campaign to change the college into a doctoral granting institution.[4]

The campaign led in 1967 to statutory authorization for the State College Board to establish doctoral programs and to a legislative mandate for a study of their establishment.[5] The study, completed in 1968, expressed reservation about the immediate feasibility of doctoral programs, though it recommended preparation for program development.[6] Lack of sufficient libraries, general absence of a research orientation among the faculties, and a weak in-state market for Ph.D.s were the reasons for the reservation. The study, however, did note that demand might exist for professional doctorates such as the Doctor of Education and Doctor of Psychology. In 1969, the system's chancellor halted development in that direction.[7] The state colleges, however, were officially renamed state universities in 1975. The issue of doctoral programs in the State University System, dormant since the early 1970s, re-emerged in 1984 in connection with the System's long-range plan.[8] The matter is currently a topic of discussion within Minnesota's post-secondary education community.

Private Institutions

Graduate programs at Minnesota's private colleges generally are of recent origin. As of 1949, Hamline University was the only private institution offering a master's degree.[9] Since then, the number of private colleges

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4. Ibid., pp. 50-51.
5. Minnesota Statutes, 1967, Chapter 668, Section 1.
6. Minnesota State College Board, Report to the Minnesota Legislature on the Investigation of the Development of Doctoral Programs in the Minnesota State College System (MSCB, December 16, 1968).
7. Mitau, Minnesota's Colleges of Opportunity, p. 60.
8. Minnesota Higher Education Coordinating Board, Review and Comment on System Plans for 1984 (MHECB, January 17, 1985), p. 50.
9. Edgar M. Carlson and Mother Antonius, "Problems Facing Minnesota's Private Colleges," in Minnesota Commission on Higher Education, Higher Education in Minnesota (University of Minnesota Press, 1950), pp. 192-93.

offering graduate programs and the number of programs offered have increased. Much of this growth occurred during the 1970s. Two private institutions, Mayo Graduate School of Medicine and Walden University, offer the Ph.D. Walden also offers the Ed.D. Several seminaries offer doctorates in divinity and theological fields. Recently, the College of St. Thomas formally proposed establishment of an Ed.D. program.

Private professional education has long existed in Minnesota. Seminaries have been preparing clergy since the 1800s. Private medical schools disbanded in the late 1880s to form the Medical School at the University of Minnesota. Private medical education re-emerged in 1971 with the founding of the Mayo Medical School. The Northwestern College of Chiropractic has been operating since 1941. Private law schools have been in operation since at least 1900. Mergers over the years led to creation of the William Mitchell College of Law in 1956.[10] The Hamline School of Law opened in 1972.

STATE INTERESTS

State government has a variety of interests in graduate and professional education. Three are discussed here. They include stimulation of economic development through the cultivation of expertise and knowledge, encouragement of the production and availability of expertise to meet in-state demand, and provision of educational opportunity and access for state residents.

Economic Development

Research, which graduate study often supports, contributes directly to Minnesota's economic vitality. While interest in this topic has become more evident in recent years, the importance of research for Minnesota goes back

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10. William Mitchell College of Law Bulletin/Catalog, 1985-87, p. 5.

decades. One of the many examples of research contributing to economic development is the development of taconite.

During the 1920s, faculty members in the University of Minnesota's School of Mines developed a process for extracting iron from taconite, a low-grade iron ore. Because of this, Minnesota's iron mining industry was able to operate long after the easily accessible deposits of high-grade iron ore had been depleted. One historian has called it "the most remarkable, practical benefit yet conferred on a state by engineering research."[11] Today, the University's Mineral Resources Research Center continues research into the uses and development of the state's mineral resources.

Expertise

Residents, businesses, and governments of Minnesota rely on the expertise of many persons with advanced education. They are attorneys, dentists, physicians, veterinarians, college professors, elementary and secondary school teachers, business managers, computer scientists, engineers, psychologists, and others. Through support for graduate and professional education in Minnesota, state government helps satisfy this demand.

Programs within Minnesota supply a large part of the in-state demand for expertise. A study of dentists published in 1979 showed that 64 percent of the graduates from the School of Dentistry at the University of Minnesota remained in the state. It further revealed that 88 percent of Minnesota's active practitioners were graduates of the University's dental school.[12] In medicine, over half the medical school graduates from the University take residencies in the

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11. Allan Nevins, The State Universities and Democracy, (University of Illinois Press, 1962), pp. 123-24.
12. D.W. Johnson and others, "Dental School Graduation in Relation to Dentist Location," Journal of Dentist Education, vol. 43 (February 1979), pp. 70-84.

state.[13] For elementary and secondary education, the location of graduate programs in education at state universities and University of Minnesota campuses enables teachers throughout the state to obtain advanced preparation.

In some areas, the state government makes a special effort to assure that Minnesota has an adequate number of experts. During the late 1960s and early 1970s, the state perceived a need for more physicians. In response, the state increased the number of physicians prepared within its borders. Through increased funding for the University of Minnesota, it expanded the capacity of the medical school. The state also encouraged the founding of the Mayo Medical School and contributed to its support through capitation grants for each Minnesota resident enrolled at the institution.

Educational Opportunity and Access

As a service to its residents, the state provides educational opportunities. It enhances geographic access through support of public institutions that offer a wide variety of graduate and professional programs. The state also has expanded opportunities beyond its borders for its residents through tuition reciprocity with neighboring states and contracting for out-of-state programs in certain professions.

Tuition reciprocity agreements with neighboring states enable Minnesota residents to attend institutions in Wisconsin, North Dakota, and South Dakota while paying tuition at rates comparable to resident rates at Minnesota public institutions. Reciprocity expands access to programs at institutions close to Minnesota's borders, including the University of Wisconsin-LaCrosse, University of Wisconsin-River Falls, North Dakota State University at Fargo, the University of North Dakota at Grand Forks, South Dakota State University at Brookings, and

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13. School of Medicine, University of Minnesota.

the University of South Dakota at Vermillion. Advanced programs at the University of Wisconsin campuses at Madison and Milwaukee also are available to Minnesota residents through reciprocity.

As described in Chapter IV, Minnesota has contracting programs with out-of-state institutions for instruction in osteopathic medicine and optometry. Instruction in these fields is not available in the state. Contracting helps Minnesota residents gain access to professional education in osteopathy and optometry. In return, participants in the contracting programs are obligated to practice in Minnesota following graduation.

INSTITUTIONS

Minnesota has 25 institutions that provide graduate and professional instruction leading to degrees. As shown in Table 27, these include 6 state universities, 2 campuses of the University of Minnesota, 10 private colleges, and 7 private professional schools. St. Mary's College offers graduate instruction through extension only.

The nature of these institutions and their programs vary considerably. The University of Minnesota-Twin Cities offers programs in a wide range of disciplines. The state universities also offer a variety of programs, but concentrate in education and business. Private colleges have more limited offerings, often fewer than five degree programs at an institution. Private professional schools focus on a single program such as divinity, law, or medicine.

Institutional ties frequently exist between undergraduate education and graduate and professional education. All the public institutions and 7 of the 10 private collegiate institutions in Table 27 offer baccalaureate instruction. Viewed from another perspective, 8 of the 10 public baccalaureate degree institutions in Minnesota offer graduate or professional programs. Of the 24 private baccalaureate institutions, 7 offer advanced instruction.

TABLE 27. INSTITUTIONS IN MINNESOTA OFFERING GRADUATE AND PROFESSIONAL PROGRAMS

Institutions	Graduate[1]		First Professional
	Master's	Doctoral	
Public			
State University System			
Bemidji	X		
Mankato	X		
Metropolitan	X		
Moorhead	X		
St. Cloud	X		
Winona	X		
University of Minnesota[2]			
Duluth	X		X[3]
Twin Cities	X	X	X
Private			
Colleges			
Augsburg College	X		
College of St. Catherine	X		
College of St. Scholastica	X		
College of St. Thomas	X		
Hamline University	X		X
Kotz Graduate School of Business	X		
Mayo Graduate School of Medicine	X	X	
St. John's University	X		X
St. Mary's College[4]	X		
Walden University		X	
Professional Schools			
Bethel Seminary	X	X	X
Luther Northwestern Theological Seminary	X	X	X
Mayo Medical School			X
Northwestern School of Chiropractic			X
St. Paul Seminary	X		X
United Theological Seminary	X	X	X
William Mitchell College of Law			X

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Includes graduate professional study and graduate study beyond first professional degrees.
[2]The University of Minnesota-Morris has offered graduate level courses through Continuing Education and Extension.
[3]First two years only of medical program leading to M.D. degree.
[4]Graduate programs offered through extension only.

ADVANCED DEGREE PROGRAMS

Minnesota's universities and colleges offer 607 advanced degree programs. Numbers of programs in the state by institution and level of degree appear in Table 28. No attempt is made to identify and describe non-degree programs for continuing education. Graduate programs in first professional fields are included with graduate programs. A listing of programs by institution appears in the Appendix.

Master's Degree Programs

In Minnesota, 21 institutions offer master's degree programs. They include 2 campuses of the University of Minnesota, 6 state universities, and 13 private institutions.

University of Minnesota. The widest range of master's programs in the state is available at the University of Minnesota at its Twin Cities and Duluth campuses. The Twin Cities campus offers 217 programs, 83 leading to the M.S. in scientific and technical fields, 67 leading to the M.A. in education and liberal arts fields, and 67 leading to professional master's degrees. At the Duluth campus, 14 master's degree programs are available; 5 leading to the M.S., 5 leading to the M.A., and 4 leading to professional degrees.

State Universities. The state universities offer 130 master's degree programs. Most lead to the M.A., M.S., or M.B.A. degree. Many programs are in teaching or other fields related to elementary and secondary education. The most extensive arrays of programs are at Mankato and St. Cloud. Mankato State University offers 58 programs, of which 32 lead to the M.S., 19 to the M.A., and 7 to professional and other master's degrees. St. Cloud State University's 30 programs include 24 leading to the M.S., 5 to the M.A., and 1 to a professional master's.

TABLE 28. GRADUATE AND PROFESSIONAL DEGREE PROGRAMS BY LEVEL AT MINNESOTA INSTITUTIONS[1]

Institution	Master's	Specialist	Doctoral	First Professional	Total
State University System					
Bemidji	16	-	-	-	16
Mankato	58	4	-	-	62
Metropolitan (M)	1	-	-	-	1
Moorhead	14	1	-	-	15
St. Cloud	30	5	-	-	35
Winona	11	1	-	-	12
System Total	130	11	-	-	141
University of Minnesota					
Duluth	14	-	-	-[2]	14
Twin Cities (M)	217	10	126	5	358
System Total	231	10	126	5	372
Private Colleges and Universities					
Augsburg College (M)	1	-	-	-	1
College of St. Catherine (M)	2	-	-	-	2
College of St. Scholastica	3	-	-	-	3
College of St. Thomas (M)	20	5	-	-	25
Hamline University (M)	2	-	-	1	3
Kotz Graduate School of Business (M)	1	-	-	-	1
Mayo Graduate School of Medicine	14	-	5	-	19
St. John's University	3	-	-	1	4
St. Mary's College	8	-	-	-	8
Walden University (M)	-	-	5	-	5
System Total	54	5	10	2	71
Private Professional Schools					
Bethel Seminary (M)	3	-	1	1	5
Luther Northwestern Theological Seminary (M)	7	-	1	1	9
Mayo Medical School	-	-	-	1	1
Northwestern School of Chiropractic (M)	-	-	-	1	1
St. Paul Seminary (M)	1	-	-	1	2
United Theological Seminary (M)	1	-	1	1	3
William Mitchell College of Law (M)	1	-	-	1	2
System Total	13	-	3	7	23
STATE TOTAL	428	26	139	14	607

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Programs leading to the Master of Divinity are included with first professional degree programs. Programs leading to advanced degrees in first professional fields, such as the Doctor of Divinity and master's and doctorates in medical specialties, are included with master's and doctoral degree programs.

[2]First two years only of medical program leading to M.D. degree.

(M) Indicates location in the metropolitan area of Minneapolis-St. Paul.

Private Institutions. Thirteen private institutions in Minnesota offer master's degree programs. The majority of programs lead to the M.A. in a variety of fields, including religious studies at institutions with a sectarian affiliation. Two institutions, Mayo Graduate School of Medicine and St. Mary's College, offer programs leading to the M.S. Many private institutions offer programs leading to professional or interdisciplinary master's degrees in fields such as business, education, and religion.

Geographic Distribution. Most of the master's degree programs in Minnesota are offered through 11 public and private institutions in the Minneapolis-St. Paul metropolitan area. State universities elsewhere in the state also offer graduate courses through extension in the Twin Cities area. The University of Minnesota-Twin Cities campus dominates the metropolitan area as it does the entire state in the variety of programs and fields.

Ten institutions outside the metropolitan area offer master's degrees. Of these, five are state universities located in Bemidji, Mankato, Moorhead, St. Cloud, and Winona. Their graduate programs are largely in education and business. In Duluth, the University of Minnesota-Duluth and the College of St. Scholastica award master's degrees in a variety of fields. St. John's University in Collegeville, St. Mary's College in Winona, and the Mayo Graduate School of Medicine in Rochester also offer a limited variety of master's degree programs.

Doctoral Degree Programs

Six institutions in Minnesota award doctoral degrees, one public and five private institutions.

University of Minnesota. The University of Minnesota-Twin Cities offers by far the largest number of doctoral programs in the state. Most of the doctorate programs lead to the Ph.D. degrees. The Ph.D. is available in 115 fields,

ranging from the liberal arts and sciences to agriculture, medicine, and engineering. Since most doctoral research is highly specialized, the 115 areas of study are a limited measure of the variety of research subjects pursued at the doctoral level.

The University of Minnesota awards other doctoral degrees. It confers the Doctor of Education in educational administration, industrial education, and vocational education. It also confers the Doctor of Musical Arts. The other five doctoral degrees are Ph.D.s in medical specialties.

Private Institutions. Five private institutions offer doctoral degrees in Minnesota. Mayo Graduate School of Medicine offers the Ph.D. in five medical fields. Walden University, which is based in Florida but also operates in Minnesota, awards the Ph.D. in administration/management, education, human services, and health services. It also offers the Ed.D. Bethel Theological Seminary, Luther Northwestern Seminary, and United Theological Seminary confer the Doctor of Ministry.

Geographic Distribution. Nearly all the doctoral programs in Minnesota are in the Twin Cities area. The University of Minnesota-Twin Cities, Bethel Theological Seminary, Luther Northwestern Theological Seminary, and United Theological Seminary are located there, as is Walden University's Minnesota office. Only the Mayo Graduate School of Medicine in Rochester is outside the Twin Cities area.

First Professional Degree Programs

Degrees in seven first professional fields are available in Minnesota including chiropractic, dentistry, divinity, law, medicine, pharmacy, and veterinary medicine. First professional programs are available at the University of Minnesota-Duluth and the University of Minnesota-Twin Cities and at

nine private institutions. The state universities do not offer first professional programs.

University of Minnesota. The first professional degrees offered at the University of Minnesota are Doctor of Dental Surgery (D.D.S.), Doctor of Medicine (M.D.), Doctor of Pharmacy (Pharm.D.), Doctor of Veterinary Medicine (D.V.M.), and Juris Doctor (J.D.). The University of Minnesota is the only institution in the state that offers first professional degrees in dentistry, pharmacy, and veterinary medicine.

Private Institutions. Private institutions in Minnesota offer first professional degrees in chiropractic, divinity, law, and medicine. The Mayo Medical School awards the M.D. Northwestern College of Chiropractic awards the Doctor of Chiropractic. Hamline University and William Mitchell College of Law offer the J.D. Programs leading to the Master of Divinity (M.Div.) degree are available at Bethel Theological Seminary, Luther Northwestern Theological Seminary, St. John's University St. Paul Seminary, and United Theological Seminary

Geographic Distribution. Eight of the 10 institutions in Minnesota that offer first professional programs are located in the Twin Cities metropolitan area. First professional degrees in chiropractic, dentistry, law, pharmacy, and veterinary medicine are obtainable only in the Twin Cities area. Complete first professional programs outside the metropolitan region are the M.D. program at Mayo Medical School in Rochester and the M.Div. program at St. John's University in Collegeville. The medical program at the University of Minnesota-Duluth is not free standing but feeds into the program at the Twin Cities campus.

Specialist Programs

Specialist programs are intermediate to master's and doctoral programs. They require work beyond the master's level but do not involve research of the kind done for doctoral degrees. Specialist degree programs are generally found in education fields.

University of Minnesota. The Certificate of Specialist in Education is offered in 10 fields at the University of Minnesota-Twin Cities. They include administration, counseling, mathematics education, and special education. The University also offers the Certificate of Specialist in Library Science.

State Universities. Specialist Degrees in Education are available at Mankato State University, Moorhead State University, St. Cloud State University, and Winona State University. Specialist programs are offered in curriculum and instruction, administration, and library media at Mankato State University; in school psychology at Moorhead State University; in administration and information media at St. Cloud State University; and in administration at Winona State University.

Private Institutions. Among private institutions, only the College of St. Thomas offers specialist degrees. These are in administration and community education.

Geographic Distribution. In the Minneapolis-St. Paul metropolitan area, specialist programs are available at the University of Minnesota and at the College of St. Thomas. Outside the metropolitan area, specialist programs are offered at the state universities in Mankato, Moorhead, St. Cloud, and Winona.

ENROLLMENT

This section examines three aspects of graduate and professional enrollments in Minnesota: magnitude and trends in recent years, enrollment of

advanced students differentiated by level of instruction, and residency of students by system and level of instruction.

Institutional Patterns and Trends

In fall 1985, Minnesota's institutions of higher education enrolled 24,558 graduate and first professional students, as shown in Table 29. Enrollment at public institutions was more than double that of private institutions, about 16,900 to 7,700. By system, the University of Minnesota ranked first with about 12,800, followed by the private colleges with 4,800, the State University System with 4,100, and private professional schools with 2,900.

The University of Minnesota-Twin Cities accounted for about half the graduate and professional students. The College of St. Thomas had the next largest enrollment, followed by Mankato State University, William Mitchell College of Law, and St. Cloud State University. Each of the remaining institutions had fewer than 1,000 students.

Advanced study accounts for a significant portion of Minnesota's post-secondary enrollments. As shown in Table 30, graduate and professional enrollments constituted nine percent of the state's total in fall 1985. Among collegiate and professional institutions, this increased to 12 percent. Composition varied widely by institution, ranging from the entire enrollment at some private graduate and professional schools to a small fraction of enrollment at other institutions.

By about a three to one margin, graduate and professional students in Minnesota are enrolled at institutions located in the Minneapolis-St. Paul metropolitan area. Institutions in the metropolitan area enrolled 18,347 students while institutions elsewhere in the state enrolled 6,211. These figures, derived from Table 29, actually might understate metropolitan area

TABLE 29. GRADUATE AND PROFESSIONAL HEADCOUNT ENROLLMENT AT INSTITUTIONS IN MINNESOTA, FALL 1985[1]

Institutions	Graduate	First Professional	Total
Public			
State University System			
Bemidji	278	-	278
Mankato	2,103	-	2,103
Metropolitan (M)	100	-	100
Moorhead	99	-	99
St. Cloud	1,021	-	1,021
Winona	519	-	519
System Total	4,120	-	4,120
University of Minnesota[2]			
Duluth[3]	439	97	536
Twin Cities[3] (M)	9,678	2,555	12,233
System Total	10,117	2,652	12,769
Public Total	14,237	2,652	16,889
Private			
Colleges and Universities			
College of St. Catherine (M)	148	-	148
College of St. Scholastica	65	-	65
College of St. Thomas (M)	2,445	-	2,445
Hamline University (M)	216	469	685
Kotz Graduate School of Business (M)	-	-	-
Mayo Graduate School of Medicine	987	-[4]	987
St. John's University	100	-[4]	100
St. Mary's College	349	-	349
Walden University (M)	39	-	39
Collegiate Total	4,349	469	4,818
Professional Schools			
Bethel Seminary (M)	130	362	492
Luther Northwestern Theological Seminary (M)	110	154	264
Mayo Medical School	-	154	154
Northwestern School of Chiropract : (M)	-	557	557
St. Paul Seminary (M)	77	-[4]	77
United Theological Seminary (M)	106	97	203
William Mitchell College of Law (M)	-	1,104	1,104
Professional Total	423	2,428	2,851
Private Total	4,772	2,897	7,669
GRAND TOTAL	19,009	5,549	24,558

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Augsburg College not included because graduate program not yet in operation.
[2]The University of Minnesota-Morris has offered graduate instruction through Continuing Education and Extension in earlier years.
[3]Includes Continuing Education and Extension enrollments which are not reported with tenth day fall enrollments to the Coordinating Board.
[4]No separately reported professional enrollments.
(M) Indicates location in the metropolitan area of Minneapolis-St. Paul.

TABLE 30. RELATIONSHIP OF GRADUATE AND PROFESSIONAL HEADCOUNT ENROLLMENT TO TOTAL HEADCOUNT ENROLLMENT AT INSTITUTIONS IN MINNESOTA, FALL 1985

Institution	Graduate and First Professional	Total All Levels	Percent Graduate and First Professional
Public			
State University System			
Bemidji	278	4,277	6%
Mankato	2,103	14,225	15
Metropolitan	100	3,892	3
Moorhead	99	6,048	2
St. Cloud	1,021	12,279	8
Winona	519	5,326	10
Other	0	2,458	0
System - All Campuses	4,120	48,505	9%
University of Minnesota[1]			
Duluth	536	12,288	4
Twin Cities	12,233	63,150	19
Other	0	4,041	0
System - All Campuses	12,769	79,479	16%
Community College System - Total	0	39,264	0%
Public Collegiate Total - All Institutions	16,889	167,248	10%
Private			
Colleges and Universities			
College of St. Catherine	148	2,481	6%
College of St. Scholastica	65	1,449	4
College of St. Thomas	2,445	6,774	36
Hamline University	685	1,863	37
Kotz Graduate School of Business	-	-	-
Mayo Graduate School of Medicine	987	987	100
St. John's University	100	1,934	5
St. Mary's College	349	1,550	23
Walden University	39	39	100
Other	0	22,420	0
Colleges and Universities - All Institutions	4,818	39,497	12%

CONTINUED

TABLE 30. RELATIONSHIP OF GRADUATE AND PROFESSIONAL HEADCOUNT ENROLLMENT TO TOTAL HEADCOUNT ENROLLMENT AT INSTITUTIONS IN MINNESOTA, FALL 1985 CONTINUED

Institution	Graduate and First Professional	Total All Levels	Percent Graduate and First Professional
Professional Schools			
Bethel Seminary	492	497	99%
Luther Northwestern Theological Seminary	264	666	40
Mayo Medical School	154	154	100
Northwestern School of Chiropractic	557	557	100
St. Paul Seminary	77	87	89
United Theological Seminary	203	203	100
William Mitchell College of Law	1,104	1,104	100
Professional School Total	2,851	3,268	87%
Two-Year Colleges Total -- Total	0	956	0%
Private Collegiate and Professional Total	7,669	43,721	18%
State Collegiate and Professional Total	24,558	210,969	12%
Public and Private Vocational Schools - Total	0	50,299	0%
STATE POST-SECONDARY TOTAL	24,558	261,268	9%

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Includes enrollments in Continuing Education and Extension.

enrollments because some state universities offer off-campus classes at sites in and around the Twin Cities.

Between fall 1973 and fall 1985, graduate and professional enrollments had increased by six percent, as shown in Table 31. Almost all this increase is attributable to first professional enrollment, which increased by 32 percent. Graduate enrollment was almost unchanged.

Although overall graduate enrollment remained virtually constant, dramatic changes occurred within systems. The number of graduate students in the State University System declined by nearly half, while the number in private institutions grew more than seven fold. As a consequence, the private sector's share of graduate enrollment increased from 3 to 25 percent, while the public sector's share declined from 97 to 75 percent. Much of this shift likely was attributable to declining enrollments in education programs, which state universities had emphasized, and growing enrollments in business programs, which the College of St. Thomas, in particular, has cultivated. Increased enrollment at private professional institutions also shifted the majority of first professional enrollments from the public to the private sector.

Level of Instruction

Graduate programs at the master's level account for well over half the graduate and professional enrollments in Minnesota. The remaining enrollment appears to be equally divided between graduate programs at the doctoral level and first professional programs. Distortion may arise because some students enrolled in master's programs are working toward a doctorate. Furthermore, some master's level students are first professionals pursuing other advanced degrees.

Of the approximately 24,500 advanced students in Minnesota in fall 1985, shown in Table 30, 19,000 were graduate students and 5,500 were first professional students. Among the graduate students, all 4,100 at the state univer-

TABLE 31. GRADUATE AND PROFESSIONAL HEADCOUNT ENROLLMENT IN MINNESOTA BY SYSTEM, FALL 1973 AND FALL 1985

	Fall 1973		Fall 1985		
	Number Enrolled[1]	Percent of Total	Number Enrolled	Percent of Total	Percent Change
Graduate Enrollment					
Public Sector					
State University System	7,675	41%	4,120[2]	22%	-46%
University of Minnesota	10,645	56	10,117	53	-5
Total Public	18,320	97%	14,237	75%	-22%
Private Sector	654	3%	4,772	25%	630%
Total Graduate	18,974	100%	19,009	100%	0%
First Professional Enrollment					
Public Sector					
State University System	-	-	-	-	-
University of Minnesota	2,453	58%	2,652	48%	8%
Total Public	2,453	58%	2,652	48%	8%
Private Sector	1,741	42%	2,897	52%	66%
Total First Professional	4,194	100%	5,549	100%	32%
GRAND TOTAL	23,168		24,558		6%

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Mayo Graduate School of Medicine included with University of Minnesota.
[2]Includes Continuing Education and Extension.

sities and as many as 3,900 of the 4,800 at private institutions were enrolled in master's level programs.[14] Perhaps 6,200 of the 10,100 graduate students at the University of Minnesota were engaged in master's level work.[15] Master's level enrollment, thus, may have amounted to over 14,000.

Residency

Except for doctoral students in graduate programs, most advanced students in Minnesota are state residents. In 1985, at least 66 percent of graduate and professional students were residents. By system, state residents constituted at least 79 percent of the advanced students at the state universities, at least 71 percent at private colleges and professional schools, and at least 58 percent at the University of Minnesota. Data on residency appear in Table 32. These figures do not include Continuing Education and Extension students at the University of Minnesota, most of whom likely are state residents.

Further analysis of graduate enrollment at the University of Minnesota reveals differences in residency patterns by level of instruction. Table 33 contains residency data for students enrolled in master's and doctoral degree programs during the 1985-86 academic year. At the master's level, 72 percent of students were state residents, which is comparable to other systems in the state. The percentage of residents at the master's level would be even higher for the University of Minnesota if graduate enrollments in Continuing Education and Extension were included.

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14. Nearly all students in the Mayo Graduate School of Medicine are in Ph.D. programs or non-degree post-medical training.
15. Table 33 below indicates that 55 percent of the students enrolled in the Graduate School at the University of Minnesota are pursuing master's degrees. Fifty-five percent of the official reported enrollment of 8,659 in fall 1985 amounts to 4,762. Adding 1,458 Continuing Education and Extension students, who almost certainly are at the master's level, would result in a total of 6,220 master's level students.

TABLE 32. RESIDENCY OF GRADUATE AND PROFESSIONAL STUDENTS AT MINNESOTA INSTITUTIONS, FALL 1985[1]

	Residents of Minnesota	Nonresidents of Minnesota	Data Unavailable	Total
Graduate Students				
Private Institutions[2]	3,553	1,106	113	4,772
State Universities[3]	3,260	529	331	4,120
University of Minnesota[4]	4,675	3,391	593	8,659
Total	11,488	5,026	1,037	17,551
Professional Students				
Private Institutions	1,888	825	184	2,897
State University	-	-	-	-
University of Minnesota	1,912	475	265	2,652
Total	3,800	1,300	449	5,549
TOTAL GRADUATE AND PROFESSIONAL STUDENTS	15,288	6,326	1,486	23,100

SOURCE: Minnesota Higher Education Coordinating Board.

[1]Permanent residence of students as reported by institutions to the Higher Education Coordinating Board.
[2]Nonresidents outnumbered residents at Mayo Graduate School of Medicine 803 to 184, at St. John's University 54 to 46, and at Walden University 35 to 4.
[3]Nonresidents outnumbered residents at Moorhead State University 70 to 29.
[4]Does not include Continuing Education and Extension

TABLE 33. RESIDENCY OF GRADUATE STUDENTS AT THE UNIVERSITY OF MINNESOTA BY COLLEGE AND LEVEL OF DEGREE PURSUED, ACADEMIC YEAR 1985-1986[1]

College	Master's Students		Doctoral Students		Total
	Resident[2]	Non-resident[3]	Resident[2]	Non-resident[3]	
Agriculture	117	117	80	245	559
Biological Sciences	34	25	33	54	146
Business	1,457	266	64	85	1,872
Dentistry	15	41	1	4	61
Education	491	86	691	251	1,519
Forestry	13	30	16	26	85
Home Economics	60	5	46	19	130
Institute of Technology	534	461	270	725	1,990
Liberal Arts	865	381	589	600	2,435
Medicine	54	36	120	111	321
Nursing	187	31	9	5	232
Pharmacy	8	14	32	48	102
Public Health	65	12	42	27	146
Veterinary Medicine	10	39	16	54	119
Unclassified	89	46	92	100	327
TOTAL	3,999	1,590	2,101	2,354	10,044

SOURCE: University of Minnesota Graduate School.

[1]Includes Duluth and Twin Cities campuses; excludes Continuing Education and Extension.

[2]Includes Minnesota residents who are not U.S. citizens as well as those who are.

[3]Includes U.S. citizens and non-citizens who are not residents of Minnesota.

The majority of doctoral students at the University of Minnesota, in contrast, came from outside the state. Of 4,455 doctoral students, 2,354, or 53 percent, were nonresidents. Notable exceptions to this pattern existed in the fields of education, home economics, nursing, and public health, where substantial majorities were Minnesota residents.

GRADUATE AND FIRST PROFESSIONAL DEGREES CONFERRED

The data on graduate and first professional degrees conferred appear in three sections. The first summarizes data on advanced degrees awarded from 1972 to 1985 by private institutions, state universities, and the University of Minnesota. The second examines the distribution of advanced degrees across fields of study. The third section considers graduate and first professional degrees awarded in Minnesota in relation to the nationwide number and distribution of advanced degrees. Highlights include:

- The total number of graduate and first professional degrees conferred in Minnesota increased 35 percent between 1972-73 and 1984-85. The number of advanced degrees awarded tripled at private institutions but declined in the State University System.

- The majority of master's degrees awarded in Minnesota have been in business and education. The greatest growth in master's degrees awarded was in business.

- Education and life sciences accounted for the greatest percentage of doctoral degrees awarded in Minnesota.

- Nearly half of all first professional degrees conferred in Minnesota were in law.

- Between 1972-73 and 1982-83, Minnesota experienced a larger percentage increase than the nation as a whole in master's and first professional degrees conferred. However, Minnesota also experienced a greater percentage decrease in doctoral degrees conferred.

- Compared to the nation as a whole, the percentage of advanced degrees conferred in Minnesota was lower than the state's percentage of the population.

Total Number of Advanced Degrees Conferred

In 1984-85, 5,634 graduate and first professional degrees were awarded in Minnesota, as shown in Table 34. Of these, 3,933, or about 70 percent, were conferred at public institutions; 3,298, or 59 percent, at the University of Minnesota; and 635, or 11 percent, at state universities. Private institutions accounted for the remaining 1,701, or 30 percent.

Between 1972-73 and 1984-85, the number of advanced degrees awarded in Minnesota rose by 35 percent. In the public sector, the number of advanced degrees granted increased by nine percent. Within the public sector, however, there were distinctly different trends for the University of Minnesota and the State University System. At the University of Minnesota, the number of advanced degrees rose by 27 percent, while at the state universities, the number of advanced degrees awarded fell by 37 percent. Since the state universities do not award first professional or doctoral degrees, master's degrees accounted for the entire decline. The number of advanced degrees granted by private institutions increased by 206 percent.

The increase at private institutions, combined with the decline in advanced degrees granted at state universities, caused a shift in the distribution of degrees across systems. Between 1972-73 and 1984-85, the private sector's share of advanced degrees granted increased from 13 percent to 30 percent, while the public sector's share decreased from 87 percent to 70 percent. The state universities' share declined from 24 to 11 percent.

Graduate Degrees. In 1984-85, 4,022 graduate degrees were awarded in Minnesota, as shown in Table 35. Of those, 3,190, or 79 percent, were awarded by public institutions. The University of Minnesota accounted for 2,555, or 64 percent, while the state universities accounted for 635, or 16 percent. Private institutions awarded the remaining 832, or 21 percent.

TABLE 34. GRADUATE AND FIRST PROFESSIONAL DEGREES CONFERRED IN MINNESOTA BY SECTOR, 1972-73 AND 1984-85

	Number Conferred 1972-73[1] (Percent of Total)	Number Conferred 1984-85 (Percent of Total)	Percent Change
Public Sector			
University of Minnesota	2,603 (63%)	3,298 (59%)	27%
State Universities	1,004 (24%)	635 (11%)	-37%
Public Sector Total	3,607 (87%)	3,933 (70%)	9%
Private Sector Total	556 (13%)	1,701 (30%)	206%
TOTAL GRADUATE AND FIRST PROFESSIONAL DEGREES CONFERRED	4,163 (100%)	5,634 (100%)	35%

SOURCE: HEGIS.

[1]Northwestern School of Chiropractic not included; Mayo Graduate School of Medicine included with the University of Minnesota.

TABLE 35. GRADUATE DEGREES CONFERRED IN MINNESOTA BY SECTOR, 1972-73 AND 1984-85

	Number Conferred 1972-73[1] (Percent of Total)	Number Conferred 1984-85 (Percent of Total)[2]	Percent Change
Public Sector			
University of Minnesota	2,009 (61%)	2,555 (64%)	27%
State Universities	1,004 (31%)	635 (16%)	-37%
Public Sector Total	3,013 (92%)	3,190 (79%)	6%
Private Sector Total	271 (8%)	832 (21%)	207%
TOTAL GRADUATE DEGREES CONFERRED	3,284 (100%)	4,022 (100%)	22%

SOURCE: HEGIS.

[1]Includes Doctor of Pharmacy (Pharm.D.) degrees; Mayo Graduate School of Medicine included with the University of Minnesota.
[2]Percentages may not add to 100 due to rounding.

Between 1972-73 and 1984-85, the number of graduate degrees granted increased by 22 percent. The number of graduate degrees conferred by public institution. grew by six percent, although changes experienced by the University of Minnesota and the state universities differed. At private institutions, the number of graduate degrees conferred rose by 207 percent.

As a result of these changes, the private sector's shar· of graduate degrees awarded rose from 8 percent to 21 percent. The corresponding decline in the public sector's share of graduate degrees granted was from 92 to 79 percent. The state universities h re most of this decline as their share dropped from 31 to 16 percent. The University of Minnesota's share rose slightly.

Master's Degrees. The total number of master's degrees conf·rred in Minnesota in 1984-85 was 3,493, as shown in Table 36. Public institutions accounted for 2,675, or 77 percent of the total. The University of Minnesota awarded 58 percent while the state universities awarded 18 percent. Private institutions conferred the remaining 23 percent.

From 1972-73 to 1984-85, the number of master's degrees granted in Minnesota rose by 28 percent. Increases at t'.e University of Minnesota and at private institutions accounted for this growth. The University of Minnesota conferred 40 percent more degrees, while the private institutions conferred 202 percent more. State universities granted 37 percent fewer degrees.

As a result of these changes, the private sector's share increased from 10 to 23 percent. In contrast, the state universities' share dropped from 37 percent to 18 percent. During this period, the University of Minnesota's share of master's degrees conferred rose slightly, from 53 to 58 percen·

Doctoral Degrees. In 1984-85, 529 doctorates were conferred in Minnesota, as shown in Table 37. Nearly all these degrees, 515, or 97 percent, were awarded by the University of Minnesota. Of the 14 remaining doctoral degrees,

TABLE 36. MASTER'S DEGREES CONFERRED IN MINNESOTA BY SECTOR, 1972-73 AND 1984-85

	Number Conferred 1972-73[1] (Percent of Total)	Number Conferred 1984-85 (Percent of Total)	Percent Change
Public Sector			
University of Minnesota	1,452 (53%)	2,040 (58%)	40%
State Universities	1,004 (37%)	635 (18%)	-37%
Public Sector Total	2,456 (90%)	2,675 (77%)	
Private Sector Total	271 (10%)	818 (23%)	202%
TOTAL MASTER'S DEGREES CONFERRED	2,727 (100%)	3,493 (100%)	28%

SOURCE: HEGIS.

[1]Mayo Graduate School of Medicine included with the University of Minnesota.

TABLE 37. DOCTORAL DEGREES CONFERRED IN MINNESOTA BY SECTOR, 1972-73 AND 84-85

	Number Conferred 1972-73[1] (Percent of Total)	Number Conferred 1984-85 (Percent of Total)	Percent Change
Public Sector			
University of Minnesota	557 (100%)	515 (97%)	-8%
State Universities	0 (0%)	0 (0%)	-
Public Sector Total	557 (100%)	515 (97%)	-8%
Private Sector Total	0 (0%)	14 (3%)	-
TOTAL DOCTORAL DEGREES CONFERRED	557 (100%)	529 (100%)	-5%

SOURCE: HEGIS.

[1]Includes Pharm.D. degrees; Mayo Graduate School of Medicine included with the University of Minnesota.

11 were professional Doctor of Ministry degrees awarded by seminaries, and three were doctorates in health and life sciences conferred by the Mayo Graduate School of Medicine.

Between 1972-73 and 1984-85, the total number of doctorates conferred in the state declined five percent. In 1972-73, the University of Minnesota was the only institution in the state that awarded doctoral degrees. Its total declined eight percent by 1984-85. As other schools have instituted doctoral programs, the number of doctorates awarded by them rose from zero to 14.

First Professional Degrees. Minnesota institutions awarded 1,612 first professional degrees in 1984-85, as shown in Table 38. The University of Minnesota awarded 46 percent of the state's first professional degrees, while private institutions awarded 54 percent. The state universities do not confer first professional degrees.

Between 1972-73 and 1984-85, the total number of first professional degrees awarded in Minnesota increased by 83 percent. The number of first professional degrees awarded by private institutions increased by 205 percent, while the increase at the University of Minnesota was 25 percent. This resulted in a reversal of position as the University's share shrank from 68 percent to 46 percent, and the private sector's share expanded from 32 percent to 54 percent.

Distribution of Advanced Degrees Across Fields of Study

This section presents data on graduate and first professional degrees conferred by field of study. It reports 1984-85 data and trends from 1972-73 to 1984-85. Sixteen broad areas of study are used to classify graduate degrees.[16]

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16. With some exceptions, these 16 categories are aggregates of the classifications used in the HEGIS survey of degrees conferred. Not every field within each category is mentioned in the following: agriculture and forestry, including agricultural sciences and renewable natural resources, but not agricultural economics; business, including management and related fields, but not office management or specialized marketing; education,

TABLE 38. FIRST PROFESSIONAL DEGREES CONFERRED IN MINNESOTA BY SECTOR, 1972-73 AND 1984-85

	Number Conferred 1972-73[1] (Percent of Total)	Number Conferred 1984-85 (Percent of Total)	Percent Change
Public Sector			
University of Minnesota	594 (68%)	743 (46%)	25%
State Universities	0 (0%)	0 (0%)	-
Public Sector Total	594 (68%)	743 (46%)	25%
Private Sector Total	285 (32%)	869 (54%)	205%
TOTAL FIRST PROFESSIONAL DEGREES CONFERRED	879 (100%)	1,612 (100%)	83%

SOURCE: HEGIS

[1]Pharm.D. degrees not included; Northwestern College of Chiropractic not included.

Master's Degrees by Field. Programs in education and business together accounted for half the master's degrees conferred statewide in 1984-85, as shown in Table 39. Of the total, 28 percent were in education while 22 percent were in business. Health sciences accounted for the third largest number. Variations in magnitude and rank by field existed within systems.

Substantial shifts occurred in master's degrees conferred by field between 1972-73 and 1984-85. Considerable increases occurred statewide in business, psychology, and public affairs, while decreases occurred in social sciences and library science. Notable variations are evident within systems. At the University of Minnesota, degrees conferred in agriculture and forestry increased significantly. In the state universities, the decline in education degrees was the opposite of the trend experienced by the other systems. The private institutions conferred an increasing number of degrees in the humanities, in contrast to decreases elsewhere.

Doctoral Degrees by Field. Doctoral degrees conferred in Minnesota are dispersed across a variety of fields. In 1984-85, education accounted for the largest concentration of degrees with 17 percent of the total, as shown in Table 40. Life sciences ranked second with about 15 percent. These figures

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including all levels of education, special education, and administration; engineering, including engineering specialties and technologies; health sciences, including academic programs in health sciences and allied health fields but excludes first professional programs; humanities, including literature, foreign languages, speech, philosophy, and religion; library science, including library and archival sciences; life science, including biology and related fields; mathematics and computer science, including mathematics, statistics, and computer science; physical sciences, including chemistry, physics, and geology; psychology, including clinical and counseling psychology and related fields; public affairs, including policy studies and social work; social sciences, including economics, agricultural economics, history, political science, sociology, and related fields; visual and performing arts, including dramatic arts, film, art history, and music; other, including architecture, area and ethnic studies, communications, home economics, liberal studies, interdisciplinary studies, parks and recreation management, and protective services.

TABLE 39. MASTER'S DEGREES CONFERRED IN MINNESOTA BY FIELD, 1972-73 AND 1984-85

Areas of Study	University of Minnesota			State Universities			Private Institutions			Total		
	1972-73	1984-85[1]	Percent Change	1972-73	1984-85	Percent Change	1972-73	1984-85	Percent Change	1972-73	1984-85	Percent Change
Agriculture and Forestry	40	74	85%	0	2	-%	0	0	-%	40	76	90%
Business	148	362	145	57	95	67	1	319	*	206	776	227
Education	312	430	38	592	291	-51	209	254	22	1,113	975	-12
Engineering	103	174	69	0	0	-	0	0	-	103	174	69
Health Sciences	216	319	48	71	41	-42	0	61	-	287	421	47
Humanities	86	47	-45	44	15	-66	61	112	84	191	174	-9
Library Science	86	90	5	61	9	-85	0	0	-	147	99	-33
Life Sciences	48	67	40	41	7	-83	0	1	-	89	75	-16
Mathematics and Computer Science	42	43	2	23	29	26	0	0	-	65	72	11
Physical Sciences	30	47	57	6	5	-17	0	0	-	36	52	44
Psychology	18	11	-39	15	20	33	0	53	-	33	84	155
Public Affairs	64	129	102	3	26	767	0	1	-	67	156	133
Social Sciences	112	75	-33	74	33	-55	0	0	-	186	108	-42
Visual and Performing Arts	58	69	19	16	23	44	0	0	-	74	92	24
Other	89	103	16	1	39	*	0	17	-	90	159	77
TOTAL	1,452	2,040	40%	1,004	635	-37%	271	818	202%	2,727	3,493	28%

SOURCE: HEGIS.

[1]Mayo Graduate School of Medicine included with the University of Minnesota.
*Percentage increase too large to be meaningful because of new programs.

TABLE 40. DOCTORAL DEGREES CONFERRED IN MINNESOTA BY FIELD, 1972-73 AND 1984-85

Areas of Study	University of Minnesota			State Universities			Private Institutions			Total		
	1972-73	1984-85[1]	Percent Change	1972-73	1984-85	Percent Change	1972-73	1984-85	Percent Change	1972-73	1984-85	Percent Change
Agriculture and Forestry	19	45	137%	0	0	-%	0	0	-%	19	45	137%
Business	24	18	-25	0	0	-	0	0	-	24	18	-25
Education	91	89	-2	0	0	-	0	0	-	91	89	-2
Engineering	43	59	37	0	0	-	0	0	-	43	59	37
Health Sciences	23	29	26	0	0	-	0	1	-	23	30	30
Humanities	40	30	-25	0	0	-	0	0	-	40	30	-25
Library Science	2	0	-100	0	0	-	0	0	-	2	0	-100
Life Sciences	65	77	18	0	0	-	0	2	-	65	79	22
Mathematics and Computer Sciences	16	13	-19	0	0	-	0	0	-	16	13	-19
Physical Sciences	47	38	-19	0	0	-	0	0	-	47	38	-19
Psychology	52	27	-48	0	0	-	0	0	-	52	27	-48
Public Affairs	4	3	-25	0	0	-	0	0	-	4	3	-25
Social Sciences	85	53	-38	0	0	-	0	0	-	85	53	-38
Visual and Performing Arts	14	16	14	0	0	-	0	0	-	14	16	14
Doctor of Ministry	0	0	-	0	0	-	0	11	-	0	11	--
Other	32	18	-44	0	0	-	0	0	-	32	18	-44
TOTAL	557	515	-8%	0	0	-%	0	14	-%	557	529	-5%

SOURCE: HEGIS.

[1]Includes Pharm.D. degrees; Mayo Graduate School of Medicine included with the Univeristy of Minnesota.

largely reflect activity at the University of Minnesota. The largest number of doctorates conferred by private institutions was in divinity.

Between 1972-73 and 1984-85, changes occurred in the distribution of doctoral degrees conferred. The greatest increases in the number of doctorates awarded occurred in agriculture and forestry, engineering, and health sciences. The greatest percentage decreases occurred in library science, psychology, other fields, and social sciences. These figures primarily reflect changes in doctorates granted at the University of Minnesota.

First Professional Degrees by Field In 1984-85, Minnesota institutions awarded 1,612 first professional degrees, as shown in Table 41. Of these, 42 percent were in law. Medicine accounted for 19 percent, divinity for 18 percent, dentistry accounted for 5 percent, veterinary medicine for 5 percent, and other fields for 8 percent.

Between 1972-73 and 1984-85, the number of first professional degrees conferred in Minnesota rose by over 80 percent. Growth statewide occurred in every field. The greatest increase was in law, where the number of degrees awarded annually more than doubled. A dramatic rise in law degrees conferred by private schools more than offset a decline at the University of Minnesota.

Comparison of Minnesota to the Nation in Degrees Conferred

Minnesota and the nation as a whole have experienced increases in advanced degrees conferred. The growth rate in Minnesota, however, was more than double the national rate between 1972-73 and 1982-83, the last year for which national data are available. Degrees conferred in the state increased 34 percent, from 4,152 to 5,584, in contrast to a 14 percent national increase from 348,166 to 396,145. As a result, Minnesota's share of the United States total rose from 1.2 percent to 1.4 percent. These data are derived from Tables 42, 43, and 44.

TABLE 41. FIRST PROFESSIONAL DEGREES CONFERRED IN MINNESOTA BY FIELD, 1972-73 AND 1984-85

Areas of Study	University of Minnesota			State Universities			Private Institutions			Total		
	1972-73	1984-85	Percent Change	1972-73	1984-85	Percent Change	1972-73	1984-85	Percent Change	1972-73	1984-85	Percent Change
Dentistry	98	141	44%	-	-	-%	-	-	-%	98	141	44%
Divinity	-	-	-	-	-	-	214	292	36	214	292	36
Law	257	228	-11	-	-	-	71	441	521	328	669	104
Medicine	178	267	50	-	-	-	-	39	-	178	306	72
Veterinary Medicine	61	76	25	-	-	-	-	-	-	61	76	25
Other[1]	-	31	-	-	-	-	-	97	-	-	123	-
TOTAL	594	743	25%	-	-	-%	285	869	205%	879	1,612	83%

SOURCE: HEGIS.

[1]Data on other first professional degrees granted in 1972-73 are not available.

TABLE 42. MASTER'S DEGREES CONFERRED IN MINNESOTA AND NATIONWIDE, 1972-73 AND 1982-83

	1972-73				1982-83			
	Number Conferred in Minnesota	Percentage of State's Degrees [1]	Number Conferred in Nation	Percentage of Nation's Degrees [1]	Number Conferred in Minnesota	Percentage of State's Degrees [1]	Number Conferred in Nation	Percentage of Nation's Degrees [1]
Agriculture and Forestry	40	2%	2,376	1%	87	3%	3,662	1%
Business	206	8	31,007	12	794	23	65,319	23
Education	1,113	41	105,565	40	1,043	30	84,853	29
Engineering	103	4	16,619	6	153	4	19,350	7
Health Sciences	287	11	7,879	3	390	11	17,063	6
Humanities	191	7	19,093	7	159	5	13,399	5
Library Sciences	147	5	7,696	3	73	2	3,979	1
Life Sciences	89	3	6,263	2	103	3	5,696	2
Mathematics and Computer Science	65	2	7,141	3	60	2	8,158	3
Physical Sciences	36	1	5,257	2	46	1	5,290	2
Psychology	33	1	5,831	2	90	3	8,378	3
Public Affairs	67	2	10,899	4	137	4	16,243	6
Social Sciences	186	7	17,719	7	90	3	11,710	4
Visual and Performing Arts	74	3	7,254	3	103	3	8,742	3
Other	90	3	12,772	5	154	4	18,074	6
TOTAL	2,727	100%	263,37	100%	3,482	100%	289,921	100%

SOURCE: HEGIS.

[1] Percentages may not add to 100 due to rounding.

TABLE 43. DOCTORAL DEGREES CONFERRED IN MINNESOTA AND NATIONWIDE, 1972-73 AND 1982-83

	1972-73				1982-83			
	Number Conferred in Minnesota[1]	Percentage of State's Degrees[2]	Number Conferred in Nation	Percentage of Nation's Degrees[2]	Number Conferred in Minnesota	Percentage of State's Degrees[2]	Number Conferred in Nation	Percentage of Nation's Degrees[2]
Agriculture and Forestry	19	3%	869	2%	33	7%	986	3%
Business	24	4	923	3	9	2	809	2
Education	91	16	7,318	21	115	24	7,500	23
Engineering	43	8	3,492	10	37	8	2,822	9
Health Sciences	23	4	643	2	24	5	1,155	3
Humanities	40	7	4,407	13	35	7	3,338	10
Library Sciences	2	-	102	-	1	-	52	-
Life Science	65	12	3,636	10	58	12	3,341	10
Mathematics and Computer Science	16	3	1,264	4	17	3	948	3
Physical Sciences	47	8	4,006	12	27	6	3,269	10
Psychology	52	9	2,089	6	32	7	3,129	9
Public Affairs	4	1	214	1	2	-	347	1
Social Sciences	85	15	4,420	13	51	10	3,084	9
Visual and Performing Arts	14	3	616	2	20	4	670	2
Other	32	6	778	2	26	5	1,638	5
TOTAL	557	100%	34,777	100%	487	100%	33,088	100%

SOURCE: HEGIS.

[1] Includes Pharm.D. degrees.
[2] Includes Doctor of Ministry degrees in Minnesota.
[3] Percentages may not add to 100 due to rounding.

TABLE 44. FIRST PROFESSIONAL DEGREES CONFERRED IN MINNESOTA AND NATIONWIDE, 1972-73 AND 1982-83

	1972-73				1982-83			
	Number Conferred in Minnesota	Percentage of State's Degrees [1]	Number Conferred in Nation	Percentage of Nation's Degrees [1]	Number Conferred in Minnesota	Percentage of State's Degrees [1]	Number Conferred in Nation	Percentage of Nation's Degrees [1]
Dentistry	98	11%	4,047	8%	124	8%	5,565	8%
Divinity	203	23	5,286	11	278	17	6,494	9
Law	328	38	27,205	54	674	42	36,853	50
Medicine	178	21	10,307	21	317	20	15,484	21
Veterinary Medicine	61	7	1,299	3	80	5	2,068	3
Other [2]	-	-	1,874	4	122	8	6,672	9
TOTAL	868	100%	50,018	100%	1,595	100%	73,136	100%

SOURCE: HEGIS.

[1] Data on other first professional degrees granted in 1972-73 are not available

[2] Percentages may not add to 100 due to rounding.

The following material compares Minnesota to the nation by level of advanced degree.

Master's Degrees. Between 1972-73 and 1982-83, the number of master's degrees conferred in Minnesota increased by 28 percent. This was almost triple the 10 percent increase nationally, leading to a growth in Minnesota's share from 1.0 percent to 1.2 percent. Generally, the distribution of degrees among fields was similar at the state and national levels. Data on master's degrees conferred appear in Table 42.

Doctoral Degrees. Comparative trends in doctoral degrees were the reverse of trends in master's degrees between 1972-73 and 1982-83. Not only did the number of degrees conferred decline in Minnesota and the United States, but the state's position relative to the nation also declined. While the number of new doctorates decreased by almost 5 percent nationally, the decrease in Minnesota approached 13 percent. Variations in trends occurred by field. Data on doctoral degrees conferred appear in Table 43.

First Professional Degrees. Between 1972-73 and 1982-83, Minnesota outpaced the nation in growth in first professional degrees conferred. The state's increase amounted to 84 percent, in contrast to a national increase of 46 percent. Whereas Minnesota conferred 1.8 percent of the degrees at the beginning of the period, its share rose to 2.2 percent at the end. The most noticeable difference in distribution of degrees is the higher percentage of divinity degrees in Minnesota. Data on first professional degrees conferred appear in Table 44.

Comparison of Degrees Conferred to Population. A disparity exists between Minnesota's share of advanced degrees conferred nationally and its share of the nation's population. Although Minnesota's institutions conferred 1.4

percent of the nation's graduate and professional degrees in 1982-83, the state had 1.8 percent of the population.[17]

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17. U.S. Bureau of the Census, State Population Estimates by Age and Components of Change (U.S. Government Printing Office, June 1985).

CHAPTER VII. IMPORTANCE OF GRADUATE AND PROFESSIONAL EDUCATION IN THE UNITED STATES

Graduate and professional education have important roles in national affairs. This chapter traces the history of advanced study in the United States, discusses its contemporary role, and describes general roles and responsibilities of different parties for its financing.

THE EMERGENCE OF GRADUATE AND PROFESSIONAL EDUCATION

Graduate and professional education in America predate the founding of the Republic. The form and substance of advanced study then were much different from today. It involved little formal instruction, was broadly interdisciplinary, and was inconsistent as to rigor. Graduate and professional education as known today are of more recent origin.

Graduate Education

Modern graduate education with its combination of advanced disciplinary study and research emerged during the middle of the 19th century. Its origins lay in three sources. One was the English undergraduate college, which provided the institutional base for advanced study. A second source was the German research institute, which promoted unrestrained research by individual scientists and scholars. The third source was the American concept of knowledge and research as a public investment embodied in the land grant university. Most contemporary graduate institutions share the characteristics of an undergraduate base, a high expectation of scholarship and research by faculty members, and an underlying belief in research as a public benefit.

Harvard, followed by other colonial institutions, began awarding master's degrees in the 1600s. Study was generally independent in nature and not focused

along disciplinary lines. The preparation and defense of a thesis were not consistent requirements. Institutions often awarded master's degrees to persons who did nothing more than remain in residence for three years following receipt of a baccalaureate degree.[1]

The transition toward advanced education emphasizing research and scholarship started at the University of Virginia. During the 1820s the University, until then an undergraduate institution, established an earned Master of Arts degree for specific fields of inquiry. Requirements for the degree followed the German model of advanced, specialized study.[2]

German universities became the intellectual beacon for thousands of American scholars and scientists who studied at them during the 19th century. These institutions supported the work of eminent researchers who passed their expertise to students through seminars, directed study, and supervised research. These efforts culminated in the awarding of the Doctor of Philosophy degree.

As Americans returned home, they sought to transplant the German form of advanced study. Numerous attempts to establish institutes of advanced study between 1830 and 1860 ended in failure, however. In 1860, Yale established the Ph.D. degree, and in 1861, it conferred the first Ph.D. in the United States.[3] Several institutions followed Yale's example during the ensuing decade. In 1876, Johns Hopkins University established the first formal graduate school with

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1. John S. Brubacher and Willis Rudy, Higher Education in Transition. An American History: 1636-1956 (Harper & Brothers, 1958), pp. 21-22; and Richard J. Storr, The Beginnings of Graduate Education in America (The University of Chicago Press, 1953), ch. 1.
2. Brubacher and Rudy, Higher Education in Transition, pp. 98-99; Storr, The Beginnings of Graduate Education in America, pp. 9-14.
3. Richard J. Storr, The Beginning of the Future: A Historic Approach to Graduate Education in the Arts and Sciences (McGraw-Hill Book Company, 1973), chs. 2-3; Storr, The Beginning of Graduate Education in America.

an organization and mission devoted to advanced study. Many other institutions emulated this, but without severing ties to undergraduate education.[4]

Land grant universities became a major force in the expansion of graduate education. Entrepreneurial leaders developed graduate education at those institutions as a means of rapidly raising their stature to rival well-established private institutions. To cultivate public support and state funds for their enterprises, leaders of land grant institutions wedded the concepts of advanced study and public service. Public universities undertook many service oriented responsibilities, including practical research in areas such as agriculture, in order to provide a base for more esoteric and academically prestigious studies.[5]

By the early 1900s, he current structure of graduate education was in place. It featured a high degree of decentralization and rivalry among numerous institutions, public and private, across the country. It housed and sustained a growing research apparatus. Graduate education also maintained firm links to undergraduate education.

Preparation of Ph.D.s to fill faculty and research positions was the focus of graduate education in the first half of this century. While the master's degree often was viewed as a stepping stone for those who continued their pursuit of the Ph.D., graduate study expanded to include subjects of a more practical nature with less of a scientific or scholarly base.[6] Institutions began offering graduate degrees such as the Master of Business Administration

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4. Brubacher and Rudy, Higher Education in Transition, pp. 179-84; and Storr, The Beginning of the Future, pp. 37-44.
5. Joseph Ben-David, American Higher Education: Directions Old and New (McGraw-Hill Book Company, 1972), pp. 445-45; H. C. Knoblauch and others, State Agriculture Experiment Stations: A History of Research Policy and Procedures (U.S. Department of Agriculture, 1962); Nevins, The State Universities and Democracy, pp. 100-01; and Lawrence R. Vesey, The Emergence of the American University (University of Chicago Press, 1965), pp. 107-08, 330.
6. Brubacher and Rudy, Higher Education in Transition, pp. 188-90.

and the Doctor of Education which were oriented toward practice rather than research in a field.[7]

Since 1950, graduate education in the United States has changed dramatically. Following two decades of growth, retrenchment occurred. In response, graduate education shifted to new areas of service. From 1950 to about 1970, graduate education experienced tremendous expansion to satisfy demand for persons with the Ph D. and other advanced degrees. Demand for college faculty grew, first in response to enrollment of World War II and Korean War veterans under the G.I. Bill, later in response to the post-war baby boom. Demand for scientists, technicians, and experts in many fields also grew with America's involvement in the Cold War and Space Race. Many universities, some of which had only recently been small, four-year colleges or teachers colleges, started graduate schools.

Rapid expansion in graduate education subsided around 1970. Enrollment from the baby boom generation began to stabilize and government spending on research declined with the easing of the Cold War, the end of the Vietnam War, and a period of economic difficulty. Diminished demand for persons with Ph.D.s in many fields led to stable or declining enrollments in numerous graduate programs.

Graduate enrollments overall, however, continued to grow, as seen in Table 45. Enrollment shifted to other programs, especially professional programs at the master's or doctoral level. Pursuit of study in fields such as business and public affairs with better employment opportunities accounted for part of the change. Increased participation by women, minorities, and foreign students also contributed to the overall growth in enrollment. In addition,

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7. Ibid., p. 190; Abraham Flexner, Universities. American, English, German (Oxford University Press, 1930).

TABLE 45. ESTIMATES OF STUDENTS ENROLLED FOR GRADUATE AND PROFESSIONAL DEGREES, SELECTED ACADEMIC YEARS 1970-1982

Type of Program	1970	1975	1980	1982
Graduate	816,000	1,054,000	1,106,000	1,090,000
Professional	170,000	234,000	280,000	278,000
TOTAL	986,000	1,288,000	1,386,000	1,368,000

SOURCE: Arthur M. Hauptman, Students in Graduate and Professional Education: What We Know and What We Need to Know (Association of American Universities, 1986), p. 4.

institutions consciously attracted new clienteles for graduate education among persons seeking to change careers, to enhance careers through continuing education, or to prepare for careers after being homemakers.[8]

Professional Education

Until the early 20th century, preparation of attorneys, dentists, physicians, and other professionals in the United States frequently occurred without formal university or college based study.[9] Entry into these professions during much of the 19th century was possible through individual aprenticeships as well as through formal study at professional schools. Most professional schools were independent establishments with inconsistent admission and performance standards.

Significant changes began to occur during the last half of the 19th century as professional schools began affiliating with universities in order to expand the curriculum, improve academic preparation, and establish standards. This development coincided with the expansion of graduate studies and research, which made universities centers for the creation as well as accumulation of knowledge It also agreed with the land grant university's mission to provide practical education.

The movement for standards in the preparation of medical professionals culminated in 1910 with the Flexner Report on medical education, which argued for several reforms. Graduation from an accredited medical school as a requirement for licensure and high academic standards for medical schools were among the proposals that were adopted widely. As a result, medical schools became the

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8. National Board on Graduate Education, Outlook and Opportunities for Graduate Education (NBGE, 1975), p. 4; and David W. Breneman, Graduate School Adjustments to the New Depression in Higher Education (National Board on Graduate Education, 1975), pp. 56-75.
9. Brubacher and Rudy, Higher Education in Transition, Ch. 10.

gateways into the profession, and medical school faculties became the gatekeepers. Wide adoption of the Flexner Report's recommendations soon followed. Over the next few decades, other professions moved in a similar direction toward licensure and preparation. Many universities established schools of medicine, dentistry, law, and veterinary medicine either through merger with existing schools or by opening their own.

First professional programs were not necessarily at the post-baccalaureate level. Initially, schools in some professions required no previous undergraduate study. Even with increased professional standards, two or three years of college often were sufficient for admission. An undergraduate degree became commonly accepted preparation, if not an unwritten requirement, for admission to professional schools only after World War II.

Graduate Professional Education

The movement for formal professional preparation expanded to many fields the early 1900s. As a consequence, universities established schools or colleges of business administration, education, engineering, journalism, nursing and other fields during the early decades of this century. The process continues today. Initial programs in these fields remained at the undergraduate level. Over the years, advanced preparation leading to graduate degrees evolved. Changing conditions in various occupations made an advanced degree desirable for promotion or expansion of career opportunities. Some fields emerged as areas for scholarly study, leading to establishment of doctoral programs.

CONTEMPORARY ROLE OF ADVANCED STUDY

Graduate and professional education serve many constituencies. Students, educational institutions, industry, government, and society as a whole benefit from advanced study. Advantages include personal career opportunities and

income, technological change and economic development, and physical, social, and cultural well-being of society. The interests of various parties in advanced study are described in this section.

Students

Students are the primary beneficiaries of graduate and professional education. Advanced study enables individuals to pursue intellectual interests and prepare for careers. In doing so, it yields monetary, professional, and other rewards.

Monetary Rewards. Financial return is foremost among the benefits that students receive from graduate and professional education.[10] Persons with advanced education reap the premium that society usually pays for scholarship, professional service, and other productive endeavors. Formal education at a professional school is often a requirement to enter practice. For practicing professionals, continuing education sustains or enhances their earning power through relicensure and acquisition of additional expertise that may lead to more lucrative work environments.

Skills acquired in specific graduate and professional programs are often transferable to other fields. This suggests that a graduate or professional education is a worthwhile investment whether or not employment in the specific field of preparation is obtainable. Justifying advanced education as an investment in general skills alone, however, is questioned by some. Reasons are advanced programs, particularly for knowledge producers and first professionals, can be quite lengthy and costly, with most attention given to development of

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10. Gary S. Becker, Human Capital (National Bureau of Economic Research, 1975); and Richard B. Freeman, The Market for College-Trained Manpower (Harvard University Press, 1971).

skills specific to the field. Acquisition of more general skills can likely occur in shorter programs or in other settings.

Nonmonetary Rewards. Nonmonetary rewards also accrue from graduate and professional education. Possession of an advanced degree confers a certain social distinction independent of income. In addition, advanced study in a field may have intrinsic value to an individual, providing a sense of satisfaction regardless of other circumstances.

Educational Institutions

Institutions that provide graduate and professional education receive benefits in return. Graduate and professional students are a source of dedicated, low-cost labor. They also are a source of intellectual stimulation to faculty and undergraduate students.

Source of Labor. Many institutions of higher education employ graduate and professional students as instructors, researchers, and providers of services. Graduate students frequently serve as teaching assistants in undergraduate courses and research assistants on research projects. Universities that operate teaching hospitals in association with medical schools use M.D.s enrolled in graduate medical programs to treat patients as part of medical training. In contrast to regular faculty and staff, individuals in these capacities make lower financial demands on the institution in wages and fringe benefits. Without this source of labor, institutions would have to decrease the scope and

volume of their activities or reallocate the mix of faculty and staff among various activities.[11]

Leadership and Morale. Institutions also benefit in nonfinancial ways from graduate and professional education. Graduate education and research increase knowledge and improve undergraduate education in many disciplines. Graduate students pursuing work also can provide intellectual stimulation for both faculty and undergraduate students.[12]

Business and Industry

American business depends heavily on graduate and professional education to meet numerous challenges. Availability of resources, environmental concerns, and social conditions are among the problems that firms continually face amidst competition with domestic and foreign rivals. Advanced study provides the knowledge and expertise for new technologies, products, and organizational practices that enable industry to thrive in both the long and short term. These benefits have led industry to support and work with educational institutions.

Human Capital. Graduate and professional education benefit business and industry most directly as a source of human capital.[13] Industries employ specialists in many fields from the physical sciences and engineering to the social sciences and law.

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11. David W. Breneman, "Effects of Recent Trends in Graduate Education on University Research Capability in Physics, Chemistry, and Mathematics," in Bruce L. R. Smith and Joseph J. Karlesky, eds., The State of Academic Science. Background Papers (Change Magazine Press, 1978), pp. 153-56; Breneman, Graduate School Adjustments, pp. 58-60; Stephen P. Dresch, An Economic Perspective on the Evolution of Graduate Education (National Board on Graduate Education, 1974), pp. 28-35; W. Lee Hansen and Burton A. Weisbrod, Benefits, Costs, and Finance of Public Higher Education (Markhan Publishing Company, 1969), pp. 33-36; and Smith and Karlesky, The State of Academic Science. The Universities in the National Research Effort (Change Magazine Press, 1977), p. 40.
12. Peter M. Blau, The Organization of Academic Work (John Wiley & Sons, 1973), p. 223.
13. Wilson, "The Role of University-Based Research," pp. 40-45.

Knowledge. Knowledge is the basis for technological change that improves products and productivity. Basic research at universities, much of it involving graduate students, is vital for developing theories and principles that can be applied to practical problems.[14] Several industries directly nurture university research for the benefits that it produces. Since the early 1900s, for example, the American chemical industry and universities have maintained mutually advantageous relationships in producing and sharing research findings.[15] More recent examples of industry relationships with universities have occurred in fields such as biomedical research, computer science, and electronics.[16]

Applied research is another benefit that industry derives from graduate and professional education. Businesses often sponsor or retain faculty members from graduate and professional schools to undertake research into matters of practical and immediate benefit.[17] Retention of faculty members on a project basis reduces the need for businesses to maintain large in-house research staffs. Such activities range from sophisticated projects involving teams of researchers to brief consultations with a single faculty member. The results

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14. Ibid.; Robert E. Evenson and others, "Economic Benefits from Research: An Example from Agriculture," Science, vol. 205 (September 14, 1979), pp. 1101-07; Neal H. Brodsky and others, University/Industry Cooperation: A Preliminary Analysis of Existing Mechanisms and Their Relationship to the Innovative Process (New York University, 1980); and Walter S. Baer, University Relationships and Other R & D Performers (The Rand Corporation, 1977).

15. Arnold Thackery, "University-Industry Connections and Chemical Research: An Historical Perspective," in National Science Foundation, University-Industry Research Relationships, pp. 210-33.

16. Marilyn L. Bach and Ray Thornton, "Academic-Industrial Partnerships in Biomedical Research: Inevitability and Desirability," Educational Record, vol. 64 (Spring 1983), pp. 26-32; Elizabeth Useem. "Education and High Technology Industry: The Case of Silicon Valley. Summary of Research Findings" (Northeastern University, Boston, 1981); Elizabeth Useem, "Education in a High Technology World: The Case of Route 128" (Northeastern University, Boston, 1982).

17. Businesses also hire faculty from undergraduate institutions who may have desired expertise.

often are the seeds of invention. Graduate students frequently provide an inexpensive source of labor for faculty members engaging in such projects.[18]

Problems can arise in relationships between business and faculty members. Businesses, because they are competitive, place emphasis on useful results, exclusivity, and confidentiality. Academic work by nature and tradition relies on flexibility of inquiry and sharing of findings. Dealing successfully with these contradictions and other issues requires understanding and effort by all parties.[19]

Federal Government

The federal government's interest in graduate and professional education to an extent is similar to the interest of business. Government employs experts, and it seeks solutions of practical problems through applied research. Government's interest in advanced education, however, extends beyond these matters into knowledge creation, student access, and redress of market failures in certain areas.

Experts. As a provider of services, the federal government employs persons with advanced education to undertake research projects for production and application of knowledge and to dispense expertise. Examples of such activity are agricultural research, wildlife management, pollution control, analysis of

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18. Herbert I. Gusfield, "Overview of University-Industry Research Interactions," in Thomas W. Langfitt and others, eds., Partners in the Research Enterprise: University-Corporate Relations in Science and Technology (University of Pennsylvania Press, 1983), p. 15.
19. Derek Bok, "Business and the Academy," Harvard Magazine (May/June 1981), pp. 23-35; A. Bartlett Giamatti, "Free Market and Free Inquiry: The University, Industry, and Cooperative Research," in Langfitt and others, eds., Partnerships in Research; H. W. Rahn and E. P. Segner, Jr., "Technical Research: Pathways for Improving Interaction Between Academia and Industry," Engineering Education, vol. 66 (May 1976), pp. 794-95, 853; Roy Rustum, "University-Industrial Interaction Patterns," Science, vol. 178 (December 1972), pp. 955-59; and David S. Tatel and R. Claire Guthrie, "The Legal Ins and Outs of University-Industry Collaboration," Educational Record, vol. 64 (Spring 1983), pp. 19-25.

international affairs, litigation in the courts, and health services in the armed forces.

Knowledge. To fulfill its functions, the federal government, like business, turns to research universities for research into practical problems. Much of this effort is concentrated in the physical sciences, engineering, and the biological and health sciences. The federal government also supports theoretical and other research in the sciences and humanities whose practical consequences are not immediate. The assumption is that the results of such research will add to bodies of knowledge and, ultimately, lead to practical benefit for government, business, and society. Since World War II, the federal government's policy has been to foster such basic research at universities rather than in the industries that might ultimately benefit.[20]

Access. The federal government has assumed responsibility for seeing that individuals have access to educational opportunities. Pursuit of education to the extent of an individual's interest and ability benefits not only the individual but also society through additions to the pool of human capital. The federal government, therefore, has pursued policies to overcome financial disadvantages experienced by individuals who are willing and able to undertake graduate and professional education. These federal policies include providing direct financial aid to disadvantaged persons and increasing access of students to capital markets for loans.

Redress of Market Failure. The federal government intervenes in graduate and professional education when regular markets fail to produce generally desired results. Government has acted to alleviate perceived shortages of expertise when no other remedies apparently would work in an acceptable time. In recent decades, for example, federal programs have increased the supply and

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20. Wilson, "The Role of University-Based Research," p. 40.

distribution of health professionals and language specialists through financial support of students and institutions. Similarly, much federal sponsorship of theoretical research occurs because immediate demand alone is insufficient to support creation of new knowledge. Government also acts to create strategic labor force reserves across a broad spectrum of expertise.

State Governments

To a considerable degree, the interests of state governments in graduate and professional education parallel those of the federal government. States employ experts, and they seek to satisfy constituents' demands for knowledge, expertise, and financial access to education for students. Beyond these, state governments provide geographic access to educational programs and encourage development of the state through support of education.

Geographic Access. States provide geographic access to instruction for their residents by operating or supporting educational institutions. This enables residents to obtain a graduate or professional education without having to leave the state. In some fields of study, programs are available at several institutions, thereby expanding access to the regional or local level. Persons in occupations such as teaching, where graduate education is encouraged, are thus able to undertake advanced work relatively close to home.

Economic Development. Within the past 10 years, state governments increasingly have been using graduate education and related research capabilities as tools for economic development. An early example of this is the Research Triangle in North Carolina. During the 1950s, state government leaders encouraged establishment of a research park located on a site roughly in the middle of a triangle formed by Duke University, North Carolina State University, and the University of North Carolina. This park became a center where graduate

students and faculty from the three universities could be employed on practical projects to help private industry and the state's economy.[21]

Research universities have become an important component in economic development of states and regions. Universities not only provide a research base for industry, but they also make localities attractive to employees by providing advanced educational opportunities, according to a Congressional report.[22] To promote economic development, state and university officials around the country have sought greater investment in research centers and parks affiliated with universities.[23]

Prestige and Cultural Development. States benefit in other ways from graduate and professional education. Graduate and professional schools add prestige to states and localities. They enhance the quality of life by serving as educational and cultural centers. They also attract highly educated persons who want the opportunity to be near others of similar backgrounds.

Society

The benefits of graduate and professional education to society appear in many ways. Individuals receive direct benefit from the services of attorneys, dentists, physicians, psychologists, teachers, and persons in other occupations for which advanced education may be necessary or useful. Indirect benefits are

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21. Luther J. Carter, "Research Triangle Park Succeeds Beyond Its Promoters' Expectations," Science, vol. 200 (June 1978), pp. 1469-70; and W. B. Hamilton, "The Research Triangle of North Carolina: A Study in Leadership for the Common Weal," South Atlantic Quarterly, vol. 65 (Spring 1966), pp. 254-78.
22. Location of High Technology Firms and Regional Economic Development, Staff Report, Subcommittee on Monetary and Fiscal Policy, Joint Economic Committee, U.S. Congress (1982).
23. See, for example, remarks by Pennsylvania Governor Dick Thornburgh in Langfitt and others, eds., Partners in the Research Enterprise, p. xix; Utah State University, Liaison With the Future: Utah State University Research and Technology Park (n.d.); Utah State University, Utah State University Research Park Status Report July 1, 1985 (July 1985); West Virginia Board of Regents, "Economic Development Initiatives: Narrative for Finance and Administration Budget Document," Draft, October 10, 1985.

in the form of new products and services from business and services and policies from government that may have resulted from the expertise and knowledge produced in graduate and professional schools.

CURRENT FINANCING ROLES AND RESPONSIBILITIES

Roles and responsibilities in financing graduate and professional education have varied considerably.[24] Sources of finance include students, the federal government, state and local governments, businesses, and private non-profit organizations. Usually the nature of support reflects the interests of the party providing it. This section discusses the nature of support by various parties.

Students

Because of enhanced earning power and job satisfaction, students have a strong incentive to invest in advanced education. Students may use savings from past income, current income, and loans based on future income for support. For younger students with a short work history, savings appear to be less important than the other two sources.

Availability of current income depends on employment opportunities. Many graduate students have the flexibility to work. They also have opportunities provided by institutions in the form of teaching and research assistantships. Others find part-time employment in unrelated jobs on- or off-campus. First professional students generally do not have these advantages. Most professional

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24. For discussion of roles and responsibilities in the financing of graduate and professional education see Education Commission of the States, The State and Graduate Education. Report on the Task Force on Graduate Education (ECS, 1975); Hauptman, Students in Graduate and Professional Education; National Board on Graduate Education, Outlook and Opportunities for Graduate Education (NBGE, 1975); Robert L. Snyder, Federal Policy and Graduate Education (Federal Interagency Committee on Graduate Education, 1975).

programs are structured in a way to favor concentrated study on a full-time basis with little provision for employment.[25]

The decision to use loans entails taking a risk that future income will cover at least the cost of the loan and other costs of attendance. If the risk of insufficient future income appears too great, loans become unattractive financing options. Loans also depend on availability of funds and willingness of lenders to take a risk on a student's education.

Federal Government

Most federal activity involves financing of students and programs to develop human capital and knowledge. Little federal money goes toward unrestricted support of institutions.

Program financing by the federal government has supported both instruction and research. During the 1960s and 1970s, federal funds supported professional programs by such means as capitation grants to medical schools. Funding for research occurs in two forms: contracts with faculty or institutions for applied research and grants for both applied and theoretical research. Many federally financed projects generate research assistantships for employment of graduate students.

Since World War II, the federal government has been the primary source of support for university research. Sixty-six percent of all university research in Fiscal Year 1983 was sponsored by the federal government.[26] Ninety-five percent of federal funds to academic institutions were for science or engineering activities including instruction, research, service fellowships, and training. Fifteen federal agencies accounted for about 95 percent of the total

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25. Carnegie Commission on Higher Education, Higher Education: Who Pays? Who Benefits? Who Should Pay? (McGraw Hill, 1973).
26. Wilson, "The Role of University-Based Research", p. 42.

federal funding to academic institutions and almost all the federal research funding for science and engineering. The leading agencies are the U.S. Department of Health and Human Services, the Department of Defense, the National Science Foundation, the Department of Energy, the U.S. Department of Agriculture, and the National Aeronautics and Space Agency.[27]

Direct support of students consists of loans and grants. Loan programs increase access to capital markets for students intent on using future income to pay for their education. Federal loans for graduate and professional students are available through the National Direct Student Loan Program (NDSL), Guaranteed Student Loan Program (GSL), and Auxiliary Loans to Assist Students (ALAS). Loan programs specifically for students in the health professions are the Health Education Assistance Program (HEAL) and Health Professions Student Loan Program (HPSL). Grants, mostly in the form of fellowships and traineeships in scientific, technical, and health fields, provide direct subsidies to help defray costs of attendance. Operating agencies interested in particular disciplines relevant to their missions award most federal grants. Veteran's educational benefits also constitute federal grants.

State Government

Financing of institutions traditionally has been the major method of state support for graduate and professional education. Through legislative appropriations, mostly to public institutions, states provide the resources for instruction and other general operations. While states may take an interest in the initiation and status of individual programs, most public institutions have considerable flexibility in their use of resources from appropriations.

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27. National Science Foundation, Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, FY 1983, Table B-17.

In addition to providing general operating funds, state governments make special appropriations for specific programs or purposes. Often these additional funds are incorporated into the regular operating budget. Program funding has supported various instructional and research efforts. Within the past few years, at least 20 states have taken initiatives that may benefit graduate education.[28] Promotion of economic development has been a major impetus. One type of initiative involves enhancing educational quality through establishment of "centers of excellence." Another is the creation of centers for applied research and other activities to work with private industries. Some states also have allocated funds to attract outstanding scholars through the creation of endowed chairs and provisions for salary supplements.

States finance students as well as institutions and programs. The greatest support actually occurs indirectly through the financing of institutions, which reduces the tuition that institutions need to collect. Some states also operate loan programs that are open to or specifically established for graduate and professional students. Finally, several states have recently established grants in the form of fellowships and graduate scholarships in specific fields.[29]

Educational Institutions

Colleges and universities play an important role in the financing of students. Using funds received for research and undergraduate instruction, institutions provide current income to many graduate students through research and teaching assistantships. Institutions and their auxiliary enterprises also employ students in various technical, administrative, clerical, and maintenance capacities. Some institutions have funds for loans in addition to federally and

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28. James R. Mingle and Catherine Walker, State Incentive Programs for Graduate Education: A Survey of States (State Higher Education Executive Officers, December 1985).
29. Ibid., pp. 6-11.

state supported loan programs. Finally, many graduate and professional schools have endowments for fellowships and scholarships to provide direct subsidies to students.

Private Business

Private businesses, seeking specifi knowledge and expertise, direct their financial support for graduate education accordingly. They devote resources largely to the financing of research projects and students rather than providing institutional support. Most support goes to activities with potential for yielding direct returns to the firm, such as research at universities to develop new products, procedures, and applications of techniques for commercial purposes. Less frequently, businesses provide funds for theoretical research.

Businesses also provide support for students more directly in several ways. Many firms pay all or part of the expenses of employees who attend graduate school in the expectation of greater productivity.[30] Firms also provide employment opportunities for graduate students enrolled in certain fields at nearby institutions.[31] Finally, businesses establish fellowships to attract students to a discipline. Frequently such fellowships are located at institutions or departments whose work fits the needs of the sponsoring firm.[32]

Private Foundations

Foundations often direct their funds to areas of study that market forces alone would not support and that appear neglected by other sources. They

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30. See, for example, Jerrier A. Haddad, "Support of Graduate Students by Industry," in Council of Graduate Schools in the United States, Research and Graduate Education, Proceedings of the Nineteenth Annual Meeting (CGSUS, 1979), pp. 27-32.
31. W.R. Hencke and others, "A Program for Student Involvement in Industrial R & D," Research Management, vol. 19 (May 1976), pp. 32-34.
32. Lois S. Peters and Herbert I. Fusfield, "Current U.S. University/Industry Research Connections," in National Science Foundation, University-Industry Research Relationships, p. 26.

sponsor a wide variety of faculty research that often results in employment of graduate students. Foundations also provide direct support of students through fellowships and other grants.

CHAPTER VIII. NATIONAL MARKET CONDITIONS

Expertise and knowledge generated by advanced study are subject to market conditions.[1] In analyzing conditions facing advanced study in the United States, two facets of the marketplace stand out: the market for instruction and the market for expertise and knowledge.

The market for instruction consists of persons who wish to study and institutions that provide instruction. Demand for instruction depends on the number and quality of students seeking an education. Supply depends on the number of institutions and the quantity, capacity, and quality of programs that institutions are willing to provide.

The market for expertise consists of those who seek the services of experts and those who provide expert service. Demand for expertise depends on the number of clients and the amount and quality of service they seek. Supply of expertise depends on the number of available experts.[2]

Direct relationships between the two markets exist. An excess supply of experts, for example, may drive down the price of expertise, thereby reducing incentives for persons to seek preparation and entrance into a field. Conversely, a shortage of institutions may depress the number of experts who are prepared, thereby creating a shortage of expertise. The following analysis focuses on market conditions for each of the major purposes of graduate and professional education: preparation of knowledge producers, creation of know-

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1. Richard B. Freeman, "Supply and Salary Adjustments to the Changing Science Manpower Market: Physics, 1948-1973," American Economic Review, vol. 65 (March 1975), pp. 27-39; and Freeman, The Market for College Trained Manpower.
2. Changes in technology and practice may alter productivity and, thus, the amount of expertise that a practitioner can dispense. Productivity may affect the number of experts needed to serve a given population.

ledge, preparation of first professionals, preparation of graduate professionals, and provision of continuing education.

KNOWLEDGE PRODUCERS

The market for knowledge producers in the United States has been stagnant or depressed in many fields. Since 1970, the output of research doctorates has remained fairly stable. This stability, however, contrasts with the tremendous growth in the number of doctorates awarded during the 1960s. The end of growth coincided with the halt in the rapid expansion of undergraduate enrollment and federal support for research. It left in its wake a period of difficult adjustments. Many Ph.D. recipients could not find employment in their field of preparation, and many Ph.D. candidates chose not to complete their degrees in the face of dismal employment prospects. The situation resulted in an apparent excess of productive capacity among graduate institutions, many of which only recently had come into being in response to growing demands for Ph.D.s.[3]

Levels of Supply and Demand

The number of research doctorates awarded annually in the United States rose from 9,733 in 1960 to 33,755 in 1973, as shown in Table 46. Following a decline in the mid-1970s, the number of degrees stabilized around 31,000. Although the overall number of degrees has fluctuated modestly since 1972, significant differences exist by field, as shown in Table 47. Between 1972 and 1982, significant increases occurred in the social sciences, while significant decreases occurred in the physical sciences, engineering, and the humanities.

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3. Dresch, An Economic Perspective on the Evolution of Graduate Education, ch. 3; Winifred L. Godwin, "Solutions Can Be the problem: Redefining the Nature of Graduate Education," Change, vol. 16 (March 1984), pp. 16-18; and Lewis B. Mayhew, Graduate and Professional Education, 1980: A Survey of Institutional Plans (McGraw-Hill, 1970).

TABLE 46. RESEARCH DOCTORATES AWARDED BY UNITED STATES UNIVERSITIES, 1960-1982

Year	Doctorates Awarded
1960	9,733
1961	10,413
1962	11,500
1963	12,728
1964	14,325
1965	16,340
1966	17,949
1967	20,403
1968	22,936
1969	25,743
1970	29,498
1971	31,867
1972	33,043
1973	33,755
1974	33,047
1975	32,951
1976	32,946
1977	31,718
1978	30,873
1979	31,235
1980	31,013
1981	31,342
1982	31,048

SOURCE: Peter D. Syverson, Summary Report, 1982. Doctorate Recipients from United States Universities (National Academy of Sciences-National Research Council, 1983), p. 4.

TABLE 47. RESEARCH DOCTORATES AWARDED BY BROAD FIELD, 1972, 1977, 1982

Year	Physical Sciences	Engineering	Life Sciences	Social Sciences	Professional Humanities	Professional Fields	Professional Education	Other	Total
1972	5,538	3,503	4,952	5,611	4,714	1,532	7,085	108	33,043
1977	4,379	2,643	4,774	6,528	4,562	1,353	7,455	24	31,718
1982	4,288	2,644	5,565	6,250	3,560	1,491	7,226	24	31,048

SOURCES: Peter D. Syverson, Summary Report, 1982. Doctorate Recipients From United States Universities (National Academy of Sciences-National Research Council, 1983), p. 4.

Within these broad fields, however, variations existed for particular disciplines.

Market conditions differ by fields, largely because of variation in employment opportunities for holders of doctorates.[4] Recent recipients of doctorates in the humanities have been most dependent on educational institutions for employment while engineers have been least dependent. As of 1983. educational institutions accounted for the following percentages of employed recent doctorates: humanities 76 percent, social sciences 65 percent, biological sciences 60 percent, physical sciences 50 percent, psychology 42 percent, and engineering 32 percent. In some physical science disciplines such as chemistry and physics, over 60 percent were employed in education.

The percentage of doctorate holders employed in academia has declined over the past decade. Ph.D.s in all fields have turned increasingly to private business and government to obtain employment.[5] Although most Ph.D.s have found employment, many have had to take work unrelated to their specialties. Among humanists, 28 percent have had to take unrelated work, in contrast to 6 percent of scientists. Furthermore, many humanists have had to accept part-time employment or seek additional training in other fields.[6] While opportunities outside academia have reduced unemployment for persons with degrees in numerous fields, they have created a shortage of persons in engineering. Shortages of engineering faculty have occurred because many potential Ph.D. candidates are taking lucrative positions in industry instead of pursuing the degree.[7]

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4. Betty D. Maxfield and Mary Belisle, Science, Engineering, and Humanities Doctorates in the United States, 1983 Profile (National Research Council, 1985), pp. 37, 76.
5 Ibid., pp. 99-108.
6. Mary Belisle and Betty D. Marfield, Humanists on the Move: Employment Patterns for Humanities Ph.D.s (National Academy Press, 1985).
7. John W. Geils, "The Faculty Shortage: The 1982 Survey," Engineering Education, vol. 74 (October 1983), pp. 47-53.

The prospects for scholarly careers by most accounts appear dim for the next decade. Enrollment of traditional age college students is expected to decline into the mid-1990s before rising and perhaps stimulating demand for faculty. Openings among current faculties due to retirement also will likely not occur in large numbers until the mid-1990s. In anticipation of a shortage of good scholars, however, some universities are already seeking to replace existing faculty.[8]

Adjustment Period

Long periods of adjustment to changing conditions are characteristic of the market for scholars. The process of adjustment is seldom complete before new conditions arise.[9] The four to seven years or more required to prepare a Ph.D. preclude swift response to demand. The preparation time can be reduced, however, by hiring scholars before completion of degrees, which was common in the 1950s and 1960s. The heavy investment in libraries and laboratories and the length of time to accumulate or reduce faculty create additional difficulties in adjusting supply of instruction. Anticipating market conditions for Ph.D.s is, at best, difficult.[10]

Distortions

At least two distortions affect the market for scholars. Both are related to the nature of academia. First, tenure, which protects faculty against threats to academic freedom, also restrains institutions from making swift

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8. Beverly T. Watkins, "Promising Young Scholars Now in Demand for Academic Jobs," The Chronical of Higher Education, September 3, 1986, pp. 1, 48.
9. Allen M. Cartter, Ph.D.s and the Academic Labor Market (McGraw-Hill, 1976); Freeman, The Market for College Trained Manpower, Ch. 7; Robert M. Rosenzweig and Barbara Turlington, The Research Universities and Their Patrons (University of California Press, 1982).
10. Richard Freeman and David W. Breneman, Forecasting the Ph.D. Labor Market: Pitfalls for Policy (The National Board on Graduate Education, 1974).

changes in personnel in the face of changing conditions. Second, collegiality among faculty often extends to some equalization of salaries. This restrains universities from making academic salaries in fields such as engineering competitive with private industry.

Geographic Characteristics

The market for knowledge producers extends internationally, although it often has a strong regional orientation as well. Only highly populous states might sustain an internal market for Ph.D.s. According to data published in 1978, institutions recruited the majority of Ph.D. recipients from outside their regions.[11] However, the largest percentage of degrees awarded, often over 40 percent, went to students from the region where the institution was located. Student attendance, as opposed to institutional recruitment, was more regionally oriented as the majority of recipients did their undergraduate and graduate work at institutions in the same region. After graduation, the majority of Ph.D. recipients obtained employment outside the region where their institution was located, though again a plurality remained in the region. In recent years, the number of foreign students receiving doctorates at American institutions has increased both in absolute numbers and in percent of total recipients, particularly in the sciences and engineering.[12]

Quality

In the national market for Ph.D.s, quality is a major ingredient of institutional success. Rankings of institutional and departmental quality are a

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11. National Research Council, A Century of Doctorates (National Academy of Sciences, 1978), pp. 70-71.
12. Center for Statistics, U.S. Department of Education, Increase in Degrees Earned by Nonresident Aliens, 1976-1983 (USDE, 1986); Higher Education and National Affairs (March 1985), p. 3; and Stephen Kahne, "Does the U.S. Need a National Policy on Foreign Students?", Engineering Education, vol. 74 (October 1983), pp. 54-56.

prominent and controversial part of the academic scene.[13] The chancellor of the University of California at Berkeley has written, "Comparative excellence is fragile and depends primarily on continued excellence of faculty as research scholars and teachers of superior graduate students."[14] Faculty members need good students to conduct research, to provide intellectual stimulation, and to exemplify the quality of preparation by faculty and institution. If the market for Ph.D.s remains depressed, competition for the few good students entering Ph.D. programs would be intense.

Quality, or at least reputation, of institutions and programs is an important attraction to students.[15] Success in preparation and placement often depends on it. The nature of research that a student undertakes, theoretical or practical, broad or narrow, also can determine prospects for employment.[16] If, as anticipated, the market for Ph.D.s continues to be depressed, relatively few talented individuals will seek doctorates. Competition among graduate schools for those persons, therefore, likely will be stiff. Schools or departments that offer the greatest opportunity will be in the best position to attract potential scholars.

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13. Allen M. Cartter, An Assessment of Quality in Graduate Education (American Council on Education, 1966); Mary Jo Clark, "The Meaning of Quality in Graduate and Professional Education," in Katz and Hartnett, eds., Scholars in the Making, pp. 85-89; Kenneth S. Roose and C. J. Anderson, A Rating of Graduate Programs (American Council on Education, 1970); and David S. Webster, "America's Highest Ranked Graduate Schools, 1925-1982," Change, vol. 15 (May-June 1983), pp. 14-24.
14. Ira Michael Heyman, "The Perspective from Berkeley: Preserving a Reputation Excellence," Change, vol. 16 (March 1984), p. 20.
15. Leonard L. Baird, "Who Goes to Graduate School and How They Get There," in Katz and Hartnett, eds., Scholars in the Making, p. 38.
16. A. Bartlett Giamatti, "Free Market, Free Inquiry," p. 61; Hencke and others, "A Program for Student Involvement," pp. 32-34; James C. Seferis and Luther S. Williams, "University and Industry as Partners," in in Pelczar and Solomon, eds., Keeping Graduate Programs Responsive, pp. 101-05.

KNOWLEDGE AND RESEARCH

The market for knowledge directly affects the number of knowledge producers who are prepared and employed. This market is difficult to analyze because it is difficult to gauge. Whereas the numbers of Ph.D.s prepared and employed are measurable, they are, at best, imperfect estimates of the quantity, type, and use of knowledge produced in many diverse fields. Level of funding for research is only an indirect measure of activity because it does not indicate the quantity of knowledge produced. A major complication for this study is the presence of many knowledge providers outside academia in industry, government, and other private entities, not to mention independent contractors and scholars.

Levels of Supply and Demand and Adjustment Period

Levels of supply and demand for knowledge are difficult to estimate. Moreover, the period of adjustment in the market for knowledge varies by the nature of the knowledge and conditions. Many research projects can yield findings in months or even weeks. On the other hand, scientific knowledge may take years to produce because of the time required to create sophisticated equipment, to develop techniques and to conduct experiments. Research in the humanities also may take years. In some cases, achievement of an ultimate goal may require even longer periods if intermediate bodies of knowledge have to be created or if an entire generation of knowledge producers has to be prepared.

Market Distortions

Several distortions affect the market for knowledge. First, frequently no price or measurable value is associated with production of particular knowledge.[17] Without the signals of price, allocation of resources is difficult.

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17. Exceptions would be research leading development of a product or procedure that is patentable and that generates profit for an industry or individual.

Second, frequently there is no direct interchange between the producers and consumers of knowledge that could result in the setting of a price. Knowledge may have use for a long time after and a long distance from where it is produced. Indeed, knowledge might not be usable or appreciated before a long time has passed. Third, artificial stimulation for production of knowledge exists in the pressure on faculty members to "publish or perish." Creation of knowledge, thus, may have at least as much to do with employment conditions as with demand for knowledge.

Geographic Characteristics

The market for knowledge is universal. Anyone, anywhere might be able to use knowledge, sponsor its production, or engage its creation. More limited markets exist in cases where universities work with private industry or governments on particular research projects.

Quality

Quality of knowledge is important for its users. The results of excellent research can readily be incorporated into a body of knowledge and set the stage for further inquiry. Poor research is a bad investment. At best, it is a waste of resources; at worst, it can misdirect the inquiry of others.

FIRST PROFESSIONALS

Until the beginning of the 1980s, growth characterized the market for first professionals in the United States. In the health sciences especially, increased demand for health care services, spurred by government programs and social expectations, led to increases in the number of physicians, dentists, and other professionals. This, in turn, led to the opening of new schools and expansion of existing ones. The absence of overt competition among health care

providers contributed to a market that could absorb without difficulty virtually all newly prepared professionals.

Over the past several years, the situation has changed. Markets for a number of professionals have become saturated, and a glut may occur in the future. Government support for medical services either has stabilized or declined, while overt competition among health care providers has become common. Federal support for education of health professionals also has declined. As a consequence, incomes for new professionals have become less lucrative, and some professions have become less attractive. Similar conditions have arisen in the legal profession.

Levels of Supply and Demand

The number of first professional degrees awarded in the United States nearly doubled between 1971 and 1983, as shown in Table 48. Most of this growth occurred in the 1970s, with a leveling-off in the 1980s. Over this period, the number of degrees conferred in law increased by more than 100 percent, medicine (M.D.s) by 74 percent, veterinary medicine by 65 percent, and dentistry by 49 percent. Accompanying this growth in preparation of first professionals was an increase in the number of professional schools in certain fields, including a 50 percent increase in medical schools, as shown in Table 49. These figures do not take into account expansion of existing schools. Evidence suggests that the market for some first professionals has become saturated. Table 50 shows the significant growth in the number of active practitioners per 100,000 population in dentistry, law, medicine, and veterinary medicine. The number of graduates from U.S medical schools might now surpass the number of residencies available

TABLE 48. FIRST PROFESSIONAL DEGREES CONFERRED IN THE UNITED STATES 1971-72 - 1982-83

Academic Year Ending	Dentistry	Law	Medicine (M.D.)	Veterinary Medicine	Other[1]	Total
1970-71	3,745	17,421	8,919	1,252	6,609	37,946
1971-72	3,862	21,764	9,253	1,247	7,285	43,411
1972-73	4,047	27,205	10,307	1,299	7,160	50,018
1973-74	4,440	29,326	11,356	1,384	7,310	53,816
1974-75	4,809	29,497	12,550	1,415	7,988	56,259
1975-76	5,425	32,293	13,426	1,532	11,973	64,649
1976-77	5,138	34,104	13,461	1,586	10,070	64,359
1977-78	5,189	34,402	14,279	1,635	11,076	66,581
1978-79	5,434	35,206	14,786	1,714	11,708	68,848
1979-80	5,258	35,647	14,902	1,835	12,489	70,131
1980-81	5,460	36,331	15,505	1,922	12,122	71,340
1981-82	5,282	35,591	15,814	2,038	13,307	72,032
1982-83	5,565	36,853	15,484	2,068	13,166	73,136

SOURCE: U.S. Department of Education

[1]Includes chiropractic, optometry, osteopathic medicine, doctor of pharmacy, podiatry, theology, and others.

TABLE 49. NUMBER OF DENTAL, LAW, AND MEDICAL SCHOOLS IN THE UNITED STATES, 1960, 1970 AND 1982

Type of School	1960	1970	1982
Dental	45	48	58
Law	134	145	180
Medical	79	86	119

SOURCE: U.S. Bureau of the Census, Statistical Abstract of the United States, 1986 (U.S. Government Printing Office, 1985), p. 160.

TABLE 50. ACTIVE PRACTITIONERS IN DENTISTRY, LAW, MEDICINE (M.D.), AND VETERINARY MEDICINE IN THE UNITED STATES PER 100,000 POPULATION, SELECTED YEARS, 1970-1982

Profession	1970		1975		1980		1982	
	Number	Number Per 100,000 Population	Number	Number Per 100,000 Population	Number	Number Per 100,000 Population	Number	Number Per 100,000 Population
Dentistry	102,220	49.5	112,020	51.6	126,240	55.2	132,010	56.6
Law	338,430	163.9	-	-	513,623	224.4	-	-
Medicine	310,845	150.0	370,395	156.1	440,357	178.2	448,660[1]	183.3[1]
Veterinary Medicine	25,900	12.5	31,100	14.3	36,000	15.8	38,810	16.7

SOURCE: U.S. Bureau of the Census, Statistical Abstract of the United States, 1986 (U.S. Government Printing Office, 1985), p. 177; and U.S. Department of Health and Human Services, Report to the President and Congress on the Status of Health Personnel in the United States (DHHS, 1984), Vol. 2, pp. B-1-4, B-1-28, B-3-1, B-3-9, B-7-3.

[1]1981 figure.

in the country.[18] Enrollments in dental, medical and veterinary schools have peaked and declined.[19] Federal government projections to the year 2000 show continued increases in the number of health professionals with a surplus of 52,000 physicians and an unspecified number of dentists and veterinarians.[20] Concerns exist about conditions in other professions as well.

Adjustment Period

The period of adjustment in the market for first professionals appears to be primarily a function of preparation time. For lawyers this is three years, while for physicians this may be up to eight years in some specialties. Experience in this century has been limited to expanding or stable markets in which supply has been able to keep pace with measurable demand. Lack of facilities, not lack of student demand for instruction, was the major barrier to the increased supply of professionals. Classes filled as soon as schools opened or expanded. The rapid increase in medical schools suggests that the addition of facilities has not been a barrier requiring considerable time to overcome. The time needed to adjust student positions and facilities during a period of decline is not yet evident.

Market Distortions

Regulation of some professional schools by professional organizations is the major distortion in the marketplace for first professionals. In overseeing quality of preparation, these societies have limited the size of classes in

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18. U.S. Department of Health and Human Services, Report to the President and Congress on the Status of Health Personnel in the United States, 1984 (D.H.H.S., 1985), Vol. 1, pp. A-1-20-21.
19. Ibid., Vol. 1, pp. 7-8 and Vol. 2, pp. A-1-1,, A-1-2, A-3-1, and A-7-1.
20. Physicians include doctors of medicine and doctors of osteopathy. Among veterinarians, the surplus may apply to small animal specialists with a shortage occurring in large animal care. Ibid., Vol. 1, pp. B-7-4 to B-7-7 and Vol. 2, B-1-28, B-3-9, and B-7-4.

professional schools. Limitations on class size effectively restrict the supply of practitioners.

Geographic Characteristics

The geographic extent of the market for instruction and the market for expertise among first professionals is not clear. Some highly reputed schools recruit nationally. If the situation Minnesota is typical, however, the market for instruction at most institutions appears oriented toward states and regions.[21] This would be understandable in view of student propensity to remain fairly close to home. Moreover, states promote this by supporting institutions not only to provide educational access for students, but also to create a pool of practitioners who remain in the state.

Evidence on the extent of the market for expertise is slight. The market for dentists seems to be heavily oriented toward the state and region. A majority of dentists in the United States practice in the state where they attended school.[22] For other first professionals, the picture is less clear. Professional practice tends to be standard across the country, though variations do exist in fields such as law. Nevertheless, practitioners can pursue opportunity wherever it exists. Graduates of medical schools especially may disperse to take residencies or to pursue graduate degrees.

Quality

Quality in first professional education is a major concern of professional organizations.[23] Accreditation by these societies is a virtual necessity for

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21. See discussion of residency in Chapter VI.
22. Johnson and others, "Dental School of Graduation in Relation to Dentist Location," pp. 70-84.
23. Clark, "The Meaning of Quality," pp. 89-90.

continued operation of schools in the United States. The accreditation process sets minimum standards of quality in education and, in some cases, equalizes education across institutions. Quality becomes a more important factor in post-graduate education and research. In a manner similar to the preparation of knowledge producers, demonstrated performance is a major criterion in the recruitment of students by institutions and the selection of institutions by students.

Quality of students enrolled in professional schools is a matter of growing concern. The fear is that a declining number of traditional college-age students combined with prospects for lower earnings will reduce the pool of applicants. In response, schools might relax admissions standards in order to fill classes. Some observers believe such a trend already may have begun at some professional schools.[24]

Admission of academically less qualified students could have several consequences. Without a corresponding relaxation of standards after admission, higher failure rates among professional students would be likely. To avoid higher rates of failure and to maintain enrollment, schools would have two options. At extra financial cost, schools could provide additional instruction to remedy academic deficiencies. Alternatively, schools could relax their standards, ultimately resulting in graduation of less qualified professionals.

GRADUATE PROFESSIONALS

In terms of degrees conferred, graduate professional education is the largest sector of advanced study. It is also diverse and difficult to delineate. Most data on degrees conferred make distinctions based on level of

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24. Evangeline L. Hebbeler, Dental Education and the Supply of Dentists: Policy Issues of the Eighties (Southern Regional Education Board, 1984), pp. 8-10; and U.S. Department of Health and Human Services, Status of Health Care Personnel, 1984, Vol. 1, p. A-3-1 and Vol. 2, p. A-3-1.

degree and field, not purpose. Distinguishing degrees for graduate professionals from degrees for knowledge producers and even some first professionals often is not possible. Consequently, the characteristics of the market for graduate professionals are somewhat vague.

Levels of Supply and Demand

American colleges and universities awarded about 290,000 master's degrees in 1982-83, as shown in Table 51. The figure is higher than the 263,400 awarded in 1972-73 but lower than the 317,100 awarded in 1976-77. Fields with significant increases were agriculture and forestry, business, engineering, health sciences, psychology, and public affairs. Significant decreases occurred in humanities, library science, and social sciences. Conferred master's degrees in education increased in the mid-1970s, followed by a sharp decrease. The decline in education degrees may account for much of the overall decrease in master's degrees.

Demand for graduate professionals is not easy to gauge. Whereas demand for Ph.D.s is closely related to the market for college faculty, demand for persons with master's degrees is much more diffuse. Moreover, many persons obtain master's degrees not to enter new careers but to advance within existing careers such as in education, business, and government. Detailed studies by field would be necessary for a better understanding of market forces.

Adjustment Period

The adjustment period for graduate professional education generally appears to be short. Programs at the master's level take one to two years of full-time study to complete, in contrast to longer periods of preparation for Ph.D.s and first professionals. Less intensive use of faculty and facilities reduces the resources required to offer programs. Therefore, accumulating resources to

TABLE 51. MASTER'S DEGREES CONFERRED BY BROAD FIELDS AND IN TOTAL IN THE UNITED STATES, 1972-73, 1976-77, AND 1982-83

	1972-73	1976-77	1982-83
Agriculture and Forestry[1]	2,376	3,231	3,662
Business	31,007	46,420	65,319
Education	105,565	126,825	84,853
Engineering	16,619	16,245	19,350
Health Sciences	7,879	12,323	17,068
Humanities	19,093	16,773	13,399
Library Science	7,696	7,572	3,979
Life Sciences	6,263	7,114	5,696
Mathematics and Computer Science	7,141	6,493	8,158
Physical Sciences	5,257	5,331	5,290
Psychology	5,831	8,301	8,378
Public Affairs	10,899	17,917	16,243
Social Sciences[1]	17,719	15,888	11,710
Visual and Performing Arts	7,254	8,636	8,742
Other	12,772	18,095	18,074
TOTAL	263,371	317,164	289,921

SOURCE: U.S. Department of Education.

[1]Agricultural economics included in social sciences.

start or expand programs may take a fairly short time. Often colleges and universities can use or build on existing staff and facilities. Exceptions can occur when personnel or equipment in specific fields are scarce.

Market Distortions

Few structural distortions appear to exist in the market for graduate professional education. Over the past two decades, master's programs have proliferated in response to demand. Some distortion may occur if salary schedules place premiums on possession of a master's degree, thereby inducing demand for instruction.

Geographic Characteristics

Many graduate professional programs recruit and place students nationally. Evidence suggests, however, that the market for graduate professional instruction is heavily oriented toward statewide and local markets. The case of science and engineering students may be illustrative. At institutions offering degrees no higher than the master's, part-time graduate enrollment in science, including the social sciences, and engineering programs was greater than full-time enrollment. Greater part-time enrollment also was more characteristic of institutions located in metropolitan areas than institutions located elsewhere.[25] The prevalence of part-time enrollments indicates that many students focusing on the master's degree already are employed in local labor markets. Teachers employed while working toward a master's degree are another large group of graduate professional tied to a state and local market.

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25. National Science Foundation, Academic Science/Engineering Graduate Enrollment at Support, Fall 1983 (NSF, 1985), pp. 179-85, 207-12.

Quality

Quality of education is important for graduate professionals, as it is for knowledge producers and first professionals. The existence of distinguished programs that recruit and place students nationally attests to the attractiveness of excellence. Many students, however, attend institutions that primarily serve local or regional clienteles. Proximity in these cases might be as important as quality in choice of institutions. Similarly, some employers might be inclined to hire local candidates for positions rather than incur the expense of national recruitment.

CONTINUING EDUCATION

Continuing education comprises the most amorphous sector of graduate and professional education. Some of it is structured, and some is rather loosely organized. Some involves self-standing programs, while some may be part of regular degree programs. Above all, some education occurs under the auspices of a higher education institution, but much occurs through providers outside higher education.

The market for continuing education is large, growing, and competitive. Through self-motivation, inducements from employers, and government mandates, hundreds of thousands of persons annually engage in continuing education, costing billions of dollars. Some observers see the provision of continuing education as a means for professional schools to generate revenue.[26]

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26. Houle, Continuing Learning in the Professions, pp. 14-18; and Milton R. Stern, "Universities in Continuing Education," in Harold J. Alford, ed., Power and Conflict in Continuing Education: Survival and Prosperity for All? (Wadsworth Publishing Company, 1983), p. 12.

Levels of Supply and Demand

Analyzing the nature and size of the market for continuing education at the graduate and professional level requires resources beyond the capacity of this study.

Adjustment Period

Adjustment periods in continuing education are quite short in most cases. Programs typically are brief, lasting a few weeks, days, or hours. Great flexibility in or absence of curricular guidelines reduces difficulty in establishing programs. Continuing education, moreover, is mobile. Except when laboratory or other facilities are necessary, programs can be organized and offered virtually anywhere without awaiting construction of new facilities.

Market Distortions

Statutory mandates create a large structural distortion in the market for continuing education. Most states require continuing education in at least one first professional field.[27] Other sources of distortion are salary and promotion practices of employers that may place emphasis on receipt of a credential rather than increase in skills. These requirements compel participation by professionals, regardless of their own inclinations, in order to retain their license to practice.

Mandated continuing education itself is a response to perceived market failure. Continuing education is intended to enable practitioners to keep current on their respective professions or at least to stimulate their professional instincts. The result improves their practice for the benefit of clients

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27. Scott Joschik, "More States Are Requiring Professionals to Take Continuing-Education Courses," The Chronicle of Higher Education, May 21, 1986, pp. 13, 16.

and the public in general. Without direct signals from clients, professionals may not engage in professional development on their own. The state, therefore, intervenes as a substitute for the market mechanism. Whether or not mandatory continuing education actually improves practice is a matter of controversy.[28]

Geographic Characteristics

The market for continuing education exists everywhere. Participants range from teachers in rural school districts to corporate officials in the headquarters of multinational firms. Providers operate locally and nationally to serve wide-ranging needs of participants.

Quality

No common standard of quality exists as each consumer and professional organization determines what constitutes acceptable education.

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28. See, for example, Daniel M. Baer, "Stop the Continuing Education Bandwagon, I Want to Get Off to Take a Side Trip," Journal of the American Medical Association, vol. 237 (June 6, 1977), pp. 2518-19; Burt A. Leete and Stephen E. Loeb, "Continuing Legal Education--Should It Be Compulsory?," Journal of Legal Education, vol. 27 (1975), pp. 110-15; Werner Lowenthal "Continuing Education for Professionals--Voluntary or Mandatory?," The Journal of Higher Education, vol. 152 (September-October 1981), pp. 519-38; Benjamin S. Shimberg, "Continuing Education and Licensing," in D. W. Vermilye, ed., Current Issues in Education: Relating Work and Education (Jossey-Bass, 1977), pp. 154-66; and Isidore Teich, "Mandatory Continuing Education from the Viewpoint of Organized Dentistry," New York State Dental Journal, vol. 37 (October 1971), pp. 469-71.

CHAPTER IX. CONCLUSIONS

While issues directly related to the financing of graduate and professional education in Minnesota emerge from this study, other issues have become apparent. Some of these others, which are briefly sketched, could be the subjects of future studies.

GENERAL FINANCING ISSUES AND ALTERNATIVES

As an alternative to the unrestricted financing of institutions, the state could treat graduate and professional education differently from undergraduate education. Funding levels for graduate and professional instruction could be dedicated to specific levels of instruction. Further, funding for advanced instruction could be determined in a different manner from undergraduate instruction. This could reduce the stress on institutions in allocating resources to high cost, low enrollment programs at the expense of other activities. In addition, the expectation that tuition revenue cover one-third of instructional costs could be modified to reduce the financial requirements for graduate and professional students. Benefits from such changes could be more stable funding for advanced instruction and lower tuition rates for graduate and professional students.

Such changes in institutional funding policies, however, could have several negative consequences. First, erosion of autonomy through restrictions on the use of funds could limit institutional responsiveness. Institutions and their governing boards now have the autonomy to allocate funds in response to demand for instruction and other services. Second, while graduate and professional education are distinct from undergraduate education, separation is difficult for

both academic, staffing, and budgetary purposes. Unrestricted, general support enables institutions to maintain integration of the educational enterprise. With regard to tuition, authority to set tuition rates rests with the governing boards as part of their autonomy. Beyond this, total costs of attendance, market conditions, and program quality facing potential graduate and professional students appear to be more important factors affecting student decisions than tuition alone.

Expansion of program financing for graduate and professional education is another avenue that the state could pursue. State financing of specific programs can be valuable when its use is limited to clearly defined objectives in response to identified circumstances. Program financing enables the state to establish and pursue specific priorities. Through mechanisms such as direct grants, contracting, and funding to sustain programs with low or controlled enrollments, the state can promote activities that educational institutions would not likely undertake by themselves.

Program financing has potential drawbacks that may temper decisions to use it extensively. It can become a form of state intervention to force or induce institutions to engage in activities that are not in their broader interests or missions. Without clearly defined purpose, it can lead to misdirected resources or unwelcome results. Program funding is subject to manipulation by institutions to attract special support for highly visible programs, thereby releasing general funds for other activities. Program financing also is risky for an institution because restricted state funding can be highly volatile in the short term. It lacks the long-term reliability and commitment essential for building and sustaining quality.

A major change in state policy would be the establishment of state-funded fellowships and other grants for graduate and professional students. Merit-

based grants could attract highly qualified individuals to specific programs or institutions. State grants could be effective in providing direct, immediate incentives for individuals to pursue specific areas of study that serve the state's interests or to attend certain institutions. Institutions and other providers use fellowships and other grants to meet their own goals as well as to help students. Grants could be an incentive to overcome unfavorable, short-term market conditions where uncertain prospects for income make advanced study unattractive to students. These uncertainties would be magnified in fields with long preparation and high costs. Considering these factors, state grants may be an appropriate means of supporting graduate and professional students.

Need-based grants, similar to those available to undergraduates, could reduce financial barriers to further studies. Such grants, however, would help the neediest individuals, not necessarily the most talented. Provision of a need-based program would be expensive. It also would require the development of new criteria to determine need due to different requirements and lifestyles of older individuals.

For students who must borrow money, the possibility of accumulating a large debt may be a deterrent to pursuing advanced studies. Reliance on loans for graduate and professional students involves the risk that advanced study will enhance the earning power to individuals, thereby enabling them to pay debts incurred for their education. The state could help overcome this risk through creative financing programs. An income contingent loan repayment program already operating in Minnesota enables graduates of some professional programs in the state to restructure their debt, if their ability to repay is limited. As experience from this financing method is gained, consideration could be given to expanding the program to students in other fields. At the same time, other creative financing methods could be explored.

SPECIFIC FINANCING ISSUES AND ALTERNATIVES

Maintaining sufficient enrollment of talented Ph.D. candidates in Minnesota is one of two specific issues related to state financing policies. Institutions in Minnesota compete nationally for outstanding students who can generate knowledge to increase the productivity of state industries. A single state may have little effect on national market conditions. Minnesota, however, can enhance the competitiveness of its institutions by means such as improving the quality of the faculty, reducing tuition, and providing grants to recruit students. The first is underway through the appropriation of funds for the retention and recruitment of outstanding faculty at the University of Minnesota. Reduction in tuition may not be effective because tuition is only a portion of a student's cost of attendance and because reduced tuition would be applied generally rather than targeted to talented individuals. Grants, on the other hand, could be targeted.

Projected surpluses of practitioners in some first professional fields such as dentistry is the second issue. If these projections result in fewer qualified applicants to professional schools, institutions could face a dilemma. Without additional financial support, they could seek to maintain enrollments by reducing academic standards and quality in professional programs. Alternatively, they could sustain professional programs by siphoning resources from other units, thereby diminishing quality elsewhere. State action either to reduce tuition or to provide grants may not be able to attract able students under unfavorable market conditions. The local orientation of Minnesota's professional schools, moreover, may make national recruitment difficult. More than two-thirds of professional students in Minnesota are state residents. One remaining option would be for the state to provide special funding to sustain

professional programs whose enrollments fall below the critical mass necessary for generating adequate financial support.

NON-FINANCING ISSUES

Roles of post-secondary institutions in graduate and professional education are dynamic. Historically, graduate and professional education in Minnesota was centered at the University of Minnesota-Twin Cities. The state universities, which have expanded the scope of their graduate programs over the past few decades, have limited their offerings to the master's level, though a desire to proceed to the doctorate level surfaced. The private institutions also have moved aggressively into graduate and professional education. Recent efforts have been made to differentiate the missions of the state's post-secondary education systems in graduate and professional education. Further reassessments likely will occur as circumstances change.

In addition to institutional roles within Minnesota, the issue of graduate and professional education in the national context also deserves consideration. Important elements of advanced study and related research activities have a pronounced national character, significantly so at the doctoral level and less so on the master's level. Factors involved are accessibility of programs, market demand, the degree of specialization within disciplines, and the ability of individual states to maintain self-contained markets for expertise. States and regions, however, tend to complement each other, as highly qualified experts tend to be geographically mobile. The pertinent question is whether state government should plan Minnesota's "fair share" in producing expertise for the nation or limit its consideration solely to state needs while leaving national considerations to institutions.

Despite a wide range of programs and substantial enrollments, advanced degrees conferred in Minnesota are not in balance nationally. While Minnesota had 1.8 percent of the population of the United States in 1982-83, its output in master's degrees was 1.2 percent, in doctorates 1.5 percent, and in professional degrees 2.2 percent. Trends between 1973 and 1983 provide yet another perspective. Master's degrees conferred in Minnesota increased 28 percent in contrast to 10 percent nationally. First professional degrees conferred increased 84 percent in Minnesota, in contrast to 46 percent nationally. However, while Ph.D.s conferred declined 5 percent nationally, they declined 13 percent in Minnesota. These statistics could lead to different conclusions: that Minnesota is a net importer of graduate but not of professional expertise, that Minnesota residents have inadequate access to graduate education, or that Minnesotans find more favorable education opportunities out of state.

APPENDIX. ADVANCED DEGREE PROGRAMS IN MINNESOTA

Data in this appendix were compiled from institutional catalogs and brochures and from data at the Minnesota Higher Education Coordinating Board (see sources at end of appendix). Program changes may have occurred since these sources were published.

UNIVERSITY OF MINNESOTA

University of Minnesota-Duluth

Master's Degrees

M.A. Master of Arts

- Art
- Communicative Disorders
- Education
- Educational Psychology
- English

M.S. Master of Science

- Biology
- Computer Science
- Chemistry
- Geology
- Physics

M.B.A. Master of Business Administration

M.Ed. Master of Education

M.I.S. Master of Industrial Safety

M.S.W. Master of Social Work

University of Minnesota-Twin Cities

Master's Degrees

M.A. Master of Arts

- Agricultural Education
- American Legal Institutions
- American Studies
- Ancient Studies
- Anthropology

Arabic
Art Education
Art History
Botany
Business Education
Child Psychology
Chinese
Classical Area Studies
Classics
Communication Disorders
Comparative Literature
Economics
Education
Educational Administration
Educational Psychology
Elementary Education
English
English as a Second Language
Family Social Science
Feminist Studies
French
French and Italian
Geography
German
Germanic Philology
Greek
Hispanic Linguistics
Hispanic Literature
History
History of Medicine and the Biological Sciences
History of Science and Technology
Home Economics
Home Economics Education
Industrial Education
Industrial Relations
Italian
Japanese
Latin
Library Science
Linguistics
Luso-Brazilian Literature
Marketing Education
Mass Communication
Mathematics
Mathematics Education
Museology
Music
Music Education
Philosophy
Physical Education
Political Science
Psychology
Public Affairs
Recreation, Park, and Leisure Studies

Religious Studies
Russian Area Studies
Scandinavian
Social and Philosophical Foundations of Education
Sociology
South Asian Languages
Speech-Communication
Theatre Arts

M.S. Master of Science

Agricultural and Applied Economics
Agronomy
Anatomy
Ancient Studies
Anesthesiology
Animal Physiology
Animal Science
Astronomy
Biochemistry
Biology
Biometry and Health Information Systems
Biophysical Sciences
Botany
Cell and Developmental Biology
Chemistry
Clinical Laboratory Science
Computer and Information Sciences
Dentistry
Dermatology
Ecology
Entomology
Environmental Health
Epidemiology
Family Planning Administration
Family Practice and Community Health
Fisheries
Fluid Mechanics
Food Science
Forestry
Genetics
Geo-Engineering
Geology
Geophysics
Home Economics
Horticulture
Hospital Pharmacy
Laboratory Medicine
Mathematics
Mechanics
Medical Microbiology
Medical Technology
Medicinal Chemistry
Metallurgy and Materials Science

Microbiology
Mineral Engineering
Neurology
Neurosurgery
Nursing
Nutrition
Obstetrics and Gynecology
Ophthalmology
Oral Biology
Orthopedic Surgery
Otolaryngology
Pediatrics
Pharmaceutics
Pharmacognosy
Pharmacology
Physical Medicine and Rehabilitation
Physical Therapy
Physics
Physiological Hygiene
Physiology
Plant Breeding
Plant Pathology
Plant Physiology
Public Health
Radiology
Social and Administrative Pharmacy
Soil Science
Statistics
Technical Communication
Theriogenology
Urology
Veterinary Anatomy
Veterinary Medicine
Veterinary Microbiology
Veterinary Parasitology
Veterinary Pathology
Veterinary Physiology and Pharmacology
Veterinary Surgery, Radiology, and Anesthesiology
Wildlife
Zoology

M.A. Master of Arts in English (Continuing Education and Extension)

M.Aero.E. Master of Aerospace Engineering

M.Ag. Master of Agriculture in Food Technology (Continuing Education and Extension)

M.Ag.E. Master of Agricultural Engineering

M.Arch. Master of Architecture

M.B.A. Master of Business Administration

M.B.T. Master of Business Taxation

M.C.E. Master of Civil Engineering

M.Ch.E. Master of Chemical Engineering

M.E.E. Master of Electrical Engineering

M.Ed. Master of Education

- Adult Education
- Agricultural Education
- Art Education
- Business Education
- Developmental/Adapted Physical Education
- Early Childhood Education
- Elementary Education
- English
- Home Economics Education
- Industrial Education
- Marketing Education
- Mathematics Education
- Music Education
- Physical Education
- Recreation, Park, and Leisure Studies
- Special Education
- Vocational Education

M.F. Master of Forestry

M.F.A. Master of Fine Arts

- Music
- Studio Arts
- Theatre Arts

M.Geo.E. Master of Geo-Engineering

M.Geo.T. Master of Geotechnology

M.I.E. Master of Industrial Engineering

M.L.A. Master of Landscape Architecture

M.M. Master of Music

M.M.E. Master of Mechanical Engineering

M.Met.Mat.S. Master of Metallurgy and Materials Science

M.Min.E. Master of Mineral Engineering

M.P. Master of Planning in Public Affairs

M.S.Aero.E. Master of Science in Aerospace Engineering

M.S.Ag.E. Master of Science in Agricultural Engineering

M.S.Anes. Master of Science in Anesthesiology

M.S.C.E. Master of Science in Civil Engineering

M.S.Ch.E. Master of Science in Chemical Engineering

M.S.Derm. Master of Science in Dermatology

M.S.E.E. Master of Science in Electrical Engineering

M.S.Exp.Surg. Master of Science in Experimental Surgery

M.S.Geo.E. Master of Science in Geo-Engineering

M.S.I.E. Master of Science in Industrial Engineering

M.S.M.E. Master of Science in Mechanical Engineering

M.S.Met.Mat.S. Master of Science in Metallurgy and Materials Science

M.S.Min.E. Master of Science in Mineral Engineering

M.S.Neur. Master of Science in Neurology

M.S.Nsurg. Master of Science in Neurosurgery

M.S.Obs.&Gyn. Master of Science in Obstetrics and Gynecology

M.S.Ophthal. Master of Science in Ophthalmology

M.S.Orth.Surg. Master of Science in Orthopedic Surgery

M.S.Otol. Master of Science in Otolaryngology

M.S.P.M.&Rehab. Master of Science in Physical Medicine and Rehabilitation

M.S.Ped. Master of Science in Pediatrics

M.S.Psychiat. Master of Science in Psychiatry

M.S.Rad. Master of Science in Radiology

M.S.Surg. Master of Science in Surgery

M.S.Ther.Rad. Master of Science in Therapeutic Radiology

M.S.Urol. Master of Science in Urology

M.S.W. Master of Social Work

Doctoral Degrees

Ph.D. Doctor of Philosophy

Aerospace Engineering
Agricultural and Applied Economics
Agricultural Engineering
Agronomy
American Studies
Anatomy
Ancient Studies
Animal Physiology
Animal Science
Anthropology
Art History
Astrophysics
Biochemistry
Biology
Biomedical Engineering
Biometry and Health Information Systems
Biophysical Sciences
Botany
Business Administration
Cell and Developmental Biology
Chemical Engineering
Chemical Physics
Chemistry
Child Psychology
Chinese
Civil Engineering
Classical Area Studies
Classics
Communication Disorders
Comparative Literature
Computer and Information Science
Control Science and Dynamical Systems
Ecology
Economics
Education
Educational Administration
Educational Psychology
Electrical Engineering
English
Entomology
Environmental Health
Epidemiology
Family Social Science
Feminist Studies
Fisheries
Fluid Mechanics
Food Science
Forestry
French
Genetics

Geo-Engineering
Geography
Geology
Geophysics
German
Germanic Philology
Greek
Hispanic and Luso-Brazilian Literatures
History
History of Medicine and Biological Sciences
History of Science and Technology
Home Economics
Horticulture
Hospital and Health Care Administration
Industrial Engineering
Industrial Relations
Japanese
Latin
Library Science
Linguistics
Mass Communication
Mathematics
Mechanical Engineering
Mechanics
Medicinal Chemistry
Metallurgy and Materials Science
Microbiology
Mineral Engineering
Music
Neuroscience
Nursing
Nutrition
Oral Biology
Pathobiology
Pharmaceutics
Pharmacognosy
Pharmacology
Philosophy
Physical Education
Physics
Physiological Hygiene
Physiology
Plant Breeding
Plant Pathology
Plant Physiology
Political Science
Psychology
Scandinavian
Social and Administrative Pharmacy
Social Work
Sociology
Soil Science
South Asian Languages
Speech-Communication

Statistics
Theatre Arts
Theriogenology
Veterinary Anatomy
Veterinary Medicine
Veterinary Microbiology
Veterinary Parasitology
Veterinary Pathology
Veterinary Physiology and Pharmacology
Veterinary Surgery, Radiology and Anesthesiology
Vocational Education
Wildlife
Zoology

D.M.A. Doctor of Musical Arts

Ed.D. Doctor of Education

Educational Administration
Industrial Education
Vocational Education

Ph.D.Neur. Doctor of Philosophy in Neurology

Ph.D.Nsurg. Doctor of Philosophy in Neurosurgery

Ph.D.Otol. Doctor of Philosophy in Otolaryngology

Ph.D.P.M.&Rehab. Doctor of Philosophy in Physical Medicine and Rehabilitation

Ph.D.Surg. Doctor of Philosophy in Surgery

First Professional Degrees

D.D S. Doctor of Dental Surgery

D.V.M. Doctor of Veterinary Medicine

J.D. Juris Doctor

M.D Medical Doctor

Pharm.D. Doctor of Pharmacy

Specialist Degrees

Certificate of Specialist in Education

Counseling
Elementary School Administration
General Educational Administration
Intermediate Unit in Educational Administration
Mathematics Education

School Business Administration
School Psychological Services
Secondary School Administration
Special Education

Certificate of Specialist in Library Science

STATE UNIVERSITIES

Bemidji State University

Master's Degrees

M.A. Master of Arts

Biology
English
Environmental Studies

M.S. Master of Science

Elementary School Administration
Elementary Teaching
Secondary Education: Business Education
Chemistry
Computer Science
English
Industrial Education
Mathematics
Music
Physical Education
Science
Social Science
Special Education

Mankato State University

Master's Degrees

M.A. Master of Arts

Art
Biology
Chemistry
Economics
English
Environmental Studies
Geography
History
Mathematics
Physical Education
Physics

Political Science
Psychology
Public Administration
Sociology
Speech Communication
Theatre Arts
Urban and Regional Studies
Women's Studies

M.S. Master of Science

Art
Biology
Business Education
Chemistry
Communication Disorders
Counseling and Student Personnel
Curriculum and Instruction
Educational Administration
Elementary Education
English
Experiential Education
Geography
German
Health Science
History
Home Economics
Industrial Technical Studies
Library Media Education
[illegible]hematics
[illegible] Education
[illegible]cs
Political Science
Reading
Rehabilitation Counseling and Technology in Education
Science
Social Studies
Sociology
Spanish
Special Education
Speech Communication
Theatre Arts

M.S. Master of Science in Continuing Studies

Community Education
Gerontology
Women's Studies

M.A T. Master of Arts in Teaching

M.B.A. Master of Business Administration

M.F.A. Master of Fine Arts

Theatre

M.M. Master of Music

Specialist Degree

Specialist Degree in Education

Curriculum and Instruction
Curriculum and Instruction: Physical Education
Educational Administration
Library Media

Metropolitan State University

Master's Degree

M.M.A. Master of Management and Administration

Moorhead State University

Master's Degrees

M.S. Master of Science

Art Education
Business Education
Chemistry Education
Computer Science
Counseling and Human Development
Educational Theatre
Elementary Education
Music Education
Reading
Special Education
School Psychology
Speech-Language Pathology and Audiology

M.B.A. Master of Business Administration

M.L.A. Master of Liberal Arts

Specialist Degree

Specialist Degree in School Psychology

St. Cloud State University

Master's Degrees

M.A. Master of Arts

- Art
- Biology
- English
- History
- Mathematics

M.S. Master of Science

- Community Counseling
- Consultants-Directors-Supervisors of Information Media
- Criminal Justice
- Curriculum and Instruction
- Early Childhood and Family Studies
- Educational Administration
- Elementary School Teaching
- Exercise Physiology
- Psychology
- Rehabilitation Counseling
- Secondary School Counseling
- Secondary School Teaching:
  - Art
  - Biology
  - Business Education
  - English
  - Geography
  - History
  - Industrial Education
  - Mathematics
  - Music
  - Physical Education
  - Social Science
- Special Education
- Speech and Hearing Therapy

Specialist Degree

Certificate of Specialist in Education

- Information Media
- Elementary School Administration
- Secondary School Administration
- General School Administration
- Special Education Administration

Winona State University

Master's Degrees

M.A. Master of Arts

English

M.S. Master of Science

Business Education and Office Administration
Counselor Education
Educational Administration
Elementary Education
English
Health Education
History
Nursing
Physical Education

M.B.A. Master of Business Administration

Specialist Degree

Specialist Degree in Educational Administration

PRIVATE INSTITUTIONS

Augsburg College

Master's Degrees

M.A. Master of Arts

Leadership

Bethel Theological Seminary

Master's Degrees

M.A. Master of Arts

Christian Education
Theological Studies

Th.M. Master of Theology

Doctoral Degree

Doctor of Ministry

First Professional Degree

M.Div. Master of Divinity

College of St. Catherine

Master's Degrees

M.A. Master of Arts

Organizational Leadership
Theology

College of St. Scholastica

Master's Degrees

M.A. Master of Arts

Nursing
Psychology of Aging

M.Ed. Master of Education

Individualized Instruction

College of St. Thomas

Master's Degrees

M.A. Master of Arts

Athletic Administration
Community Education
Counseling Psychology
Curriculum and Instruction
Development/Adapter Physical Education
Developmental and Remedial Reading
Elementary School Administration
General School Administration
Gifted, Creative, and Talented Education
Learning and Human Development Technology
Pastoral tudies
Private School Administration
School Business Officer
Secondary School Administration
Secondary School Education
Special Learning Difficulties

M.B.A. Master of Business Administration

M.B.C. Master of Business Communication

Master's in Software Design and Development

Master's in Manufacturing Systems Engineering

Specialist Degree

Specialist Degree in Education

Community Education
Elementary School Administration
General Administration
Private School Administration
Secondary School Administration

Hamline University

Master's Degrees

M.A.. Master of Arts

Liberal Studies
Public Administration

First Professional Degree

J.D. Juris Doctor

Kotz Graduate School of Management

Master's Degree

M.B.A. Master of Business Administration

Luther Northwestern Theological Seminary

Master's Degrees

M.A. Master of Arts

Church History
New Testament
Old Testament
Pastoral Theology and Ministry
Systematic Theology
Youth Ministry

M.Th. Master of Theology

Doctoral Degree

D.Min. Doctor of Ministry

First Professional Degree

M.Div. Master of Divinity

Mayo Graduate School of Medicine

Master's Degree

M.S. Master of Science

Cell Biology
Dentistry
Dermatology
Immunology
Neurologic Surgery
Neurology
Ophthalmology
Orthopedics
Otorhinolaryngology
Pediatric Cardiology
Pharmacology
Physical Medicine and Rehabilitation
Physiology
Psychiatry

Doctoral Degree

Ph.D. Doctor of Philosophy

Biophysical Sciences Biomedical Imaging Track
Cell Biology
Immunology
Pharmacology
Physiology

Mayo Medical School

First Professional Degree

M.D. Doctor of Medicine

Northwestern College of Chiropractic

First Professional Degree

Doctor of Chiropractic

St. John's University

Master's Degrees

M.A. Master of Arts

Liturgical Studies
Religious Education
Theology

First Professional Degree

M.Div. Master of Divinity

St. Mary's College

Master's Degrees

M.A. Master of Arts

Counseling and Psychological Services
Education
Educational Administration
Human and Health Services
Human Development

M.S. Master of Science

Biology
Nurse Anesthesia

M.A.T. Master of Arts in Teaching

St. Paul Seminary

Master's Degree

M.A. Master of Arts

Theology

First Professional Degree

M.Div. Master of Divinity

United Theological Seminary

Master's Degree

M.A.R.S. Master of Arts in Religious Studies

Doctoral Degree

D.Min. Doctor of Ministry

First Professional Degree

M.Div. Master of Divinity

Walden University

Doctoral Degrees

Ph.D. Doctor of Philosophy

Administration/Management
Education
Health Services
Human Services

Ed.D. Doctor of Education

William Mitchell College of Law

Master's Degree

L.L.M. Master's of Laws in Taxation

First Professional Degree

J.D. Juris Doctor

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