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Study of College Costs and Prices, 1988–89 to 1997–98

Volume 1

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Executive Summary

In the 1998 Amendments to the Higher Education Act (HEA), Congress directed the National Center for Education Statistics (NCES) to conduct a new study of higher education costs (expenditures)[1] paid by institutions and prices paid by students and their families. This report is the final product of Phase I of the study, which relied primarily on existing national data and statistical models.

The framework for the study was influenced by the findings of the National Commission on the Cost of Higher Education, published in *Straight Talk About College Costs and Prices* (1998). This study is one follow-up to the Commission's recommendations.

Congress directed that the study address a number of specific questions:

- How have tuition and fees changed over time compared with inflation?
- How have the major expenditure categories (including capital and technology costs) changed over time?
- How are expenditures related to prices?
- To what extent does institutional aid (i.e., financial aid provided by institutions) affect tuition increases?
- To what extent has federal financial aid been used to offset increases in institutional aid?

[1]In this report, the terms "costs" and "expenditures" are used interchangeably to mean the amount institutions spend to provide education and related educational services to students.

Goals and Limitations of the Study

Phase I had two major goals: (1) to address the questions raised by Congress (listed above) insofar as possible given currently available information; and 2) to examine the usefulness of existing statistical models for testing the relationships among revenues, costs, and prices in higher education.

The study is limited in its ability to provide specific answers to many of Congress' questions for several different reasons, not all of which could be changed in future research. The use of existing data, models, and institutional classification schemes restricted the ability to focus on certain aspects of costs and prices. For instance, institutional differences in types of students served and in program and discipline mix make it difficult for classification schemes to allow generalization across institutions. As a result, the comparison groups are formed of institutions that may not be truly comparable.

In addition, currently available national data are not sufficient to address many questions, reflecting the fact that institutions often do not collect the data required to answer questions about the relationships among prices, revenues, and expenditures. These data concerns are further complicated by several factors, including the absence of consistent definitions for terms such as technology, tuition discounting, and merit aid; the lack of uniformity in defining capital costs; and the lack of consistent institutional accounting conventions. There are differences between the ac-

counting standards used for public and private not-for-profit institutions, which are particularly relevant to the measurement of capital costs. Public and private not-for-profit institutions are subject, respectively, to standards from the Government Accounting Standards Board (GASB) and the Financial Accounting Standards Board (FASB). Recent changes to both sets of standards may improve the data collected by NCES, but it will take several years until all changes are implemented at the institutional level.

Despite these limitations, currently available national data can be used to describe and analyze aggregate trends in costs, prices, and revenues for groups of institutions, as well as to examine the strength of various relationships among these factors. Such analyses can improve and expand upon previous national studies and address some of the issues raised by Congress in the 1998 HEA Amendments.

Study Design and Methodology

Using primarily data from the Integrated Postsecondary Education Data System (IPEDS), this study analyzes trends in costs, prices, and revenues at postsecondary institutions from 1988–89 to 1995–96 (to 1997–98 for public institutions) and explores relationships among the variables. The analyses of relationships use existing statistical models, updated and extended over a longer period of time than in previous studies. All financial data were adjusted for inflation to constant 1999 dollars using the Consumer Price Index.[2] A different model was used for the public sector than for the private not-for-profit sector because research has consistently documented that there are fundamental differences in the financing structures, enrollment markets, and tuition decisionmaking processes between the sectors.

The study also examines relationships between tuition and financial aid variables. Because neither of the two existing models includes financial aid (except institutional aid) among the independent variables, new models were developed to analyze these relationships. In addition to using data from IPEDS, the analyses use data from the Institutional Prices and Student Financial Aid Survey (IPSFA), a new survey that captures information on both tuition and financial aid. At the time of this report, financial aid data from this survey were only available for one year, so an examination of changes over time to allow trends to be identified was not possible.

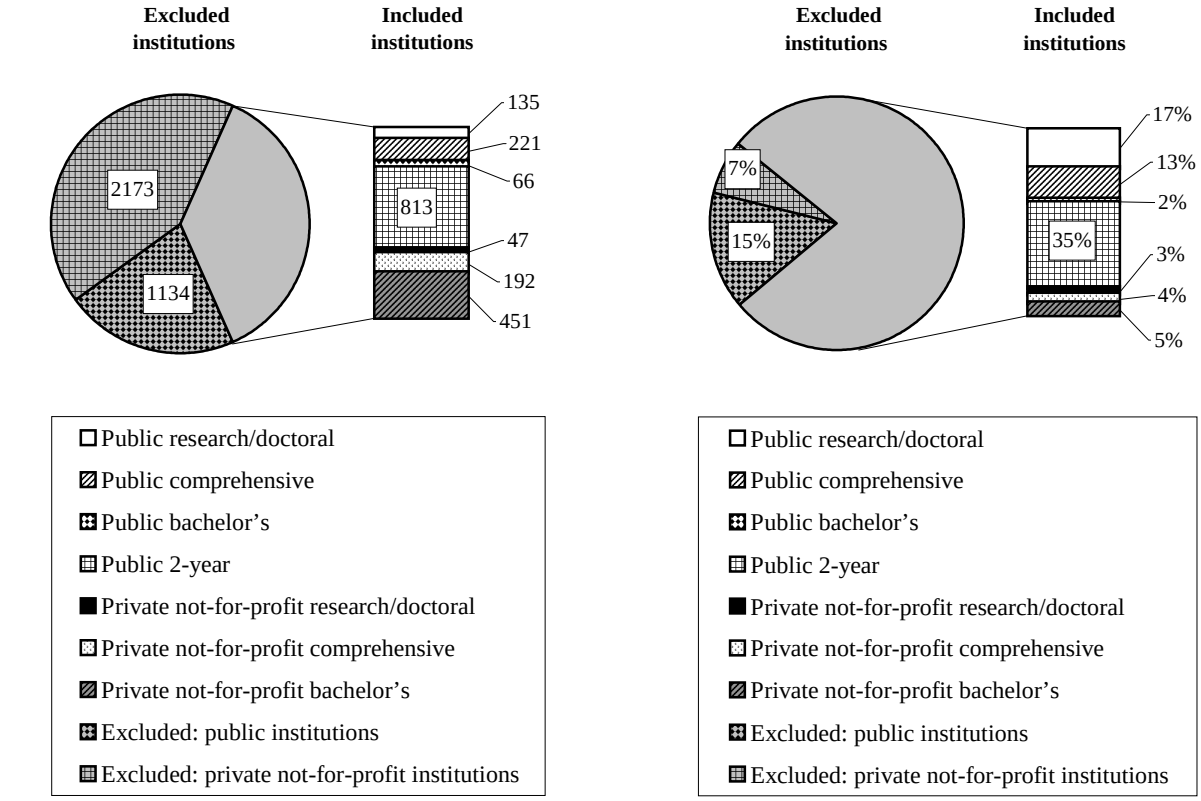
The universe of institutions examined in this study was drawn from the IPEDS universe, although some IPEDS institutions were excluded to increase comparability and to deal with missing data.[3] For example, an attempt was made to include only institutions with primarily undergraduate enrollment, as undergraduate tuition charges were the focus of the study. The institutions in the final universe were grouped by sector; 4-year institutions were then divided into research/doctoral, comprehensive, and bachelor's institutions. All analyses were performed separately on each group of institutions because the groups face different financial pressures and constraints.

The number of institutions and proportions of undergraduate enrollment included in the final groups of institutions are provided in figures 1 and 2. Although the groups of institutions comprise

[2]The Consumer Price Index for All Urban Consumers (CPI-U, 1982-84 = 100) measures change in relation to a base period, in this case the average index level for a 36-month period covering 1982, 1983, and 1984, which is set equal to 100.

[3]See the institutional universe section in Chapter I and the data and methods sections of Chapters III, IV, and V for discussion of the exclusion of institutions.

Figure 1.—Number of institutions included in and excluded from the final universe, by type of institution: 1997–98



NOTE: Refers to final universe for panels of institutions used in chapters III and IV, based on IPEDS data.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full 1998 Collection Year.

Figure 2.—Percent of undergraduate fall enrollment at institutions included in and excluded from the final universe, by type of institution: 1997–98

NOTE: Refers to final universe for panels of institutions used in chapters III and IV, based on IPEDS data.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full 1998 Collection Year.

less than half of all public and private not-for-profit institutions in the IPEDS universe, they enroll more than three-quarters of undergraduates attending IPEDS institutions in the public and private not-for-profit sectors.

To provide a framework for this study's analyses, NCES commissioned papers from seven national experts in higher education finance and student aid. A summary of an invitational meeting convened by NCES to discuss the commissioned papers, as well as the papers themselves, are included in the report.

Findings and Conclusions

The conclusions reached from the trend analyses and models in this report are consistent with earlier research and the views of the expert authors who contributed commissioned papers for this report. The detailed analyses found variations in the nature and the strength of relationships between costs and prices across types of institutions, and within types of institutions over time.

Changes in tuition and other revenue sources over time

In both the public and private not-for-profit sectors, average tuition charges increased at a faster rate than inflation over the period of the analyses, and tuition charges also increased faster than most expenditure categories within the institutions. The share of overall revenue coming from tuition has increased on average for all institutional types in both sectors, compared with relative decreases in other revenue sources.

Across all types of public institutions, in-state undergraduate tuition and fees increased annually—by an average of 4.1 percent at research/doctoral institutions, 4.2 percent at comprehensive institutions, 4.3 percent at bachelor's institutions, and 3.4 percent at 2-year institutions—between 1988–89 and 1997–98 (figure 3). On average, gross tuition revenue accounted for increasing proportions of total educational and general (E&G)[4] revenue over this period, while revenue from state appropriations declined as a proportion of the total.

Across all types of private not-for-profit institutions, undergraduate tuition and fees increased annually—by an average of 3.6 percent at research/doctoral institutions, 4.1 percent at comprehensive institutions, and 3.7 percent at bachelor's institutions—between 1988–89 and 1995–96 (figure 4). On average, gross tuition revenue accounted for increasing proportions of total E&G revenue over this period. At the same time, the proportion of E&G revenue from endowment income and private gifts, grants, and contracts decreased.

Changes in expenditures over time

On the expenditure side for both public and private not-for-profit institutions, instruction expenditures continued to constitute the largest proportion of total E&G expenditures,[5] but remained flat or decreased as a proportion of E&G expenditures. Meanwhile, institutional scholarships and fellowships constituted one of the fastest growing expenditure categories and made up an increasing proportion of total E&G expenditures (figures 3 and 4).

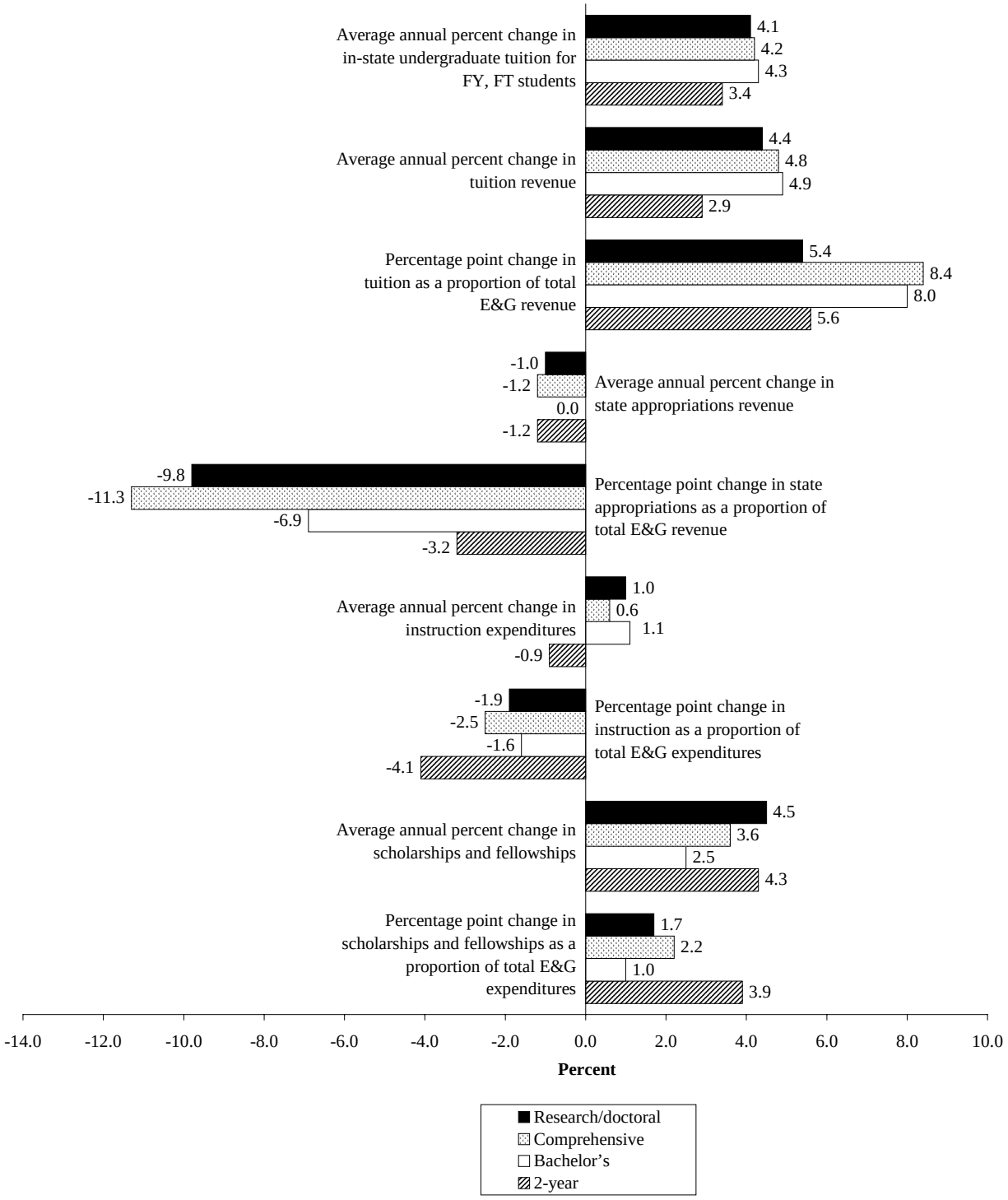
Relationship of tuition changes with changes in revenues, expenditures, and other factors

For *public 4-year institutions*, revenue from state appropriations remains the largest source of revenue and is the single most important factor associated with changes in tuition.

[4]E&G revenues include tuition and fees, government appropriations, government grants and contracts, private gifts, endowment income, sales and services, and other revenue; they exclude revenue for auxiliary enterprises, hospitals, and independent operations.

[5]E&G expenditures include instruction, research, public service, academic support, student services, institutional support, plant operations and maintenance, scholarships and fellowships, and transfers; they exclude expenditures for auxiliary enterprises, hospitals, and independent operations.

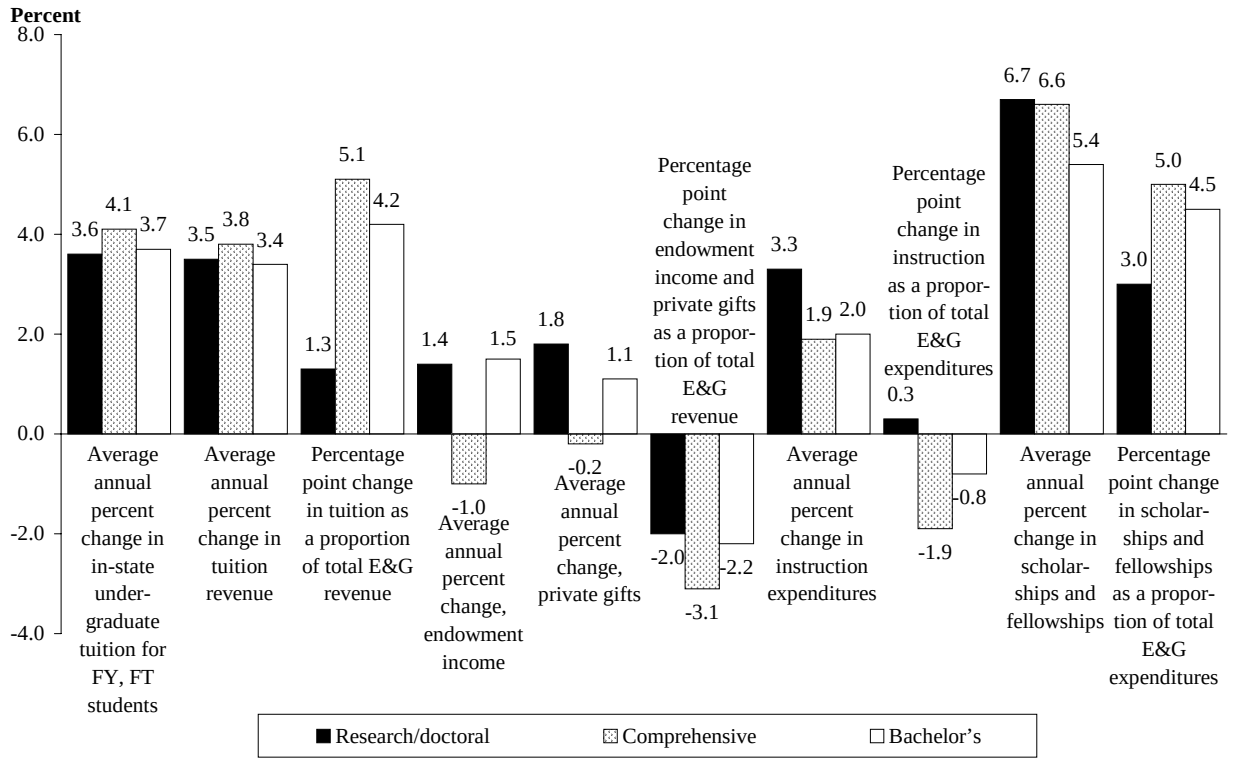
Figure 3.—Percent change in various financial indicators at public institutions, by type of institution: 1988–89 to 1997–98



NOTE: FY, FT means full-year, full-time students. E&G signifies educational and general revenue or expenditures. All changes were calculated using constant 1999 dollars.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Figure 4.—Percent change in various financial indicators at private not-for-profit 4-year institutions, by type of institution: 1988–89 to 1995–96



NOTE: FY, FT means full-year, full-time students. E&G signifies educational and general revenue or expenditures. All changes were calculated using constant 1999 dollars.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

State appropriations revenue decreased relative to other sources of revenue for all types of public 4-year institutions, and in fact experienced real annual decreases for research/doctoral and comprehensive institutions over the time period examined (figure 3).

Decreasing revenue from government appropriations (in which state appropriations make up the majority) was the most important factor associated with tuition increases at public 4-year institutions over the period of analysis. At public research/doctoral institutions, the correlation between change in appropriations and change in tuition was –0.315, a medium sized relationship (the relationships were small at the other two groups of public 4-year institutions).

Although increases in instruction expenditures were associated with increases in tuition at public 4-year institutions, they did not explain as much of the variation in tuition changes as decreases in state appropriations revenue did. At public research/doctoral institutions, the correlation between change in instruction expenditures and change in tuition was 0.087, a small sized relationship (the relationships also were small at the other two groups of public 4-year institutions). In addition, the proportion of total E&G expenditures

for instruction for these groups of institutions declined slightly over the time period examined.

For *public 2-year institutions*, the model found that changes in revenue and expenditure categories accounted for a very low percentage of the variation in tuition changes over the entire period of analysis—7.3 percent—in comparison with the public 4-year sector, which had values ranging from 39.1 percent for research/doctoral institutions to 61.3 percent for comprehensive institutions. This suggests there are some important differences between public 2-year and 4-year institutions that are not captured in this model.

The findings suggest that prices at *private not-for-profit 4-year institutions* were related to both "internal" institutional budget constraints and "external" market conditions. In the private not-for-profit sector, there is no single overriding factor as strongly related to tuition as state appropriations revenue is in the public 4-year sector.

For all types of private not-for-profit 4-year institutions, certain "internal" factors—higher costs in two areas (institutional aid and average faculty compensation levels) and lower levels of revenue from two nontuition sources (endowment income and private gifts, grants, and contracts, together considered philanthropic revenue)—were associated with higher levels of undergraduate tuition. At private not-for-profit research/doctoral institutions, the correlation between the tuition and institutional aid variables was 0.801 and the correlation between the tuition and faculty compensation variables was 0.547, both of these large sized relationships (the relationships also were large at comprehensive and bachelor's institutions, with the exception of the relationship with institutional aid at bachelor's institutions, which was a medium sized relationship). The correlation between tuition and philanthropic revenue was 0.511, also a large relationship (the relationships also were large for the other two groups of institutions).

In addition, certain "external" factors—such as the availability of institutional aid for students, the price of attending public institutions in the same state, and per capita income in the state—were associated with tuition levels for all types of private not-for-profit 4-year institutions. At private not-for-profit research/doctoral institutions, the correlation between tuition and average tuition at public 4-year institutions in the state was 0.357 and the correlation between tuition and per capita state income was 0.294, both of these medium sized relationships (the relationships also were medium sized at comprehensive and bachelor's institutions).

Some differences were found regarding whether and the extent to which other factors—for example, instruction expenditures—were related to tuition, suggesting that the three types of private not-for-profit 4-year institutions face different competitive environments.

Patterns in financial aid

Patterns in financial aid differ considerably among the types of institutions (figure 5), yet some tendencies emerge within each broad institutional sector.

At *public 4-year institutions*, more than two-thirds of first-time, full-time, degree/certificate-seeking undergraduates received aid from any source, on average. The average percentages receiving aid and the average amounts received varied depending on the type of aid and the type of institution, but the highest figures were for student loan aid at all types of public 4-year institutions.

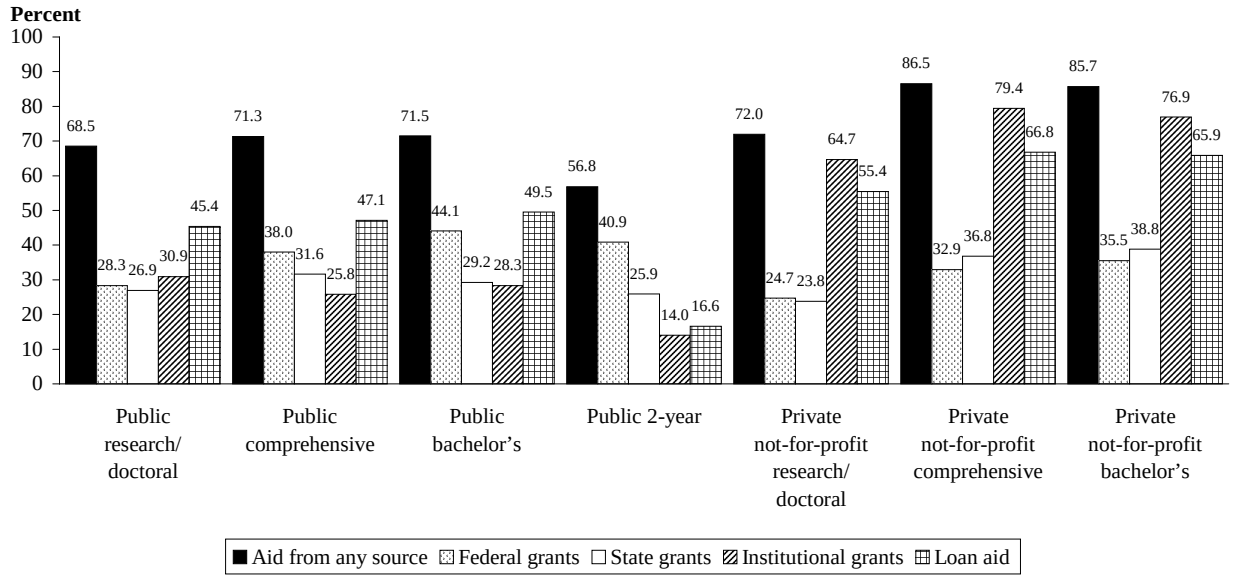
Public 2-year institutions presented a distinctly different situation. At these institutions, on average, 56.8 percent of first-time, full-time, degree/certificate-seeking undergraduates received aid from any source; the highest percentage and the highest average amount were for federal grant aid; and relatively low percentages of students received student loans or institutional aid.

At *private not-for-profit 4-year institutions*, about three-quarters of first-time, full-time, degree/certificate-seeking undergraduates received aid from any source, on average. The highest average percentages of students received institutional aid. Student loan aid was the second highest in terms of the average percentage of students receiving aid.

Relationship of tuition changes with financial aid patterns

Regarding the relationship between financial aid and tuition, the models found no associations between most of the aid variables (federal grants, state grants, and student loans) and changes in tuition in either the public or private not-for-profit sectors. The single exception is institutional aid, which was found to have a positive association with tuition increases for public comprehensive and private not-for-profit comprehensive institutions. The correlation between the change in tuition and the institutional aid variable was 0.103 at public comprehensive institutions and 0.188 at private not-for-profit comprehensive institutions, both of these small sized relationships.

Figure 5.—Average proportions of first-time, full-time, degree/certificate-seeking undergraduates receiving aid, by type of institution and aid source



NOTE: Financial aid data are for either 1997–98 or 1998–99, depending on which year was reported by the institution.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Usefulness of statistical models for testing relationships among revenues, costs, expenditures, and prices

In general, the study shows that available national data can be used to explore aggregate trends in revenues, costs, and prices for broad groups of institutions. Models using these data also can point out associations between revenue and expenditure variables and tuition—for example, as state appropriations for public 4-year institutions decrease, the average undergraduate tuition at this type of institution tends to increase. However, these statistical models are correlational in nature and cannot lead to definitive conclusions regarding the underlying relationships among changes in variables over time. Ideally, new models would need to be constructed to explore the simultaneous direct and indirect effects of costs, revenues, financial aid, market conditions and other external influences, family resources, and college prices.

Finally, even with future improvements in definitions and prospective data collection, the technique of cost analysis will always provide only partial answers to questions about the reasons for price increases at colleges and universities. Given the distinctive characteristics of higher education—such as the availability of nontuition sources of revenue—there is little reason to expect a consistent relationship between costs and prices across all institutions or groups of institutions, even though a specific relationship may be present at one particular institution. Nevertheless, the analyses presented in this report highlight trends and point to associations between variables that can lead to a better understanding of the nature of higher education finance.

Acknowledgments

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Chapter I: Introduction

This report presents the findings of the first phase of a study mandated by Congress as part of the 1998 Amendments to the Higher Education Act (HEA). Part C, section 131(c) of the HEA, entitled "Improvements in Market Information and Public Accountability," directs the Commissioner of Education Statistics to conduct a national study of trends in higher education prices and costs.[1] Specifically:

> (1) IN GENERAL.—The Commissioner of Education Statistics shall conduct a national study of expenditures at institutions of higher education. Such study shall include information with respect to—
>
> a) the change in tuition and fees compared with the consumer price index and other appropriate measures of inflation;
>
> b) faculty salaries and benefits;
>
> c) administrative salaries, benefits and expenses;
>
> d) academic support services;
>
> e) research;
>
> f) operations and maintenance; and
>
> g) institutional expenditures for construction and technology and the potential cost of replacing instructional buildings and equipment.
>
> (2) EVALUATION. —The study shall include an evaluation of—
>
> a) changes over time in the expenditures identified in paragraph (1);
>
> b) the relationship of the expenditures identified in paragraph (1) to college costs; and
>
> c) the extent to which increases in institutional financial aid affect tuition increases, including the demographics of students receiving

[1]In this report, the terms "costs" and "expenditures" are used interchangeably to mean the amount institutions spend to provide education and related educational services to students, as the costs incurred by an institution are frequently measured through expenditures. More strictly, however, the costs of education can be defined as the minimum of what must be given up to accomplish some result, while expenditures are not tied to results and can exceed the minimum amount; see Fowler and Monk (2001).

> such aid, the extent to which financial aid is provided to students with limited need in order to attract a student to a particular institution, and the extent to which Federal financial aid, including loan aid, has been used to offset the costs of such practices.

The study of expenditures is just one element mandated by the law. Section 131 directs the Commissioner of Education Statistics to improve information and standardize definitions to measure postsecondary costs, and to cooperate with the Bureau of Labor Statistics to develop a "market basket" of items comprising the cost of postsecondary education. This report contains the results of the study of expenditures only; however, the context within which the study was commissioned also is relevant.

This report is organized as follows. In this volume, Chapter I provides background for the study, defines the terms of the analysis, describes the research models used in the study, and discusses the limitations of the research. Chapter II summarizes the discussion from a national invitational meeting regarding a series of commissioned papers. Chapter III presents the findings of the research on prices, expenditures, and revenues at public institutions, while Chapter IV presents the findings of the research on private not-for-profit institutions. Chapter V provides a brief review of previous work in the area of financial aid and prices at higher education institutions and presents the results of a series of regression models. Chapter VI presents a summary of findings and conclusions. Appendix A compiles technical notes and the full methodology, and Appendix B provides a glossary of terms and variables. Volume 2 includes the complete set of commissioned papers, as well as the agenda and list of participants for the national invitational meeting.

Background for the Study

The study mandate from Congress was influenced by the report of the National Commission on the Cost of Higher Education, *Straight Talk About College Costs and Prices* (1998). The Commission's report was delivered to Congress in the spring of 1998 following an intensive six-month study that included a review of national research in addition to the Commission's own investigation of trends and causes of tuition increases. The Commission reported that sticker prices (published tuition and fees) had been increasing faster than inflation in both the public and private not-for-profit sectors, and that expenditures (costs) were also increasing, but generally at a lower rate than prices. They were unable to reach definitive conclusions about the root causes for the price increases due to the limited time frame for the study and the lack of available data to allow these questions to be addressed. The Commission found that the language of higher education finance did not consistently distinguish between costs, prices, and subsidies, and that the ab-

sence of clear definitions and common standards precluded the collection of comparative data for more in-depth research. They stated concern that college finances had become opaque not just to the general public but also to the institutions themselves. They believed that more complete analyses of trends in costs over a longer time period would help to reveal the root causes of price increases. Their final report to Congress included recommendations for future research needed to understand more completely the reasons for price and cost increases. They also recommended that institutions take affirmative steps to improve their understanding of the relation between costs and prices, both to better communicate these issues to the public and to improve management within the institutions.

By charging the National Center for Education Statistics (NCES) with the study of costs, Congress mandated that quantitative, statistically determinable techniques be the primary means of researching change in prices and costs. NCES determined that a proper response to Congress required the collection of new institutional-level data, because available national data do not adequately capture distinctions between institutions and other important aspects of the issues. Limitations of current data include the inadequacy of available institutional classification schemes; a lack of common definitions for variables being examined; and different accounting standards between public and private not-for-profit institutions. (These issues are elaborated below in the discussion of limitations of the research.) NCES developed a request for a proposal for a study using new data, and proposals were received from across the country. However, no funds were appropriated by Congress to accomplish this task. NCES therefore asked The Institute for Higher Education Policy to attempt to respond to Congress' questions using existing national data as Phase I of the mandated study. This is an admittedly more limited goal than seeking complete answers to Congress' questions, because of the reliance on retrospective analysis of previously collected data. Nevertheless, this study reports the story portrayed by existing research models and currently available data.

Purpose and Design of This Study

The goal of Phase I of the NCES Study of College Costs and Prices is to examine the relation between costs and prices to more precisely answer the question left unanswered by the Cost Commission about the extent to which spending (expenditure) patterns are contributing to tuition increases in higher education. To do this, papers were commissioned from a number of experts in the field of higher education finance and were discussed at an invitational meeting involving the broader research community. The summary of this discussion, presented in Chapter II, sets the stage for the subsequent statistical analyses, which update existing models of the relationship between costs and prices and extend them for a longer period of time. The statistical analyses in

the study have several components: 1) an analysis of trends in average costs, revenues, and prices at public institutions and a description of the statistical relationships among these factors; 2) an analysis of trends at private not-for-profit institutions, as well as an examination of the factors associated with tuition increases at these institutions; and 3) an analysis of the relationship, if any, of financial aid to prices at public and private not-for-profit institutions.

To fully understand these analyses and the complex relationship between cost and price, it is important to keep in mind the structure of higher education finance, which differs substantially from the economics of a private, for-profit firm. Most important, most public and private not-for-profit institutions receive revenue from many sources, allowing them to supplement revenue from tuition. As a result, for most students the price they pay does not cover the average costs of their education. The difference between average costs and the portion that is paid from tuition is a general institutional subsidy. Other important definitions and terms relevant to higher education are presented in the box below.

Definition of Terms	
Institutional type:	There are three major sectors of institutions that provide postsecondary education: *public* institutions, which range from constitutionally autonomous research universities to locally-funded community colleges; *private not-for-profit* institutions, which range from major research universities to liberal arts institutions; and *private for-profit* institutions. Education also is provided outside of institutions of higher and postsecondary education—for example, in corporate settings and over the Internet. This study is confined to education provided within formal institutions of higher education as defined by the U.S. Department of Education (ED), focusing on institutions in the public and private not-for-profit sectors.
Carnegie classification:	This system classifies all degree-granting and accredited institutions based on degree conferrals, federal support, and admissions selectivity, divided into Research, Doctoral, Comprehensive, Bachelor's (Liberal Arts), Associate of Arts, and Specialized institutions.[2] This study uses the 1994 Carnegie classifications of research/doctoral, comprehensive, and liberal arts/bachelor's to separate 4-year public and private not-for-profit institutions into broadly similar groups for the purposes of analysis.

[2]This system is undergoing changes that will not be finalized until 2005.

Definition of Terms—Continued	
Full-time equivalent (FTE) enrollment:	FTE measures attempt to adjust enrollment for attendance patterns. In many calculation methods, all full-time students are counted, plus a portion of part-time students (typically one-third). Because institutions define "part-time" attendance differently, however, using total instructional credit/contact hour activity to calculate FTE, as is done in this report (see Appendix A for details), may be a more consistent measure.
***Cost*:**	The amount institutions spend to provide education and related educational services to students (measured through *expenditures*, see below).
Cost per FTE student:	The average amount spent annually to provide education and related services to each full-time equivalent student. Unless otherwise specified, costs per FTE student cited in this report are average costs for all levels of students in all programs.
Price:	In general, price is the amount students and their families are charged and what they pay for educational services. There are different types of prices depending on what is included; see sticker price, price of attendance, and net price below**.**
Sticker price:	The tuition and fees that institutions charge (the published price).
Total price of attendance:	The tuition and fees (sticker price) that institutions charge students plus other expenses related to their education. These expenses may include housing (room and board if the student lives on campus, or rent or related housing costs if the student does not live on campus), books, and transportation. This term is often referred to as the "cost of attendance**.**"
Net price:	The amount students and their families pay after financial aid is subtracted from the total price of attendance.
Revenues:	The current fund revenue institutions receive can be categorized according to source—for example, tuition and fees; earnings from endowment; government (state, federal and local) appropriations; government grants and contracts; private gifts, grants and contracts; sales of educational services, such as bookstores, dormitories, or auxiliary enterprises; and other revenue such as hospital revenue and independent operations. Educational and general (E&G) revenue represents a part of total current fund revenue. Definitions of these categories are provided in Appendix B.
Expenditures:	Institutions expend current funds in discrete functional areas, which are categorized in operating budget categories such as direct instruction; research; public service; academic support; student services; institutional support; operation and maintenance of plant; and scholarships and fellowships.[3] Educational and general (E&G) expenditures are a portion of total current fund expenditures. Definitions of these categories are provided in Appendix B.

[3]In cost analyses, scholarships and fellowships are sometimes treated as a reduction in price rather than as an expenditure item.

Definition of Terms—Continued	
***General subsidy*:**	The general subsidy is the difference between the average price charged to students and the average cost to the institution of providing an education, per student. Because institutions receive revenue from both tuition and nontuition sources, students—regardless of whether they attend public or private colleges or universities, or whether they receive financial aid—typically receive a general subsidy. This general subsidy does not include the additional subsidies that some students receive from institutional scholarships and other types of financial aid. Institutional decisions about tuition levels also are decisions about setting the level of the general subsidy.
"Average" tuitions:	All institutions charge different categories of students slightly different levels of tuition and fees. Students pay different fees in addition to tuition charges. Fees are direct charges assessed for services such as laboratory expenses, health services, exercise facilities, and art studios. The distinction between "tuition" and "fees" is particularly difficult to track in public institutions. At the same time, many students receive tuition "discounts" in the form of institutional aid,[4] which means that the net tuition is frequently lower than the "sticker" price or full tuition charge.[5] The analysis in this report follows the common pattern of using the typical tuition and mandatory fees charged to full-time, full-year undergraduates as the measure of average tuition.
Financial Accounting Standards Board and Government Accounting Standards Board:	Financial data in higher education are based on audited financial statements that are consistent with relevant accounting standards. The Government Accounting Standards Board (GASB) sets the standards for public institutions, and the Financial Accounting Standards Board (FASB) sets them for private institutions. There are some differences in the accounting standards between FASB and GASB, particularly in the treatment of capital assets.

Expert Analysis

To provide a broader context for the research, NCES commissioned papers from seven national experts in higher education finance and student aid, and sponsored an invitational meeting involving these researchers and other members of the higher education community in conjunction with the National Postsecondary Education Cooperative (NPEC). The authors were not asked to conduct new research, but rather to summarize the conclusions they had reached in their own work about college prices and costs, including recommendations for future research efforts. The national experts are:

[4]In this report, the terms "tuition discounting," "differential pricing," "institutional aid," and "expenditures for scholarships and fellowships" are used synonymously. The term "tuition discounting" has not been consistently defined in part due to differences in the treatment of institutional aid as a reduction in price (tuition waiver) or as an institutional expenditure. Some authors have used "tuition discounting" to refer to all institutional aid, while others have used it to refer only to that portion of total institutional aid that is funded from unrestricted institutional funds. For the former case, see Lapovsky's commissioned paper in Volume 2; for the latter, see Allan (1999). In either case, "tuition discounting" can include need-based aid, non-need-based aid, or both.

[5]National datasets such as IPEDS do not allow analysis of the differences between "sticker" and "net" prices except at the average, aggregate level. See Yanikoski and Wilson (1984) for a discussion of differential pricing policies.

- David W. Breneman, Dean, Curry School of Education, University of Virginia
- D. Bruce Johnstone, Professor of Higher and Comparative Education, SUNY Buffalo
- Dennis Jones, President, National Center for Higher Education Management Systems (NCHEMS)
- Lucie Lapovsky, President, Mercy College
- Michael McPherson, President, Macalester College, and Morton Owen Schapiro, President, Williams College
- Michael Middaugh, Vice President for Institutional Research, University of Delaware; and
- Gordon Winston, Professor of Economics and Director of the Williams Project on the Economics of Higher Education, Williams College.

The meeting was held on August 2-3, 2000 in Washington, DC. A summary of the discussion at the meeting is included in this report in Chapter II. In addition, the complete set of commissioned papers, a list of attendees, and an agenda for the meeting are enclosed in Volume 2.

Institutional Universe and Data Sources

The statistical analyses in this study target tuition levels for "traditional" undergraduate students and focuses on institutions in the public and private not-for-profit "higher education" sector, defined by NCES as institutions that are both degree granting and Title IV participating.[6] To an extent, this focus is necessitated by limited information on non-degree-granting postsecondary institutions, particularly in the private for-profit and corporate sectors. In addition, it is standard practice in cost studies to endeavor to construct comparable groups of institutions for analysis; the criteria used in this report are consistent with those used in prior studies.[7]

The primary source of available national data for the analyses is the Integrated Postsecondary Education Data System (IPEDS), an annual series of national surveys of postsecondary education institutions that collect information on finances, enrollment, degree completions, faculty salaries and benefits, and other institutional characteristics. The analyses in Chapters III and IV are based on IPEDS data for panels of higher education institutions over the period 1988–89 to 1995–96 (to 1997–98 for public institutions), which allow a description of trends in prices, revenue, and expenditures in constant dollar terms, including how they relate to enrollment.[8] In addi-

[6]Title IV participating institutions are institutions that have participation agreements with the U.S. Department of Education for Title IV student aid programs, based on the Postsecondary Education Participation System (PEPS) file.

[7]Bias analyses of the differences in the characteristics of institutions included in and excluded from the final universes are described in Appendix A.

[8]Panel data are repeated over-time observations for the same group of individual cases (institutions); each institution has data for the same variables for each year of the period analyzed.

tion, data from a new survey, the Institutional Prices and Student Financial Aid Survey (IPSFA), were used in Chapter V to capture recent information on both tuition and financial aid packaging, including the percentage of students receiving federal grants, state grants, institutional grants, and student loans, and the average amounts of aid received. All financial variables in the report were adjusted for inflation using the Consumer Price Index (CPI-U, 1982-84 = 100), adjusted to 1999 dollars.[9]

All analyses in this report were performed separately for seven groups of higher education institutions, based on public/private control of institution and, for 4-year institutions, Carnegie classification. The final groups include three categories of private not-for-profit 4-year institutions (research/doctoral, comprehensive, and bachelor's institutions), and four categories of public institutions (research/doctoral, comprehensive, bachelor's, and 2-year institutions).[10] The number of institutions and proportions of undergraduate enrollment comprised by the final universes are provided in tables 1 and 2. Although the panels of institutions used in Chapters III and IV comprise 37 percent of all public and private not-for-profit institutions in the IPEDS universe in 1997–98,[11] together they enrolled 78 percent of undergraduates attending public and private not-for-profit institutions in the fall of that year.[12]

Analytical Models Used in the Analysis

Rather than breaking new ground, most of the analyses in this report rely on current knowledge of appropriate models in order to best address Congressional concerns. Previously developed models for the public and private not-for-profit sectors were identified by NCES and updated with more recent data. Different models were used for the public and private not-for-profit sectors, because the research has consistently documented that there are fundamental differences in the financing structures, enrollment markets, and tuition decisionmaking processes

[9]The Consumer Price Index for All Urban Consumers (CPI-U) measures changes in relation to a base period, in this case the average index level for a 36-month period covering 1982, 1983, and 1984, which is set equal to 100.

[10]In addition to private for-profit institutions, 2-year private not-for-profit institutions were excluded from the analysis due to the small size of this sector as well as problems with data availability.

[11]Although financial data for private not-for-profit institutions are available only until 1995-96, enrollment data are available for subsequent years, including 1997-98.

[12]Similarly, the universe of institutions in Chapter V comprised 55 percent of all public and private not-for-profit institutions in the IPSFA universe in 1999, but enrolled 85 percent of first-time, full-time undergraduates attending public and private not-for-profit institutions in that year. Bias analyses of the differences in the characteristics of institutions included in and excluded from the final universes are described in Appendix A.

Table 1.—Number and undergraduate enrollment of public and private not-for-profit institutions included and excluded from the final universe in Chapters III and IV: 1997–98

	Institutions		Undergraduate fall headcount enrollment	
	Number	Percentage of total	Number	Percentage of total
Final universe:				
Public research/doctoral	135	2.6	2,118,284	16.9
Public comprehensive	221	4.2	1,624,631	13.0
Public bachelor's	66	1.3	198,349	1.6
Public 2-year	813	15.5	4,424,311	35.3
Private not-for-profit research/doctoral	47	0.9	315,221	2.5
Private not-for-profit comprehensive	192	3.7	459,621	3.7
Private not-for-profit bachelors	451	8.6	621,849	5.0
Excluded from universe:				
Public institutions	1,134	21.7	1,893,167	15.1
Private not-for-profit institutions	2,173	41.5	860,940	6.9
All public and private not-for-profit institutions	5,232	100.0	12,516,373	100.0

NOTE: Institutions included in the final universe were selected according to various criteria, including Title IV participation, degree-granting status, location in the 50 states and the District of Columbia, sector, Carnegie classification (for 4-year institutions), enrollment, and percentage of undergraduate and full-time enrollment. The enrollment data presented in this table are from the original IPEDS files, prior to the imputation process or other analysis procedures described in Chapters III and IV and in Appendix A.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full 1998 Collection Year.

between the sectors.[13] Given the differences in the pre-existing models and the theories behind them, the variables included in the models for the two sectors also differ slightly.

Public institutions are heavily subsidized with state (and sometimes local) tax dollars. Pricing decisions in public institutions are policy decisions shared between state governments and institutional governing boards, defined by the broad parameters of state postsecondary education policies. Decisions about changes in tuition from year to year are dependent on the state appropriations and budget processes. Tuition levels are often specified in the annual budget legislation, and as a technical matter, tuition revenues are often treated as offsets to state appropriation levels. At the same time, for many public institutions, decisions about student access and enrollment are made at the state level, with the individual institutions responsible for developing

[13]See, for instance, Winston (1998b); McPherson and Shapiro (1991, 1998); Davis (1997).

Table 2.—Number and undergraduate enrollment of public and private not-for-profit institutions included and excluded from the final universe in Chapter V: 1999

	Institutions		First-time, full-time, degree/certificate-seeking undergraduate enrollment	
	Number	Percentage of total	Number	Percentage of total
Final universe:				
Public research/doctoral	145	3.6	383,705	21.0
Public comprehensive	254	6.4	281,057	15.4
Public bachelor's	74	1.9	35,545	1.9
Public 2-year	934	23.4	493,477	27.1
Private not-for-profit research/doctoral	77	1.9	105,897	5.8
Private not-for-profit comprehensive	222	5.6	102,308	5.6
Private not-for-profit bachelors	471	11.8	150,786	8.3
Excluded from universe:				
Public institutions	615	15.4	149,853	8.2
Private not-for-profit institutions	1,194	30.0	120,744	6.6
All public and private not-for-profit institutions	3,986	100.0	1,823,372	100.0

NOTE: Institutions included in the final universe were selected according to various criteria, including Title IV participation, degree-granting status, location in the 50 states and the District of Columbia, sector, Carnegie classification (for 4-year institutions), and enrollment. The enrollment data presented in this table are from the original IPSFA files; some institutions did not report enrollment data. In addition, the total number of institutions differs from that in Table 1 due to differing data sources; IPSFA data were available for a sub-set of the institutions in IPEDS.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

admissions policies that are consistent with these access goals. Within their missions, some institutions are expected to accommodate all enrollment demand from qualified applicants; others are allowed to limit enrollments, or expand them to serve new populations. As a result, enrollment demand at public institutions is determined less by market conditions, including price, than are enrollments at private not-for-profit institutions.

At private not-for-profit institutions, price-setting decisions are influenced by internal budget considerations as well, such as desired expenditures and the availability of nontuition revenue. However, prices at private not-for-profit institutions are more likely than public institutions to be influenced by external market factors of the environments in which they operate, including the existence of competition from other institutions, the income levels of potential consumers, perceptions of quality and institutional reputation, and other factors. In addition, private not-for-profit institutions tend to have substantial control over their admissions policies, and

enrollment management policies have become an increasingly important tool.[14] Although private not-for-profit institutions typically have a target for enrollment, the targets vary widely. Some institutions may choose to limit new enrollments, while others may have excess capacity and need to fill seats. Nonetheless, market conditions play an important role for both prices and enrollment at most private not-for-profit institutions.

The model that was replicated for analysis of trends in public institutions is a single-equation correlational model developed by the U.S. General Accounting Office (GAO) in 1998. This model describes the statistical associations between institutional revenue and expenditure categories and changes in prices over time. The model is based on the theory, which is implicit in the 1998 HEA mandate, that various categories of expenditures—such as instruction, administrative expenses, research expenditures, and operations and maintenance—are associated with changes in prices over time. The model also takes into account research suggesting that sources of revenue, especially from state and local governments, are relevant to tuition levels charged at public institutions. The model therefore focuses on factors internal to the institutions (expenditures and revenues) and captures external influences only indirectly—for example, state policy decisions on support for higher education are indirectly measured through the level of government appropriations revenue. The research on the public model is presented in Chapter III.

The model that was updated for private not-for-profit institutions is a simultaneous equation model of college enrollments and prices, jointly developed by Westat, Inc., and Pelavin Associates (1994). This model attempts to describe the relationships between prices and both "internal" and "external" factors at private not-for-profit 4-year institutions. The model assumes that prices and new enrollments simultaneously determine each other, and uses separate equations to capture the associations of internal and external factors with tuition. The structure of the model allows observed levels of tuition to be viewed as equilibrium prices at a specific point in time, while controlling for various factors that may influence institutions' and students' decisions regarding enrollment. This model was not extended to the public sector, because the Westat/Pelavin research found the model to be a poor fit for public institutions. The research on private not-for-profit 4-year institutions is presented in Chapter IV.

Neither of the two pre-existing models included financial aid among the independent variables, with the important exception of institutional aid. Therefore, a new model was developed to analyze these relationships, using data on revenues and expenditures from IPEDS and data on various forms of student aid from the IPSFA dataset. IPSFA resulted from a mandate in the 1998

[14]Anecdotal evidence suggests that public institutions are beginning to use enrollment management policies more frequently; to date, however, most studies of these policies have focused on private not-for-profit institutions. See Lapovsky's commissioned paper in Volume 2.

HEA Amendments that called for improved data collection. At the time of this report, financial aid data from IPSFA were only available for one year, so an examination of changes over time to allow trends to be identified was not possible. Chapter V reviews previous research regarding the relationship between financial aid and prices, and presents the results of the models using the newly available IPSFA data on financial aid.

Limitations of the Research

Despite the effort to improve on previous national studies, the analyses in this report remain unfinished insofar as providing complete answers to some aspects of Congress' questions. The limitations are caused by: 1) the need to rely on existing typologies for classifying institutions; 2) the absence of standard definitions for several of the factors of interest to Congress; 3) the differences in accounting standards between institutional sectors; and 4) the inherent limitations of statistical analysis of costs to reveal causal relationships between costs and prices. These issues are discussed in more detail below.

Institutional classification systems/comparability of types

National data systems organize institutional information into broad categories based on the Carnegie classification system.[15] However, the standard Carnegie classifications fail to capture aspects of institutions beyond differences in primary mission and funding, such as the nature of students served, programs offered, the role of faculty in the institution, and governance. These areas are essential to accurate analysis of costs because they shape institutional expenditure patterns as well as the availability of revenues including tuition revenues. Some examples of institutional characteristics most relevant to the analysis of costs are:

- *Student attendance status*. The changing demography of American higher education means there is no longer a "typical" college student. In addition to full-time undergraduate students—who comprise a minority of total student enrollments across all sectors—there are part-time undergraduates, full- and part-time technical students, post-baccalaureate certificate and credential students, academic graduate students, and first professional (e.g., law and medicine) students. Students may live at home or on campus, and the majority work while in college. All of these differences affect the way that students interact with the college, which in turn shapes their price of attendance. To conduct proper comparative analyses, samples that compare institutions serving similar student profiles need to be developed.

[15]See Carnegie Foundation for the Advancement of Teaching, 1994 Classification System, available from their website: http://www.carnegiefoundation.org/Classification.

- *Student academic preparation*. There also are important differences among institutions in the academic portfolios of students entering the institutions. Some institutions maintain very selective admissions policies and only serve students who are well prepared for college-level work. However, the majority of institutions are not as selective. The variability of student preparation is relevant to cost analysis because students in less selective institutions generally take longer to graduate. Furthermore, academic selectivity is an important factor in shaping the competitive environment for faculty and resources within the institutions. The most selective institutions operate in statewide or even national markets, whereas less selective institutions draw students primarily from local or regional areas. Academic selectivity also influences tuition and fee structures. The most selective institutions typically charge higher tuition and fees than less selective institutions do. This is true even at public institutions where the majority of revenue is still provided by the state or local government.

- *Program and mission*. The Carnegie classification system attempts to categorize institutions based on their mission (instruction, research, and public service) and program offerings. Even within these categories, however, there are variations among institutions because of different mixes of disciplines and programs, as well as the different roles of sponsored research, institutional community service, and non-credit instruction. These differences, along with student admission selectivity, affect the revenue sources and markets for an institution, including whether it serves local, regional, national, or even international markets. Revenue availability and market share, in turn, shape cost structures.

- *Production function of higher education*. While all higher educational institutions share an instructional mission, the way in which instruction is provided differs between institutions in terms of class size, use of full-time faculty, reliance on educational technology, and the relation of research to instruction. Some institutions maintain small classes taught by full-time faculty with few administrative or research roles; others use part-time faculty, distance learning, and large classes. These differences determine the unit costs of the instruction function, as well as the percentage of total costs that can be directly attributed to instruction.

- *Funding profile*. Changes in funding patterns mean that the traditional classifications of "public" and "private not-for-profit" are not precise descriptions of the funding profile of many institutions. Public institutions have many sources of funds in addition to public tax revenues; private not-for-profit institutions receive public funds; and both public and private not-for-profit institutions increasingly have for-profit subsidiaries. The private for-profit sector also has grown considerably, and a substantial amount of teaching and learning is now being provided in the corporate sector by entities that are not even classified as "postsecondary" institutions. To classify institutions accurately for research purposes, new descriptors would need to be developed that accurately capture the new funding patterns.

Standard definitions

The challenge of collecting comparable data is not confined to the issue of institutional classifications. There are no standard definitions currently being used to guide data collection for several of the variables that Congress is interested in, in particular "merit aid" and technology finance. Many state and institutional aid programs make awards based on both need and merit, e.g., students must establish economic need for aid, and then awards are distributed based on merit. This inability to differentiate and clearly define merit aid makes it impossible to probe past trends in merit-based versus need-based institutional aid. In addition, technology is not a standard expenditure item, as the costs of technology are embedded as costs within other categories. For instance, the costs of technology related to distance learning are reported as instructional expenditures, and the proportion of instructional costs that are attributable to technology alone are not separately identified. The problem is similar in other categories, such as administrative costs, or building costs, where technology costs are embedded within the larger categories.

Some of these data limitations could potentially be overcome, but would require new definitions to be developed and applied prospectively to the future collection of data. Even if there were agreement about these definitions, it is not possible to apply these measures retroactively to data that have already been collected.

Accounting standards

The issues of definition and classification are further complicated by institutional accounting standards, which influence the data institutions maintain. For example, there are differences in the accounting standards used by public and private not-for-profit institutions that affect the comparability of data for capital expenditures and the valuation of physical plant because of differences between the sectors in reporting of costs for depreciation, land value, and replacement costs. These differences mean that existing national data cannot be used as a basis for analysis of capital outlay costs. In addition, many public institutions do not technically own the land or the buildings for their campuses, which are properties of either state or local government. The assets and costs of affiliated foundations are reported differently between the sectors as well. The challenge of comparable accounting standards cannot be overcome simply through changes in IPEDS data reporting, as the accounting standards are the province of the Federal and Government Accounting Standards Boards, independent agencies.

At the same time, current financial reporting procedures do not provide for the collection of certain breakdowns that would be necessary for detailed analysis. For example, revenue and expenditure data cannot be differentiated by level of student. Detailed information about differential pricing policies, commonly referred to as "tuition discounting," are not available to allow

analysis of the difference between "sticker" and net tuition prices except at an aggregate level. In addition, institutions often do not track internal pathways between and among revenue sources and expenditures, which means that certain relationships—such as any direct linkage between federal loan capital and institutional aid—cannot be specifically defined using national data.

Recently, changes were made to FASB standards and were incorporated into IPEDS beginning in Fiscal Year 1997.[16] Similarly, GASB recently issued new accounting rules that will be phased in after June 15, 2001. These changes may improve the data collected through NCES, but it will take several years until all changes are implemented at the institutional level.

The limits of cost analysis

The production function of higher education complicates the measurement of costs, and limits the usefulness of cost analysis as a tool for understanding the causes of trends in higher education finance. Unlike the more technical data limitations that are described above, these constraints cannot be overcome through the refinement of data collection or prospective analysis, but are inherent in the basic measures. The literature on cost analysis in higher education addresses these issues in considerably more detail than will be repeated here.[17] The following bullets briefly summarize the many issues that determine the shape of the analysis:

- ***Inputs are outputs:*** The distinction between inputs and outputs is particularly difficult to measure in higher education, because there is no good way to measure the value added by the effect of education on students. As a result, it is not possible to isolate the value of the product (an educated student with a degree or credential) from the cost of production (the resources required to educate one student) from the quality of the input (the academic and social credentials of entering college students). It is similarly hard to measure the other institutional outputs of community service and research. As a result, most cost analyses use expenditures as proxies for costs, without trying to separate inputs from outputs or measuring value added.
- ***The problem of joint products:*** The joint products of teaching, research, and service do not allow most instructional resources to be separated from funds spent for other purposes. Funds for contracted activities, including some sponsored research, can be segregated from analyses of other expenditures, but the costs of research related to the institution's core mission remain.
- ***Student FTE enrollment as the basis for unit costs*:** It is necessary to develop some way to assess "unit" costs for higher education, because looking at gross expenditures

[16]For example, expenses will be measured according to accrual rather than cost accounting methods, and tuition and fee revenue will be reported net of price discounts, with an offsetting adjustment to the expense side. The GASB changes will be similar but too different to compare public institutions with private not-for-profit institutions.

[17]See, for example, an introductory essay by Jenny (1996); and Bowen (1980).

and revenues at the institutional level gives no context to the analysis. The default unit measure for analysis of costs is student enrollment, typically measured in terms of FTE enrollment. However, problems remain with the use of FTE enrollment as the basis for measuring costs. For example, the distribution of students by level of study and discipline affects patterns of expenditures but is not captured in FTE measures. In addition, the unit costs of administration and student services are driven by headcount enrollment rather than course-taking patterns reflected in measures of FTE. As a result, the FTE measure does not capture all unit costs, particularly in institutions with high numbers of part-time students.

- ***Identification of "educational" costs and revenues:*** In focusing on the educational product, analyses should attempt to isolate costs and revenues that are devoted to the core activities of the institution. Therefore, costs and revenues associated with such activities as auxiliary operations, contracted research, and sales or services to vendors should be deleted from the measures. To avoid the "double-counting" of aid, and to be able to identify how financial aid influences tuition and prices, most analysts deduct grant aid from government or private aid sources where possible.
- ***Focus on operating costs:*** A full understanding of costs should ideally include capital costs that are not part of the operating budget, including long-term debt financing for construction of new facilities, renovation and repair costs, and the value of lands and buildings. However, differences in accounting methods between the public and private not-for-profit sectors as well as different habits in funding make it difficult to develop comparable measures of capital costs across sectors. As a result, most analysis is isolated to evaluation of trends in operating costs and revenues. Winston estimates that excluding capital expenditures from cost analysis understates the true cost of education by about 25 percent.[18]

Given these and other characteristics of higher education—such as the availability of non-tuition sources of revenue—there is little reason to expect a consistent relationship between costs and prices across all institutions or groups of institutions, even though a specific relationship may be present at one particular institution and may even be discovered with enough information about the institution.[19] Nevertheless, the analyses presented in this report highlight trends and point to associations between variables that can lead to a better understanding of the nature of higher education finance.

[18]See Winston's commissioned paper in Volume 2.

[19]See Stringer and Cunningham (1999) for a more detailed discussion of these issues.

Chapter II: Summary of Commissioned Papers and National Invitational Meeting

Introduction and Overview

In order to provide a framework for the analysis presented in subsequent chapters and provide different perspectives on some of the relevant issues, the views of the national higher education research community were solicited through seven commissioned papers on college costs and prices and a discussion of these papers at a subsequent national invitational meeting. The meeting, held in Washington, DC on August 2-3, 2000, was convened by the National Center for Education Statistics (NCES) in conjunction with the National Postsecondary Education Cooperative (NPEC).

In their papers, the experts were asked not to present new research, but rather to summarize the conclusions they had reached from their work about the major factors influencing changes in college costs and prices, and to suggest the foci of future research efforts. The paper authors and titles are:

- David W. Breneman, Dean, Curry School of Education, University of Virginia, "An Essay on College Costs";
- D. Bruce Johnstone, Professor of Higher and Comparative Education, SUNY Buffalo, "Higher Education and those 'Out of Control Costs'";
- Dennis Jones, President, National Center for Higher Education Management Systems (NCHEMS), "Cost Analysis and the Formulation of Public Policy";
- Lucie Lapovsky, President, Mercy College, New York, "Institutional Financial Health: Tuition Discounting and Enrollment Management";
- Michael McPherson, President, Macalester College, and Morton Owen Schapiro, President, Williams College, "Issues of Cost and Price in Higher Education: Observations on Needed Data and Research";
- Michael Middaugh, Vice President for Institutional Research, University of Delaware, "Measuring Higher Education Costs: Considerations and Cautions"; and
- Gordon Winston, Professor of Economics and Director of the Williams Project on the Economics of Higher Education, Williams College, "Higher Education's Costs, Prices, and Subsidies: Some Economic Facts and Fundamentals."

The complete set of commissioned papers, a list of attendees, and the agenda for the meeting are included in Volume 2 of this report.

Major Discussion Points

This summary of the meeting's discussion about the commissioned papers is not intended to capture all of the complexity of a rich two-day discussion. Rather, this summary reiterates the major elements of the conversation.

The Trend Data

The facts about basic trends in prices and financial aid for public 2- and 4-year and private not-for-profit 4-year institutions are not in serious dispute. The details of the measures differ slightly between researchers, depending on the time periods being reviewed and sources of data used, but the direction and shape of the changes are the same regardless. Overall, between 1985–86 and 1995–96, gross tuition ("sticker price") in both the public and private sectors grew faster than consumer price index (CPI) measures of inflation. Net prices (tuition and fees after receipt of grant aid) also rose faster than inflation, despite increases in financial aid. The type of financial aid that has grown the fastest over this period has been institutional aid. Although net prices have increased, trend data do not indicate skyrocketing college costs—for example, in the public sector, over the past decade, costs have increased overall by around a percent a year—nor do they reveal prices that have increased so much that overall enrollments have suffered. The highest-priced private not-for-profit institutions continue to experience more enrollment demand than can be accommodated despite rising tuitions. (See the commissioned paper by McPherson and Schapiro for a more detailed discussion of these issues.)

Public and Policymaker Perceptions of College Costs and Prices

As measured by opinion polling and focus group studies, public concern about rising college prices remains high. However, public opinion seems to be largely based on perception of prices at selective, private not-for-profit institutions, which tend to have the highest sticker prices overall but represent only a fraction of the universe of American postsecondary education. These public perceptions in turn influence policymaker views about college affordability. In general, the public is not well informed about either college prices or financial aid, overestimating the cost of college in all sectors and underestimating the availability of financial aid. (Johnstone's commissioned paper discusses these issues in more detail.)

Differences Between Public and Private Not-for-Profit Institutions

Research by many authors shows persistent differences between the public and private not-for-profit sectors, both in the trends in prices and costs and the probable causes for the trends. In public institutions, prices (tuition levels) are determined by public policymakers and are a function of overall state budget practices. Tuition increases in the past decade have been partial replacements for lost state tax subsidies. (Commissioned papers by Breneman and Jones explore these issues.) In private not-for-profit institutions, the picture is more complex, as there are distinct types of institutions within this sector that operate in different markets. For example, highly selective, private not-for-profit research universities serve different markets than comprehensive urban colleges. Competition plays an important and complicated role in price and cost decisions in the private not-for-profit market. There is some evidence that institutions operate in "microclimates," influenced by enrollment demand, pricing, and reputation for institutions in the same stratum. (Winston's commissioned paper goes into more detail about these issues.) The differences between sectors and types of institutions mean that research will be most informative if it separates public and private not-for-profit institutions as well as recognizing differences within institutional sectors.

The Relationship Between Cost and Price

For both public and private not-for-profit institutions, costs generally are only indirectly related to prices across groups of institutions, due to multiple sources of revenue and other characteristics of higher education institutions. Therefore, an analysis of changes in internal cost structures will not shed much light on changes in prices at the aggregate level. As a result, detailed analysis of costs, using either national or institutional data, will not yield insights that will help to answer questions about college prices, access, affordability, or quality.

- *Public institutions:* The cost/price relation is particularly weak in public institutions, where prices are set by policy, institutions are publicly subsidized regardless of student financial need, and costs or expenditures are determined by mission, program structure, and revenue availability. Tuition is typically the revenue of last resort, used to backfill state funding. While many states require public institutions to set non-resident tuition to equal "full" costs, in most states a very low percentage of undergraduate student enrollments at these institutions are out-of-state students. For the vast majority of students who pay in-state tuitions, the prices are determined by policy, not by costs.
- *Private not-for-profit institutions:* In private not-for-profit institutions, there is a stronger relationship between price and cost than in the public sector because of the absence of significant forms of institutional subsidy. Yet even in private not-for-profit institutions, costs are only one element of pricing decisions. Prices are influenced by student demand, institutional perceptions of quality in relation to competing institu-

tions, the availability of other revenues, the cost of the programs, and other factors. (Winston's commissioned paper addresses these issues in greater detail.)

Tuition Discounting

Tuition discounting allows institutions to adjust sticker prices downward by using institutional financial aid. The information about tuition discounting helps to show that price-setting is a management and marketing decision, not based predominantly on institutional costs. Institutional aid is most commonly viewed as an expenditure item, or a cost from foregone income from reduced tuitions. Tuition discounting also contributes to gross tuition revenue, if the awards attract students to institutions that they might otherwise have not attended. Depending on the institution, tuition discounting can even increase net tuition revenue if the increases in gross tuition are greater than the increases in the cost of institutional aid. Tuition discounting is a growing trend, particularly among private not-for-profit institutions with relatively weak enrollment demand. The practice of tuition discounting also may be growing in public institutions, but there is limited information on the topic. (Lapovsky's commissioned paper provides a more complete discussion of this issue.)

The Uses of Cost Analysis

Analysis of internal institutional expenditure patterns or costs is an important management tool within individual institutions and, to some extent, as a comparative tool between institutions. The development of unit cost measures has always been difficult in higher education because of multiple sources of revenues, weak outcome measures, and joint products between research and instruction. These methodological issues have been resolved somewhat with respect to measuring the direct costs of instruction at the aggregate level, without differentiating between undergraduate and graduate education. Analyses of trends in costs of instruction conducted within an individual institution help reveal patterns by discipline and program, making cost assessment a useful element of planning and program review. Comparative analysis of broad cost patterns between institutions also can be helpful to institutions in setting a context for their own work and for benchmarking costs. The tools developed by Michael Middaugh at the Delaware Project on Instructional Productivity and by the National Association of College and University Business Officers (NACUBO) are both good tools for these kinds of comparisons. (A complete description of the Delaware Project is provided in Middaugh's commissioned paper.)

Cost analysis is not, in itself, a useful mechanism for understanding the root causes of price increases at the national level because of the relatively weak relation between prices and costs and the differences in types of institutions. Cost analysis also requires a level of detail that can take attention and resources away from the types of analyses that are best addressed at the state

and national level, such as assessments of changes in subsidy patterns and student access. (The commissioned papers by Jones and Breneman provide more detail on these issues.)

Cost Drivers

At the aggregate level, research and theory consistently suggest that the major cost "drivers"—the factors and forces that determine how much institutions can spend and how they spend it—are:

- *Revenue availability:* institutions attempt to raise all the money they can from multiple sources;
- *Institutional aid:* for some institutions, increases in the use of institutional aid may require increases in revenue, from either tuition or other sources such as endowment income (for other institutions, the use of tuition discounting may contribute to increases in revenue);
- *Mission and discipline:* institutions that have research, graduate education, and public service missions tend to have higher costs, particularly if they offer programs in engineering and other laboratory sciences;
- *Faculty compensation and workload policies:* institutions that use full-time faculty in the classroom spend more on instruction than those that use teaching assistants, adjuncts, and part-time faculty to augment the core faculty;[20] and
- *Class size:* large classes are less expensive than small ones.

[20]Related to the issue of faculty compensation is the labor-intensive nature of higher education; some economists have argued that higher education is not capable of experiencing increases in productivity, but nevertheless institutions must pay competitive salaries that rise over time, leading to continuous increases in unit costs. For discussion of this issue, see the commissioned papers by Johnstone and Breneman.

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Chapter III: Revenues, Expenditures, and Prices at Public Institutions

This chapter focuses on the results of the first analytical component, the trend analysis and modeling of expenditures, revenues, and prices for public institutions. The chapter seeks to address Congress' questions by describing changes over the period 1988–89 to 1997–98 in various expenditure and revenue categories, as well as changes in tuition levels, for public 4-year and 2-year institutions. The analysis also updates a correlational regression model in order to explore the associations among these factors.

Data and Methods

In order to examine the comparative changes of various categories over time, trend data on expenditures, revenues, enrollment, and prices were calculated for the period 1988–89 to 1997–98, using a panel of public 4-year and 2-year institutions. These data include average, inflation-adjusted dollar changes over the whole period and average annual percentage changes. In addition, shifts in the composition of revenues and expenditures are described. These trend data are presented according to type of institution.

To supplement these descriptive statistics and to better understand the statistical relationships between various revenue and expenditure categories and changes in tuition, a linear regression model from a report by GAO, *Higher Education: Tuition Increases and Colleges' Efforts to Contain Costs* (1998), was refined and updated. GAO examined changes in in-state, full-time, full-year undergraduate tuition and fees over the five-year period 1989–90 to 1994–95 for public 4-year institutions. Linear regression analysis was used to identify relationships between the dollar change in tuition over this period (the dependent variable) and the dollar changes in various revenue and expenditure categories per student (the independent variables, 15 in total). The model thus identified variables *associated with* larger or smaller tuition increases, i.e., the characteristics of institutions with larger or smaller tuition increases.

The regression model presented in this analysis reproduces the GAO model with a few minor modifications and for a longer time period (table 3). For 4-year institutions, the dependent

Table 3.—Characteristics of regression model for public institutions

	GAO model	Updated model
Universe	Four-year public institutions in the 50 states and the District of Columbia where more than 50 percent of students enrolled in the fall term were undergraduates and more than 50 percent of students enrolled in the fall term were attending full time. Institutions had to report tuition revenue, instruction expenses, fall enrollment, and typical tuition and fees for in-state undergraduate students. Institutions at which the stated tuition charge was less than 50 percent or more than 150 percent of reported tuition revenue per FTE student were excluded. N = 383	Four-year and 2-year public institutions in the 50 states and the District of Columbia where at least 50 percent of students enrolled in the fall term were undergraduates, at least 25 percent of students enrolled in the fall term were attending full time, and at least 200 FTE students were enrolled. N = 1,235 (research/doctoral = 135; comprehensive = 221; bachelor's = 66; two-year = 813)
Time period	1989–90 to 1994–95	1988–89 to 1997–98, with sub-periods of 1988–89 to 1990–91; 1990–91 to 1994–95; and 1994–95 to 1997–98
Notes	All financial variables were converted to constant 1994–95 dollars; revenue and expenditure variables were expressed per FTE student (calculated as the number of full-time fall-term students plus one-third the number of part-time fall-term students).	All financial variables were converted to constant 1999 dollars; revenue and expenditure variables were expressed per FTE student (calculated from reported instructional activity for the fall term).
Dependent variable	Dollar change in in-state, full-time, full-year undergraduate tuition and required fees	Same for 4-year institutions; dollars change in in-district, full-time, full-year undergraduate tuition and required fees for 2-year institutions
Independent variables	Dollar change in revenue from federal, state, and local government appropriations	Same
	Dollar change in revenue from grants, contracts, and other sources (excluding non-institutional scholarships and fellowships and revenue for hospitals, auxiliary and independent operations)	Separated into two variables: 1) government grants and contracts less federal, state, and local scholarships and fellowships; and 2) philanthropic revenue (endowment income plus revenue from private gifts, grants, and contracts)
	Dollar change in instruction expenditures	Same
	Dollar change in student services expenditures	Same

Table 3.—Characteristics of regression model for public institutions—Continued

	GAO model	Updated model
Independent variables	Dollar change in institutional scholarships and fellowships	Same
	Dollar change in other student-related expenditures (prorated portion of academic and institutional support, physical plant maintenance, and transfers)	Same
	Dollar change in research expenditures	Same
	Dollar change in non-student-related expenditures (public service plus a prorated portion of academic and institutional support, physical plant maintenance, and transfers)	Same
	Percentage point change in the ratio of in-state undergraduate tuition to average tuition revenue received per FTE student	Eliminated because of definitional overlap with dependent variable
	Change in dollar amount of tuition used for noncurrent fund purposes	Eliminated due to lack of significance
	Ratio of in-state undergraduate tuition to average tuition revenue received per FTE student in base year	Eliminated because of definitional overlap with dependent variable
	Dollar change in market value of endowment fund	Eliminated due to missing data
	Level of in-state undergraduate tuition in base year	Same
	Dollar change in the amount by which E&G revenues exceeded/fell short of E&G expenditures	Same
	Dollar change in surplus/deficit from independent operations, auxiliary enterprises, and hospitals	Eliminated due to lack of significance
		Added: Percentage point change in ratio of graduate FTE enrollment to total FTE enrollment

SOURCE: U.S. General Accounting Office (GAO), 1998, *Higher Education: Tuition Increases and Colleges' Efforts to Contain Costs,* GAO/HEHS-98-227, Washington, DC: Government Printing Office, September.

variable is the same: the dollar change in the tuition and required fees charged to the typical full-time, full-year, in-state, undergraduate student.[21] (For 2-year institutions, in-district undergraduate tuition is used as the dependent variable.) The model includes 12 independent variables, some of which differ slightly from the GAO study due to clarifications or data issues. (Except where otherwise noted, changes are in terms of constant dollars per FTE student.)

- The level of in-state undergraduate tuition in the base year
- Change in instruction expenditures
- Change in research expenditures
- Change in student services expenditures
- Change in other student-related expenditures, including pro-rated portions of academic and institutional support, physical plant maintenance, and transfers
- Change in non-student-related expenditures, including public service and pro-rated portions of academic and institutional support, physical plant maintenance, and transfers
- Change in philanthropic revenue, including revenue from endowment income as well as revenue from private gifts, grants, and contracts
- Change in revenue from government appropriations, from federal, state, and local sources
- Change in revenue from government grants and contracts from federal, state, and local sources, less federal, state, and local scholarships and fellowships
- Change in the amount by which educational and general (E&G) revenues exceed or fall short of E&G expenditures, where E&G revenues and expenditures are those categories that are most directly related to the missions of the institutions[22]
- Change in institutional scholarships and fellowships
- Percentage point change in the ratio of graduate FTE enrollment to total FTE enrollment (only for 4-year institutions)

The universe for the model includes slightly more public 4-year institutions than in the GAO report (422 compared with 383) and includes more than 800 public 2-year institutions,

[21]In using in-state tuition as the dependent variable, this model may not reflect public institutions' pricing policies regarding out-of-state students; it is plausible that public institutions' behavior with regard to out-of-state students is more similar to the behavior of private not-for-profit institutions. Also note that the amount of tuition and fees charged to in-state, undergraduate students differs from tuition and fee revenue per FTE student; the former represents the rate of tuition charged to a certain type of student, while the latter reflects tuition and fee revenue collected from all students. Both of these measures do not take into account tuition discounts, which are accounted for as expenditures on institutional scholarships and fellowships.

[22]E&G revenues include tuition and fees, government appropriations, government grants and contracts, private gifts, endowment income, sales and services, and other revenue. E&G expenditures include instruction, research, public service, academic support, student services, institutional support, plant operations and maintenance, scholarships and fellowships, and transfers. Both exclude revenue and expenditures for auxiliary enterprises, hospitals, and independent operations.

whereas GAO confined its study to 4-year institutions. Regression analyses are run for each type of public institution, i.e., research/doctoral institutions, comprehensive institutions, bachelor's institutions, and 2-year institutions. In addition, the model covers a longer time period (1988–89 to 1997–98) than in the GAO report. Separate analyses are performed for three sub-periods: 1988–89 to 1990–91, 1990–91 to 1994–95, and 1994–95 to 1997–98. In these sub-periods, the average annual rate of increase in undergraduate tuition differs markedly, with the highest rate occurring in the middle sub-period for all four groups of public institutions (see table 4).

Table 4.—Average annual percentage change in in-state undergraduate tuition and fees for full-time, full-year students: 1988–89 to 1997–98

	Time period			
	1988–89 to 1997–98	1988–89 to 1990–91	1990–91 to 1994–95	1994–95 to 1997–98
Public research/doctoral	4.1	2.7	6.3	2.2
Public comprehensive	4.2	2.4	6.3	2.7
Public bachelor's	4.3	3.7	5.3	3.5
Public 2-year	3.4	1.3	5.3	2.4

NOTE: Percentages were calculated as averages of the average annual change increments within each institutional type. Tuition amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

As in the GAO report, the model identifies revenue and expenditure variables that are associated (or fail to be associated) with the size of tuition increases. The results can be interpreted as pointing to the independent variables that have a relationship with the change in tuition, after adjusting statistically for the covariation of all other variables in the model.

Data Sources, Panel Selection, and Statistical Procedures

The source of data for both the trend analysis and the regression modeling is the Integrated Postsecondary Education Data System (IPEDS) for 1988–89 to 1997–98. The universe of public institutions was drawn from Title IV-participating, degree-granting institutions located in the 50 states and the District of Columbia. Both 4-year and 2-year institutions were included; 4-year institutions were further divided by Carnegie classification into research/doctoral, comprehensive, and bachelor's institutions. The following were excluded from the universe: institutions that enrolled less than 200 FTE students; 4-year institutions with less than 50 percent undergraduate fall headcount enrollment; and 4-year institutions with less than 25 percent full-time fall headcount

enrollment.[23] The final dataset comprises four panels of public institutions with data for all ten years; the total number is 1,235 (research/doctoral = 135; comprehensive = 221; bachelor's = 66; 2-year = 813).[24] Financial variables were adjusted to constant 1999 dollars using the Consumer Price Index (CPI-U, 1982–84 = 100). Revenue and expenditure variables were calculated on a per FTE student basis, where FTE was generated from reported or estimated fall instructional activity (credit hours).[25]

Prior to conducting the regression analyses, bivariate relationships between variables were examined through scatterplots and correlation matrices. (Relationships between the independent variables and dependent variables were assumed to be linear, and no visual evidence was found to contradict this assumption.) Following the GAO framework, the results of the updated models are presented for each institutional type and each time period, including the following statistics: multiple and adjusted R-squared; model probability; the number of valid cases; Pearson's correlation coefficients of each independent variable with the dependent variable; regression coefficients for each independent variable; the incremental change in multiple R-squared for each independent variable; and the probability of the t statistic for each independent variable.[26] Independent variables are identified as "important" if the decline in the portion of variation accounted for (R-squared) by omitting the variable from the model was 10 percentage points or greater.[27] (See Appendix A for details on missing data procedures, FTE calculations, explanation of statistical terms, and other technical notes.)

[23]Data for 1997–98 were used to define and measure all of these selection criteria.

[24]The original number of public 4- and 2-year institutions in the IPEDS dataset in 1997–98 was 1,921. The various criteria and data cleaning procedures eliminated 686 institutions, or 36 percent of the total. However, the institutions remaining in the panels comprised 84 percent of undergraduate enrollment at all public 4-year institutions and 81 percent at all 2-year institutions in 1997–98. Selection criteria are comparable to those used in most contemporary studies of higher education costs and prices. See Appendix A for details on how many institutions were eliminated at each step, as well as bias analyses of the differences in the characteristics of institutions included in and excluded from the final universes.

[25]Because IPEDS revenue and expenditure data cannot be broken down by level of student, per FTE variables were calculated using total FTE rather than undergraduate FTE. It is important to note that matching these variables with undergraduate tuition levels is not ideal. Nevertheless, this study was limited to the use of available data. Attempts were made to address this issue, by limiting the universe of institutions to those with primarily undergraduate enrollment and by adding a variable to the model to reflect the proportion of graduate students at public 4-year institutions. In addition, the measure of FTE students captures only enrollment for credit, while revenue and expenditure categories may capture both credit and non-credit activity. This issue is most likely to be relevant for public 2-year institutions.

[26]Note that because the population is a census, some of these statistics are displayed not to measure significance, but rather to gauge the explanatory power of the model as a whole (model probability) or the strength of the relationships between the independent variables and the dependent variable (probability of the t statistic).

[27]When independent variables are highly correlated with each other, the usefulness of assessing the importance of a variable by deleting it from the model is limited because it is difficult to distinguish their independent contribution to the portion of variation accounted for; therefore, in cases in which bivariate correlations are 0.7 or greater, the correlation is noted and the R-squared change when both variables are deleted from the model is provided.

Trends in Enrollment, Tuition, Revenues, and Expenditures

The results of the trend analysis for public institutions reveal patterns for each institutional type. Average amounts and percentage changes are reported on an inflation-adjusted basis wherever applicable.

Public Research/Doctoral Institutions

The sub-group of 135 public research/doctoral institutions comprised 16.9 percent of undergraduate enrollment at all public and private not-for-profit institutions in fall 1997. Over the period between 1988–89 and 1997–98, in-state undergraduate tuition at public research/doctoral institutions increased on average by about $1,068 in constant 1999 dollars, or by 4.1 percent annually. The average annual rate of increase in in-state undergraduate tuition was highest over the period 1990–91 to 1994–95 at 6.3 percent, and lowest (2.2 percent) over the most recent subperiod, 1994–95 to 1997–98 (table 4). Neither total headcount fall enrollment nor FTE first-time enrollment at this group of institutions changed over the period, while FTE fall enrollment did increase slightly, by 0.4 percent annually (table 5).

Tuition revenue made up a substantial proportion of total E&G revenue at research/doctoral institutions, 21.9 percent on average, and it grew at one of the highest rates of average annual increase among the various sources of revenue, at 4.4 percent. In comparison, total E&G revenue increased annually by 1.5 percent. Over the period 1988–89 to 1997–98, tuition revenue per FTE student increased on average by $1,682 in constant 1999 dollars, while E&G revenue per FTE increased by $2,686. Another important source of revenue for research/doctoral institutions was federal grants and contracts revenue, which made up 16.9 percent of total E&G revenue on average and increased annually by 2.3 percent. Nevertheless, research/doctoral institutions continued to rely more on revenue from state appropriations than on tuition revenue or federal grants and contracts; state appropriations revenue made up 42.6 percent of total E&G revenues on average. Despite this fact, state appropriations revenue at research/doctoral institutions decreased annually by about 1 percent in real dollars during this period.

As a result of the differing rates of change of various revenue categories, the composition of E&G revenue at research/doctoral institutions changed over the period. For example, on average tuition revenue accounted for 18.4 percent of E&G revenue in 1988–89, but tuition revenue grew to 23.8 percent of the total in 1997–98, an increase of 5.4 percentage points. Conversely, the proportion of revenue from state appropriations decreased by 9.8 points, from 48.7 percent to 38.9 percent of the total, over the same time period (table 6).

Table 5.—Average change in price, enrollment, revenue, and expenditures at public research/doctoral institutions: 1988–89 to1997–98

	Average change, in constant 1999 dollars	Average annual percentage change	Proportion of total revenues/ expenditures, on average	Proportion of total E&G revenues/ expenditures, on average
In-state undergraduate tuition for FY, FT students	$1,068	4.1	—	—
In-state graduate tuition	1,285	4.3	—	—
Out-of-state undergraduate tuition	3,238	4.6	—	—
Total fall enrollment	—	0.0*	—	—
FTE fall enrollment	—	0.4	—	—
FTE first time enrollment	—	0.0*	—	—
Revenue (per FTE) by source:				
Tuition	1,682	4.4	17.2	21.9
Federal appropriations	-50	-2.9	0.7	0.9
State appropriations	-825	-1.0	33.4	42.6
Local appropriations	1	2.4	0.1	0.1
Federal grants and contracts	677	2.3	13.2	16.9
State grants and contracts	184	3.9	2.1	2.7
Local grants and contracts	20	5.6	0.3	0.4
Private gifts, grants, and contracts	508	4.2	5.2	6.7
Endowment income	31	2.4	0.6	0.8
Sales and services of educational activities	199	2.9	3.1	3.9
Other	262	4.4	2.5	3.2
Auxiliary enterprises	478	2.0	10.5	—
Hospital	389	1.8	10.9	—
Independent operations	-22	-2.9	0.2	—
Total revenue	3,568	1.6	100.0	—
E&G revenue	2,686	1.5	—	100.0
Expenditures (per FTE) by function:				
Instruction	615	1.0	28.0	35.6
Research	643	1.9	14.9	19.0
Public service	283	2.4	5.2	6.6
Academic support	283	1.7	7.3	9.3
Student services	132	1.7	3.3	4.2
Institutional support	150	1.1	6.0	7.7
Plant operations/maintenance	-41	-0.3	5.7	7.3
Scholarships and fellowships	544	4.5	5.4	6.9
Mandatory transfers	118	4.3	1.3	1.6
Nonmandatory transfers	102	4.9	1.4	1.8
Auxiliary enterprises	457	1.9	10.7	—
Hospital	331	1.5	10.6	—
Independent operations	-17	-2.6	0.2	—
Total expenditures	3,602	1.6	100.0	—
Total E&G	2,818	1.2	—	100.0
Institutional scholarships and fellowships	290	8.1	—	—

N = 135

— Not applicable.

*Value rounds to less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Table 6.—Percentage composition of E&G revenue and expenditure at public research/doctoral institutions, on average: 1988–89 to 1997–98

	1988–89	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Tuition	18.4	19.0	19.9	21.3	22.6	23.1	23.2	23.7	23.9	23.8
Federal appropriations	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.7
State appropriations	48.7	47.4	45.9	43.4	41.4	40.8	40.5	39.5	39.2	38.9
Local appropriations	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Federal grants and contracts	15.6	16.0	16.1	17.1	17.7	17.6	17.5	17.3	17.0	16.8
State grants and contracts	2.4	2.4	2.6	2.5	2.6	2.7	2.9	3.0	2.9	2.9
Local grants and contracts	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Private gifts, grants, and contracts	5.9	6.3	6.5	6.6	6.7	6.6	6.5	6.7	7.1	7.5
Endowment income	0.9	0.9	0.8	0.7	0.8	0.7	0.7	0.8	0.9	0.9
Sales and services of educational activities	3.6	3.7	3.8	4.1	4.0	3.9	4.0	4.0	4.1	4.1
Other	3.0	2.7	2.9	2.8	2.8	3.1	3.3	3.6	3.7	3.8
E&G revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Instruction	36.6	36.4	36.5	35.7	35.7	35.5	35.5	34.9	35.0	34.7
Research	18.4	18.6	19.0	19.0	19.2	19.5	19.4	19.1	18.9	18.9
Public service	6.4	6.4	6.6	6.7	6.6	6.6	6.6	6.8	6.9	6.9
Academic support	9.3	9.4	9.2	9.1	9.1	9.2	9.2	9.4	9.4	9.4
Student services	4.2	4.2	4.2	4.1	4.2	4.2	4.2	4.2	4.3	4.3
Institutional support	8.0	7.9	7.7	7.5	7.4	7.5	7.4	7.8	7.7	7.7
Plant operations/maintenance	8.0	7.8	7.6	7.3	7.1	7.2	7.0	6.9	6.9	6.8
Scholarships and fellowships	5.9	6.0	6.2	6.8	7.3	7.1	7.2	7.4	7.5	7.7
Mandatory transfers	1.4	1.4	1.5	1.6	1.8	1.6	1.7	1.7	1.8	1.8
Nonmandatory transfers	1.8	1.8	1.5	2.2	1.6	1.8	1.7	1.9	1.6	2.0
E&G expenditure	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N = 135

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before percentage shares were calculated. All revenue and expenditure categories are per full-time equivalent (FTE) student.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Instruction expenditures, which primarily consist of spending on faculty salaries and benefits, represented the largest proportion of total E&G expenditures at research/doctoral institutions, 35.6 percent on average, followed by externally funded research expenditures at 19.0 percent. Instruction expenditures increased at a slightly slower annual rate than did E&G expenditures as a whole, 1.0 percent in real dollars, compared to 1.2 percent on average. The expenditure category of scholarships and fellowships—specifically, institutional scholarships and fellowships—was one of the fastest growing categories. Institutional scholarships and fellowships increased annually by 8.1 percent, with an increase of $290 per FTE student in constant 1999 dollars over the whole period (table 5). Within this pattern of change, the composition of E&G expenditure at research/doctoral institutions also shifted between 1988–89 and 1997–98. On average, instruction expenditures as a percentage of total E&G expenditures decreased by 1.9 percentage points, from 36.6 percent to 34.7 percent. Meanwhile, scholarships and fellowships as a proportion of total E&G expenditures increased by 1.8 percentage points, from 5.9 percent to 7.7 percent of the total (table 6).

Public Comprehensive Institutions

The sub-group of 221 public comprehensive institutions comprised 13 percent of undergraduate enrollment at all public and private not-for-profit institutions in fall 1997. Over the period 1988–89 to 1997–98, in-state undergraduate tuition at comprehensive institutions increased by 4.2 percent annually, with the highest rate of increase over the period 1990–91 to 1994–95 at 6.3 percent, and lowest (2.4 percent) over the first sub-period, 1988–89 to 1990–91 (table 4). At the same time, both total headcount and FTE fall enrollment at these schools increased by slightly less than 1 percent annually, whereas FTE first-time enrollment decreased on average by 0.6 percent annually (table 7).

On average, tuition revenue made up 28.3 percent of total E&G revenue at comprehensive institutions, with an average inflation-adjusted annual increase of 4.8 percent. In comparison, total E&G revenue increased annually by 1.2 percent in real dollars. These schools continued to rely more on revenue from state appropriations than on tuition revenue, with state appropriations revenue making up over half of total E&G revenues. Nonetheless, state appropriations revenue decreased annually by about 1.2 percent in real dollars during this period. Revenue from federal grants and contracts constituted the third largest proportion of E&G revenue at comprehensive institutions, on average 10.8 percent (table 7).

The composition of E&G revenue at comprehensive institutions changed over the period 1988–89 to 1997–98, particularly as a result of the rates of change in tuition and state appropriations revenue. On average, tuition revenue accounted for 22.7 percent of E&G revenue in

Table 7.—Average change in price, enrollment, revenue, and expenditures at public comprehensive institutions: 1988–89 to 1997–98

	Average change, in constant 1999 dollars	Average annual percentage change	Proportion of total revenues/ expenditures, on average	Proportion of total E&G revenues/ expenditures, on average
In-state undergraduate tuition for FY, FT students	$906	4.2	—	—
In-state graduate tuition	1,053	4.5	—	—
Out-of-state undergraduate tuition	2,554	4.6	—	—
Total fall enrollment	—	0.6	—	—
FTE fall enrollment	—	0.7	—	—
FTE first time enrollment	—	-0.6	—	—
Revenue (per FTE) by source:				
Tuition	1,245	4.8	24.5	28.3
Federal appropriations	20	17.5	0.2	0.2
State appropriations	-653	-1.2	44.1	50.9
Local appropriations	-10	-5.8	0.1	0.2
Federal grants and contracts	197	1.9	9.4	10.8
State grants and contracts	167	6.3	2.6	3.0
Local grants and contracts	-3	-1.0	0.2	0.2
Private gifts, grants, and contracts	94	4.9	1.8	2.1
Endowment income	11	5.0	0.2	0.3
Sales and services of educational activities	49	3.4	1.5	1.7
Other	42	2.1	2.0	2.3
Auxiliary enterprises	169	1.1	13.4	—
Hospital	0	0.0	0.0	—
Independent operations	0*	0.9	0.1	—
Total revenue	1,300	1.2	100.0	—
E&G revenue	1,159	1.2	—	100.0
Expenditures (per FTE) by function:				
Instruction	240	0.6	36.3	42.1
Research	79	3.2	2.3	2.6
Public service	112	4.0	2.6	3.1
Academic support	152	1.8	7.8	9.1
Student services	178	2.5	6.5	7.5
Institutional support	107	1.0	10.3	12.0
Plant operations/maintenance	-57	-0.6	8.1	9.4
Scholarships and fellowships	377	3.6	9.5	11.0
Mandatory transfers	15	1.3	1.5	1.7
Nonmandatory transfers	23	8.3	1.2	1.4
Auxiliary enterprises	153	1.0	13.8	—
Hospital	0	0.0	0.0	—
Independent operations	-4	0.6	0.1	—
Total expenditures	1,374	1.3	100.0	—
Total E&G	1,239	0.9	—	100.0
Institutional scholarships and fellowships	154	7.7	—	—

N = 221

— Not applicable.

* Value rounds to less than $1.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

1988–89 but grew to 31.1 percent of the total in 1997–98, an increase of 8.4 percentage points. The proportion of revenue from sources such as federal and state grants and contracts and private gifts, grants, and contracts also increased slightly. At the same time, revenue from state appropriations decreased from 58.4 percent to 47.0 percent of the total, a decrease of 11.4 percentage points (table 8).

On the expenditure side, instruction expenditures constituted the largest proportion of total E&G spending at comprehensive institutions, 42.1 percent on average, followed by expenditures for institutional support (12.0 percent) and expenditures for scholarships and fellowships (11.0 percent). Scholarships and fellowships—specifically, institutional scholarships and fellowships—was one of the fastest growing expenditure categories; institutional scholarships and fellowships increased annually by 7.7 percent, with an increase of $154 per FTE student in constant 1999 dollars over the period (table 7). Given these differences, the composition of E&G expenditures also changed: in particular, instruction expenditures decreased by 2.5 percentage points, and plant operations and maintenance expenditures fell by 1.6 points. Expenditures for scholarships and fellowships as a proportion of the total increased by 2.2 percentage points (table 8).

Public Bachelor's Institutions

The sub-group of 66 public bachelor's institutions comprised 1.6 percent of undergraduate enrollment at all public and private not-for-profit institutions in fall 1997. At public bachelor's institutions, in-state undergraduate tuition increased by about $953 in constant 1999 dollars over the period 1988–89 to 1997–98 and increased annually by 4.3 percent on average. As at the other groups of institutions, the average annual rate of increase in tuition was highest over the period 1990–91 to 1994–95, at 5.3 percent; the rate was lowest (3.5 percent) over the most recent subperiod, 1994–95 to 1997–98 (table 4). Enrollment at these schools increased over the period 1988–89 to 1997–98, with total headcount and FTE fall enrollment increasing annually by slightly more than 1 percent and FTE first-time enrollment increasing at a slightly lower average rate, 0.6 percent (table 9).

Bachelor's institutions continued to rely more on revenue from state appropriations than on tuition revenue, with state appropriations revenue making up 47.1 percent of total E&G revenues on average. However, state appropriations revenue was flat over the period 1988–89 to 1997–98. Tuition revenue, on the other hand, made up a smaller percentage of total E&G revenue on average (28.9 percent) but had the second highest rate of average annual increase among the various sources of revenue, at 4.9 percent in real dollars (private gifts, grants, and contracts had the highest rate of annual increase, 8.8 percent, but made up only 2.5 percent of E&G revenue on

Table 8.—Percentage composition of E&G revenue and expenditure at public comprehensive institutions, on average: 1988–89 to 1997–98

	1988–89	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Tuition	22.7	24.0	25.5	27.5	29.7	30.4	30.2	31.0	31.2	31.1
Federal appropriations	0.2	0.2	0.2	0.1	0.2	0.3	0.3	0.2	0.2	0.4
State appropriations	58.4	56.8	54.7	52.0	48.9	48.7	48.5	47.1	47.1	47.0
Local appropriations	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Federal grants and contracts	10.3	10.3	10.5	11.2	11.5	10.9	10.8	10.8	10.9	11.0
State grants and contracts	2.3	2.6	2.6	2.5	2.9	3.0	3.3	3.6	3.4	3.5
Local grants and contracts	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Private gifts, grants, and contracts	1.7	1.7	1.9	2.1	2.1	2.1	2.3	2.3	2.5	2.4
Endowment income	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3
Sales and services of educational activities	1.5	1.5	1.6	1.7	1.8	1.9	2.0	1.7	1.8	1.7
Other	2.3	2.2	2.3	2.1	2.3	2.1	2.2	2.5	2.5	2.5
E&G revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Instruction	43.0	43.1	43.2	42.8	42.1	41.7	42.1	41.7	41.1	40.5
Research	2.4	2.5	2.5	2.7	2.5	2.5	2.7	2.7	2.8	2.8
Public service	2.7	2.8	3.0	3.1	3.1	3.1	3.3	3.1	3.2	3.4
Academic support	9.0	9.1	9.0	8.9	8.9	9.0	9.1	9.1	9.2	9.4
Student services	7.1	7.2	7.3	7.3	7.9	7.6	7.6	7.3	7.8	7.9
Institutional support	12.2	12.1	12.1	11.9	11.7	11.7	12.1	12.3	11.9	11.8
Plant operation/maintenance	10.4	10.0	9.8	9.4	9.3	9.3	9.1	9.2	9.0	8.8
Scholarships and fellowships	9.9	9.9	10.1	11.1	11.5	11.1	11.2	11.6	11.8	12.1
Mandatory transfers	1.9	1.9	1.6	1.6	1.7	1.5	1.8	1.7	1.8	1.9
Nonmandatory transfers	1.4	1.5	1.4	1.2	1.2	2.4	1.2	1.2	1.4	1.4
E&G expenditure	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N = 221

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before percentage shares were calculated. All revenue and expenditure categories are per full-time equivalent (FTE) student.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Table 9.—Average change in price, enrollment, revenue, and expenditures at public bachelor's institutions: 1988–89 to 1997–98

	Average change, in constant 1999 dollars	Average annual percentage change	Proportion of total revenues/ expenditures, on average	Proportion of total E&G revenues/ expenditures, on average
In-state undergraduate tuition for FY, FT students	$953	4.3	—	—
In-state graduate tuition	887	3.6	—	—
Out-of-state undergraduate tuition	2,631	5.0	—	—
Total fall enrollment	—	1.2	—	—
FTE fall enrollment	—	1.3	—	—
FTE first time enrollment	—	0.6	—	—
Revenue (per FTE) by source:				
Tuition	1,193	4.9	24.9	28.9
Federal appropriations	-3	0.1	0.2	0.2
State appropriations	-62	0.0*	40.5	47.1
Local appropriations	-170	-19.5	0.6	0.7
Federal grants and contracts	50	0.5	11.2	13.0
State grants and contracts	96	3.5	2.8	3.3
Local grants and contracts	-4	-1.7	0.1	0.2
Private gifts, grants, and contracts	173	8.8	2.1	2.5
Endowment income	-4	-0.6	0.4	0.4
Sales and services of educational activities	36	3.1	1.3	1.5
Other	34	2.1	1.9	2.2
Auxiliary enterprises	119	0.8	14.2	—
Hospital	0	0.0	0.0	—
Independent operations	0	0.0	0.0	—
Total revenue	1,485	1.4	100.0	—
E&G revenue	1,338	1.5	—	100.0
Expenditures (per FTE) by function:				
Instruction	378	1.1	32.8	38.5
Research	12	1.4	1.1	1.2
Public service	141	4.7	2.9	3.4
Academic support	148	2.0	7.3	8.6
Student services	215	2.8	7.4	8.7
Institutional support	77	0.7	10.8	12.7
Plant operations/maintenance	6	0.1	8.6	10.0
Scholarships and fellowships	298	2.5	12.1	14.2
Mandatory transfers	112	8.6	1.3	1.6
Nonmandatory transfers	20	13.0	0.9	1.1
Auxiliary enterprises	189	1.2	14.7	—
Hospital	0	0.0	0.0	—
Independent operations	0	0.0	0.0	—
Total expenditures	1,597	1.6	100.0	—
Total E&G	1,435	1.3	—	100.0
Institutional scholarships and fellowships	149	8.0	—	—

N = 66
—Not applicable.
*Value rounds to less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

average). Revenue from federal grants and contracts constituted the third largest proportion of E&G revenue at bachelor's institutions, 13.0 percent on average (table 9).

These varying trends resulted in changes in the composition of E&G revenue at bachelor's institutions. As a proportion of E&G revenue, tuition revenue accounted for 23.4 percent in 1988–89 but increased to 31.5 percent of the total in 1997–98, a rise of 8.1 percentage points. The proportion of revenue from private gifts, grants, and contracts increased slightly, by 1.3 percentage points. Conversely, revenue from state appropriations decreased by 6.9 percentage points, and the proportion of revenue from federal grants and contracts also decreased slightly (table 10).

Instruction expenditures constituted the largest proportion of total E&G expenditures at bachelor's institutions, 38.5 percent on average, but instruction expenditures increased at a slightly slower inflation-adjusted annual rate than did E&G expenditures as a whole, 1.1 percent compared to 1.3 percent. The next largest proportions of total expenditures were scholarships and fellowships (14.2 percent), institutional support (12.7 percent), and expenditures for plant operations and maintenance (10.0 percent). Although institutional scholarships and fellowships increased annually by 8.0 percent, expenditures for institutional support and plant operations and maintenance had average annual increases of less than 1 percent (table 9). These trends led to shifts in the composition of E&G expenditures: on average, the proportion of instruction expenditures decreased by 1.6 percentage points, and the proportions of institutional support and plant operations and maintenance expenditures also fell slightly. The proportion of expenditures for scholarships and fellowships rose slightly, as did the proportions of student services expenditures (table 10).

Public 2-year Institutions

The sub-group of 813 public 2-year institutions comprised 35.3 percent of undergraduate enrollment at all public and private not-for-profit institutions in fall 1997. Over the period 1988–89 to 1997–98, in-district undergraduate tuition at 2-year institutions increased by about 3.6 percent annually, while in-state undergraduate tuition increased by 3.4 percent annually. On average, total headcount fall enrollment at 2-year institutions increased, by 1.4 percent annually, while FTE fall enrollment increased by 1.1 percent annually. On the other hand, FTE first-time enrollment decreased on average by 1.9 percent annually (table 11).

Two-year institutions relied less on tuition revenue in comparison to 4-year institutions, with tuition making up 19.9 percent of total E&G revenue on average. However, tuition revenue had an annual rate of increase of 2.9 percent in real dollars, compared to total E&G revenue,

Table 10.—Percentage composition of E&G revenue and expenditure at public bachelor's institutions, on average: 1988–89 to 1997–98

	1988–89	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Tuition	23.4	24.5	26.5	28.8	30.3	31.0	30.1	31.6	31.7	31.5
Federal appropriations	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
State appropriations	51.5	51.4	49.8	47.2	45.3	45.2	47.2	44.5	44.1	44.6
Local appropriations	2.0	1.7	1.1	0.7	0.6	0.5	0.2	0.2	0.2	0.2
Federal grants and contracts	13.4	13.4	13.2	13.8	13.8	13.0	12.5	12.3	12.8	12.2
State grants and contracts	3.2	2.7	2.8	2.8	3.1	3.5	3.4	3.8	3.7	3.7
Local grants and contracts	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Private gifts, grants, and contracts	1.7	1.9	2.3	2.5	2.4	2.5	2.5	3.0	2.8	3.0
Endowment income	0.5	0.5	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4
Sales and services of educational activities	1.4	1.3	1.2	1.4	1.5	1.6	1.4	1.5	1.6	1.6
Other	2.5	2.1	2.3	2.1	2.0	1.9	2.2	2.3	2.5	2.5
E&G revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Instruction	39.2	39.0	38.7	38.6	38.3	38.1	39.1	38.7	37.6	37.6
Research	1.3	1.2	1.2	1.1	1.2	1.3	1.3	1.4	1.2	1.2
Public service	3.0	3.0	3.1	3.0	3.4	3.6	3.6	3.6	3.8	3.9
Academic support	8.3	8.7	8.7	8.6	8.5	8.5	8.6	8.6	8.7	8.6
Student services	8.3	8.3	8.4	9.0	8.4	8.6	9.0	9.2	9.2	9.2
Institutional support	13.3	13.3	13.4	13.0	12.2	12.6	12.3	12.3	12.3	12.3
Plant operation/maintenance	11.2	10.8	10.2	10.1	9.8	9.8	9.4	9.8	9.6	9.8
Scholarships and fellowships	13.4	13.8	13.9	14.6	15.3	14.3	14.1	13.5	14.0	14.5
Mandatory transfers	1.2	1.1	1.2	1.2	1.6	1.8	1.7	2.0	2.0	2.1
Nonmandatory transfers	0.8	0.8	1.2	0.6	1.3	1.4	0.9	1.0	1.6	0.9
E&G expenditure	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N = 66

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before percentage shares were calculated. All revenue and expenditure categories are per full-time equivalent (FTE) student.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Table 11.—Average change in price, enrollment, revenue, and expenditures at public 2-year institutions: 1988–89 to 1997–98

	Average change, in constant 1999 dollars	Average annual percentage change	Proportion of total revenues/ expenditures, on average	Proportion of total E&G revenues/ expenditures, on average
In-district undergraduate tuition for FY, FT students	$396	3.6	—	—
In-state undergraduate tuition for FY, FT students	479	3.4	—	—
Out-of-state undergraduate tuition	1,154	3.4	—	—
Total fall enrollment	—	1.4	—	—
FTE fall enrollment	—	1.1	—	—
FTE first time enrollment	—	-1.9	—	—
Revenue (per FTE) by source:				
Tuition	436	2.9	18.7	19.9
Federal appropriations	4	4.5	0.6	0.6
State appropriations	-570	-1.2	39.4	41.7
Local appropriations	-517	-3.2	14.1	14.9
Federal grants and contracts	261	2.8	12.3	13.0
State grants and contracts	47	2.1	4.2	4.4
Local grants and contracts	-13	-1.4	0.6	0.6
Private gifts, grants, and contracts	-98	-2.4	1.1	1.1
Endowment income	-7	-2.8	0.2	0.2
Sales and services of educational activities	16	3.8	0.6	0.6
Other	-165	-3.6	2.8	3.0
Auxiliary enterprises	-418	-4.5	6.6	—
Hospital	0	0.0	0.0	—
Independent operations	-13	-7.5	0.2	—
Total revenue	-51	0.1	100.0	—
E&G revenue	-604	-0.4	—	100.0
Expenditures (per FTE) by function:				
Instruction	-444	-0.9	41.2	44.1
Research	-7	-6.1	0.1	0.1
Public service	-40	-1.4	2.2	2.3
Academic support	77	1.4	7.1	7.6
Student services	31	0.7	8.6	9.2
Institutional support	-73	-0.3	13.4	14.3
Plant operations/maintenance	-72	-0.8	8.8	9.5
Scholarships and fellowships	346	4.3	10.5	11.2
Mandatory transfers	10	2.9	0.5	0.6
Nonmandatory transfers	22	4.4	1.0	1.0
Auxiliary enterprises	12	0.3	6.3	—
Hospital	0	0.0	0.0	—
Independent operations	-13	-6.9	0.2	—
Total expenditures	-151	0.4	100.0	—
Total E&G	191	-1.2	—	100.0
Institutional scholarships and fellowships	107	6.8	—	—

N = 813

— Not applicable.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

which *decreased* annually by 0.4 percent. Two-year institutions continued to draw primarily on revenue from state and local appropriations, which constituted 41.7 percent and 14.9 percent, respectively, of total E&G revenue. However, state and local appropriations revenue experienced average annual decreases over the period of 1.2 percent and 3.2 percent, respectively. Federal and state grants and contracts together made up 17.4 percent of total E&G revenue on average, and experienced annual increases over the period (table 11).

As a result of these shifts, the composition of E&G revenue at 2-year institutions changed, with tuition and federal grants and contracts revenue increasing in proportion to state and local appropriations revenue. On average, tuition revenue accounted for 15.1 percent of E&G revenue in 1988–89 but increased to 20.7 percent of the total in 1997–98, an increase of 5.6 percentage points. Revenue from federal grants and contracts also increased as a proportion of E&G revenue, by 3.5 percentage points. Meanwhile, revenue from state and local appropriations decreased by 3.2 and 4.4 percentage points, respectively (table 12).

Instruction expenditures constituted the largest proportion of total E&G expenditures at 2-year institutions, 44.1 percent on average, followed by expenditures for institutional support (14.3 percent), scholarships and fellowships (11.2 percent), expenditures for plant operations and maintenance (9.5 percent), and student services expenditures (9.2 percent). Many of these expenditure categories experienced real annual decreases over the period 1988–89 to 1997–98, and E&G expenditures as a whole decreased by about 1.2 percent annually. Instruction expenditures, institutional support, and plant operations and maintenance had average annual decreases of slightly less than 1 percent. Conversely, institutional scholarships and fellowships increased annually by 6.8 percent, with an increase of $107 per FTE student in constant 1999 dollars over the period 1988–89 to 1997–98 (table 11). The composition of E&G expenditures also changed: on average, instruction expenditures decreased by 4.0 percentage points, while the proportion of expenditures for scholarships and fellowships grew by 3.9 percentage points (table 12).

Model Results

The results of the regression modeling for public institutions highlight several major findings for each institutional type. In each set of findings, “important” independent variables are reported in decreasing order of the portion of variation they account for after controlling for other factors.

Table 12.—Percentage composition of E&G revenue and expenditure at public 2-year institutions, on average: 1988–89 to 1997–98

	1988–89	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Tuition	15.1	17.5	18.5	20.5	21.4	21.4	21.0	21.2	21.4	20.7
Federal appropriations	0.7	0.8	0.7	0.6	0.6	0.6	0.4	0.4	0.4	0.8
State appropriations	44.3	44.0	44.0	41.6	40.4	40.1	40.0	40.0	41.2	41.1
Local appropriations	18.0	16.2	15.5	14.6	14.3	14.5	14.7	14.0	13.6	13.6
Federal grants and contracts	9.9	11.5	11.7	13.5	14.4	14.4	14.1	13.6	13.4	13.4
State grants and contracts	4.1	4.4	4.2	4.0	3.9	4.1	4.3	5.4	4.6	4.9
Local grants and contracts	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6
Private gifts, grants, and contracts	2.1	0.9	0.9	0.9	1.0	0.9	1.1	1.1	1.1	1.2
Endowment income	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Sales and services of educational activities	0.5	0.5	0.5	0.5	0.7	0.6	0.6	0.7	0.7	0.7
Other	4.3	3.2	3.0	2.8	2.5	2.6	3.0	2.8	2.8	2.9
E&G revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Instruction	46.8	45.3	44.8	44.1	43.7	43.5	43.5	43.3	43.0	42.8
Research	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1
Public service	2.7	2.3	2.4	2.3	2.4	2.2	2.2	2.2	2.3	2.3
Academic support	7.0	7.7	7.7	7.5	7.5	7.6	7.5	7.7	7.9	8.0
Student services	9.2	8.7	8.8	9.0	9.1	9.4	9.5	9.6	9.4	9.7
Institutional support	15.0	14.4	14.3	14.2	13.9	14.0	14.3	14.3	14.4	14.4
Plant operation/maintenance	9.6	10.1	9.9	9.6	9.3	9.3	9.3	9.5	9.2	9.0
Scholarships and fellowships	8.2	9.7	10.0	11.7	12.4	12.4	12.1	11.8	12.0	12.1
Mandatory transfers	0.5	0.6	0.5	0.4	0.5	0.5	0.5	0.6	0.6	0.7
Nonmandatory transfers	0.8	1.1	1.5	1.0	1.0	0.9	0.9	0.9	1.1	1.1
E&G expenditure	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N = 813

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before percentage shares were calculated. All revenue and expenditure categories are per full-time equivalent (FTE) student.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Public Research/Doctoral Institutions

Together, the 12 variables in the regression model accounted for almost 40 percent of the variation in in-state undergraduate tuition at public research/doctoral institutions over the period 1988–89 to 1997–98 (table 13). The model had the strongest "explanatory" power in the 1990–91 to 1994–95 sub-period, during which time in-state undergraduate tuition was increasing the fastest. Over the whole period, the most "important" variable associated with the change in tuition was:

- *Change in revenue from government appropriations*. Institutions that experienced the greatest declines in appropriations (from all government sources) per FTE student typically had larger increases in tuition. This variable accounted for 19 percent of the variation in the change in tuition, after accounting for the other independent variables. The change in government appropriations also was an "important" variable in the sub-periods 1988–89 to 1990–91 and 1990–91 to 1994–95.

Other independent variables accounted for lower proportions of the variation in in-state undergraduate tuition over the period 1988–89 to 1997–98:

- *Change in non-student-related expenditures*. In general, schools with greater increases in public services, academic and institutional support, and plant operations and maintenance tended to have larger increases in in-state undergraduate tuition.[28] This variable accounted for 4.5 percent of the variation in the change in tuition, after accounting for the other independent variables.
- *Change in instruction expenditures*. Schools that had the largest increases in instruction expenditures tended to have greater increases in in-state undergraduate tuition. This variable accounted for 4.5 percent of the variation in the change in tuition.
- *Change in other student-related expenditures.* Similar to non-student-related expenditures, schools with greater increases in expenditures for academic support, institutional support, and plant operations and maintenance tended to have larger increases in in-state undergraduate tuition. This variable accounted for 3.6 percent of the variation in the change in tuition.
- *Change in institutional scholarships and fellowships.* In general, institutions with larger increases in institutional aid had greater increases in in-state undergraduate tuition. This variable accounted for 3.4 percent of the variation in the change in tuition. In the sub-period 1990–91 to 1994–95, the change in institutional scholarships and fellowships appeared particularly important, accounting for 10.6 percent of the variation in the dependent variable.

[28]One should note that expenditures for such items as academic support and institutional support can be both student-related and/or non-student-related; these expenditures were prorated based upon a simple formula in order to calculate the independent variables. See Appendix A for details.

Table 13.—Coefficients for the regression of the change in in-state, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public research/doctoral institutions

Time period	1988–89 to 1997–98				1988–89 to 1990–91			
Multiple R-squared	0.391				0.287			
Adjusted R-squared	0.329				0.215			
Model significance	0.000*				0.000*			
N	131				131			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability
Constant	—	415.584	—	0.007*	—	42.499	—	0.422
Level of in-state undergraduate tuition in base year	0.161	0.045	0.3	0.425	0.131	0.023	0.8	0.234
Change in instruction expenditures	0.087	0.161	4.5	0.004*	0.069	0.170	7.7	0.001*
Change in research expenditures	0.184	0.104	1.2	0.124	0.116	0.195	7.1	0.001*
Change in student services expenditures	0.089	0.484	2.4	0.032*	-0.066	-0.141	0.4	0.386
Change in other student-related expenditures	0.041	0.209	3.6	0.009*	-0.057	0.139	1.8	0.082
Change in non-student-related expenditures	0.123	0.164	4.5	0.004*	-0.024	0.106	1.6	0.097
Change in philanthropic revenue	0.046	-0.155	2.7	0.024*	0.125	-0.107	1.6	0.101
Change in revenue from government appropriations	-0.315	-0.241	19.0	0.000*	-0.045	-0.148	10.7	0.000*
Change in revenue from government grants and contracts	0.238	-0.046	3.0	0.505	-0.043	-0.205	6.8	0.001*
Change in the amount by which E&G revenues exceed/fall short of E&G expenditures	-0.300	0.068	0.8	0.209	0.198	0.177	15.3	0.000*
Change in institutional scholarships and fellowships	0.238	0.349	3.4	0.011*	0.228	0.213	1.4	0.122
Change in ratio of graduate to total enrollment	-0.064	-203.935	0.0	0.892	0.145	1267.869	0.8	0.231

Table 13.—Coefficients for the regression of the change in in-state, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public research/doctoral institutions—Continued

Time period	1990–91 to 1994–95				1994–95 to 1997–98			
Multiple R-squared	0.497				0.230			
Adjusted R-squared	0.446				0.152			
Model significance	0.000*				0.001*			
N	131				131			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability
Constant	—	318.860	—	0.014*	—	308.055	—	0.001*
Level of in-state undergraduate tuition in base year	0.135	-0.013	0.0	0.783	-0.205	-0.056	3.7	0.019*
Change in instruction expenditures	-0.138	0.127	1.1	0.104	-0.134	0.053	0.6	0.340
Change in research expenditures	0.196	0.212	2.1	0.028*	-0.120	0.014	0.0	0.850
Change in student services expenditures	-0.035	-0.066	0.0	0.843	0.185	0.852	7.8	0.001*
Change in other student-related expenditures	0.110	0.438	6.7	0.000*	-0.069	0.099	1.4	0.136
Change in non-student-related expenditures	0.184	0.173	1.8	0.041*	-0.024	0.060	1.1	0.198
Change in philanthropic revenue	-0.002	-0.130	0.7	0.186	-0.096	-0.048	0.5	0.383
Change in revenue from government appropriations	-0.370	-0.290	12.8	0.000*	-0.216	-0.176	6.8	0.001*
Change in revenue from government grants and contracts	0.189	-0.127	1.7	0.149	0.076	0.023	0.2	0.743
Change in the amount by which E&G revenues exceed/fall short of E&G expenditures	-0.036	0.196	3.4	0.005*	0.152	0.073	2.5	0.051
Change in institutional scholarships and fellowships	0.539	0.872	10.6	0.000*	0.057	0.277	2.5	0.051
Change in ratio of graduate to total enrollment	-0.070	-687.185	0.0	0.686	-0.128	-1008.624	0.3	0.480

—Not applicable.
*Relatively strong relationship.

NOTE: In order to deal with outliers, one percentile was trimmed from the top and bottom of the variables for the change in government appropriations and the change in government grants and contracts. The model, in following the GAO framework, was not reduced, and therefore may be misspecified. Interpretation of the regression coefficients should be more cautious than if the model had been reduced.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Public Comprehensive Institutions

Over the period 1988–89 to 1997–98, the 12 independent variables in the regression model accounted for 42.4 percent of the variation in in-state undergraduate tuition at these schools. The model had the strongest "explanatory" power in the 1990–91 to 1994–95 sub-period, which is also the sub-period in which annual tuition increases were highest (table 14). The most important independent variables over the period 1988–89 to 1997–98, in terms of their association with changes in tuition, were the following:

- *Change in revenue from government appropriations.* After taking into account the other independent variables, institutions that had the greatest declines in appropriations per FTE student typically had larger increases in tuition. This variable accounted for 27.9 percent of the variation in the change in tuition, after accounting for the other independent variables. The change in revenue from government appropriations remained an important variable in all three sub-periods.
- *Change in revenue from government grants and contracts.* Schools with larger increases in these types of revenue tended to have smaller increases in in-state undergraduate tuition. This variable accounted for 13.5 percent of the variation in the change in tuition.
- *Change in instruction expenditures.* Schools that had larger increases in instruction expenditures tended to have greater increases in in-state undergraduate tuition. This variable accounted for 12.5 percent of the variation in the change in tuition. Nevertheless, the change in instruction expenditures was not an important variable in any of the sub-periods.
- *Change in the amount by which E&G revenues exceeded/fell short of E&G expenditures.* Institutions with larger decreases in the amount by which E&G revenues exceeded expenditures tended to have larger increases in in-state undergraduate tuition. This variable accounted for 10.5 percent of the variation in the change in tuition. This variable was important primarily for the first two sub-periods.

Other independent variables accounted for lower proportions of the variation in in-state undergraduate tuition, including:

- *Change in non-student-related expenditures.* In general, schools with greater increases in these expenditures tended to have larger increases in undergraduate tuition. This variable accounted for 8.3 percent of the variation in the change in tuition, after accounting for the other independent variables.
- *Change in student services expenditures.* Institutions that had greater increases in these expenditures tended to have larger increases in in-state undergraduate tuition. This variable accounted for 7.7 percent of the variation in the change in tuition.

Table 14.—Coefficients for the regression of the change in in-state, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public comprehensive institutions

Time period	1988–89 to 1997–98				1988–89 to 1990–91			
Multiple R-squared	0.424				0.281			
Adjusted R-squared	0.390				0.237			
Model significance	0.000*				0.000*			
N	213				210			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability
Constant	—	256.345	—	0.009 *	—	114.157	—	0.014 *
Level of in-state undergraduate tuition in base year	0.196	0.081	2.6	0.070	0.020	-0.021	9.8	0.304
Change in instruction expenditures	0.049	0.370	12.5	0.000 *	-0.015	0.213	7.1	0.000 *
Change in research expenditures	0.068	0.160	0.6	0.147	0.038	0.236	2.0	0.021 *
Change in student services expenditures	0.252	0.639	7.7	0.000 *	-0.109	0.088	0.2	0.488
Change in other student-related expenditures	0.067	0.204	3.4	0.001 *	-0.208	0.093	1.4	0.052
Change in non-student-related expenditures	0.094	0.459	8.3	0.000 *	-0.022	0.289	6.9	0.000 *
Change in philanthropic revenue	0.014	-0.477	3.6	0.001 *	-0.092	-0.378	3.5	0.002 *
Change in revenue from government appropriations	-0.215	-0.403	27.9	0.000 *	-0.127	-0.209	15.6	0.000 *
Change in revenue from government grants and contracts	0.064	-0.244	13.5	0.000 *	-0.078	-0.252	3.0	0.001 *
Change in the amount by which E&G revenues exceed/fall short of E&G expenditures	-0.040	0.321	10.5	0.000 *	0.200	0.234	18.1	0.000 *
Change in institutional scholarships and fellowships	0.149	0.308	1.5	0.023 *	0.068	0.324	4.0	0.001 *
Change in ratio of graduate to total enrollment	0.004	1572.873	1.4	0.028 *	0.001	428.171	0.1	0.595

Table 14.—Coefficients for the regression of the change in in-state, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public comprehensive institutions—Continued

Time period	1990–91 to 1994–95				1994–95 to 1997–98			
Multiple R-squared	0.498				0.251			
Adjusted R-squared	0.468				0.205			
Model significance	0.000*				0.000*			
N	210				210			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability
Constant	—	109.480	—	0.105	—	142.250	—	0.056
Level of in-state undergraduate tuition in base year	0.124	0.085	2.1	0.005 *	0.148	0.022	[b]	0.402
Change in instruction expenditures	0.070	0.331	8.4	0.000 *[a]	-0.160	0.166	2.8	0.008 *
Change in research expenditures	0.031	0.611	7.9	0.000 *	0.052	0.088	0.2	0.481
Change in student services expenditures	0.300	0.440	4.1	0.000 *	-0.083	0.210	0.9	0.130
Change in other student-related expenditures	0.296	0.481	24.3	0.000 *	-0.152	0.055	0.3	0.368
Change in non-student-related expenditures	0.056	0.412	6.3	0.000 *	0.184	0.298	6.1	0.000 *
Change in philanthropic revenue	-0.056	-0.657	11.7	0.000 *	0.048	-0.049	0.1	0.626
Change in revenue from government appropriations	-0.057	-0.466	28.2	0.000 *[a]	-0.355	-0.296	13.3	0.000 *
Change in revenue from government grants and contracts	-0.073	-0.423	8.4	0.000 *	0.073	-0.015	0.6	0.795
Change in the amount by which E&G revenues exceed/fall short of E&G expenditures	-0.028	0.436	17.4	0.000 *	0.054	0.175	4.3	0.001 *
Change in institutional scholarships and fellowships	0.073	0.118	0.1	0.440	0.053	0.175	0.7	0.195
Change in ratio of graduate to total enrollment	-0.017	-163.038	0.0	0.763	-0.034	-973.378	0.5	0.280

—Not applicable.

*Relatively strong relationship.

[a]Change in government appropriations was correlated with change in instruction expenditures (r=.715). Removing both variables from the model decreased R squared by 29.8 percentage points.

[b]For this sub-period, deleting level of tuition in the base year as an independent variable actually increases the R squared rather than lessening it.

NOTE: In order to deal with outliers, one percentile was trimmed from the top and bottom of several variables: change in government appropriations, change in government grants and contracts, and level of undergraduate tuition in base year. The model, in following the GAO framework, was not reduced, and therefore may be misspecified. Interpretation of the regression coefficients should be more cautious than if the model had been reduced.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

- *Change in philanthropic revenue.* Schools with larger increases in revenue from endowment income and private gifts, grants, and contracts tended to have smaller increases in in-state undergraduate tuition, especially during the sub-period 1990–91 to 1994–95. This variable accounted for 3.6 percent of the variation in the change in tuition.
- *Change in other student-related expenditures.* Similarly to non-student-related expenditures, schools with greater increases in expenditures for academic support, institutional support, and plant operations and maintenance tended to have larger increases in in-state undergraduate tuition. This variable accounted for 3.4 percent of the variation in the change in tuition.

Public Bachelor's Institutions

Despite the relatively small number of institutions in this group, the 12 variables in the regression model accounted for over 60 percent of the variation in in-state undergraduate tuition over the period 1988–89 to 1997–98. The model had the strongest "explanatory" power in the 1990–91 to 1994–95 sub-period, but did not fit well in the 1988–89 to 1990–91 sub-period[29] (table 15). The most important independent variables over the whole period, in terms of their association with changes in tuition, were the following:

- *Change in revenue from government appropriations.* After taking into account the other variables, institutions that had the greatest declines in appropriations per FTE student typically had larger increases in tuition. This variable accounted for 23.1 percent of the variation in the change in tuition, after accounting for the other independent variables. The change in revenue from government appropriations was particularly important in the last two sub-periods.
- *Change in instruction expenditures.* Schools that had greater increases in instruction expenditures tended to have larger increases in in-state undergraduate tuition. This variable accounted for 18.7 percent of the variation in the change in tuition.
- *Change in the amount by which E&G revenues exceeded/fell short of E&G expenditures.* Bachelor's institutions with larger decreases in the amount by which E&G revenues exceeded expenditures tended to have larger increases in in-state undergraduate tuition. This variable accounted for 18 percent of the variation in the change in tuition.
- *Change in non-student-related expenditures.* Schools with larger increases in these expenditures tended to have greater increases in in-state undergraduate tuition. This variable accounted for 10.2 percent of the variation in the change in tuition.

[29]This group of institutions had the lowest number of cases (66), which may have caused some problems for the modeling procedures. Some influential outliers remained but could not be removed without reducing the number of cases further.

Table 15.—Coefficients for the regression of the change in in-state, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public bachelor's institutions

Time period	1988–89 to 1997–98				1988–89 to 1990–91			
Multiple R-squared	0.613				0.157			
Adjusted R-squared	0.515				-0.054			
Model significance	0.000*				0.702			
N	60				61			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability
Constant	—	329.513	—	0.007 *	—	200.075	—	0.003 *
Level of in-state undergraduate tuition in base year	0.365	0.100	3.6	0.040 *	-0.043	-0.022	1.0	0.455
Change in instruction expenditures	0.134	0.380	18.7	0.000 *	0.160	0.104	2.0	0.293
Change in research expenditures	0.107	-0.081	0.1	0.654	-0.013	0.115	1.5	0.363
Change in student services expenditures	0.011	0.160	0.4	0.446	0.148	0.227	1.1	0.439
Change in other student-related expenditures	0.053	0.187	4.1	0.029 *	0.207	0.139	4.2	0.128
Change in non-student-related expenditures	0.085	0.464	10.2	0.001 *	0.091	0.128	1.1	0.428
Change in philanthropic revenue	0.444	0.408	6.8	0.006 * [a]	0.214	0.054	0.7	0.520
Change in revenue from government appropriations	-0.167	-0.380	23.1	0.000 *	0.225	-0.080	3.5	0.455
Change in revenue from government grants and contracts	-0.260	-0.259	7.6	0.004 *	0.080	-0.075	1.3	0.400
Change in the amount by which E&G revenues exceed/ fall short of E&G expenditures	0.055	0.337	18.0	0.004 *	0.149	0.150	3.1	0.196
Change in institutional scholarships and fellowships	0.331	-0.406	4.4	0.024 * [a]	0.059	0.068	0.5	0.585
Change in ratio of graduate to total enrollment	-0.182	-1670.457	0.5	0.413	0.045	67.392	0.0	0.984

Table 15.—Coefficients for the regression of the change in in-state, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public bachelor's institutions—Continued

Time period	1990–91 to 1994–95				1994–95 to 1997–98			
Multiple R-squared	0.569				0.395			
Adjusted R-squared	0.461				0.244			
Model significance	0.000*				0.009*			
N	61				61			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after controlling for other factors	Probability
Constant	—	65.646	—	0.536	—	357.757	—	0.002 *
Level of in-state undergraduate tuition in base year	0.333	0.146	9.4	0.002 *	0.139	-0.065	2.7	0.145
Change in instruction expenditures	0.258	0.130	1.8	0.163	-0.165	0.062	0.6	0.485
Change in research expenditures	-0.153	0.317	1.0	0.306	-0.157	0.077	0.0	0.792
Change in student services expenditures	0.172	-0.134	0.3	0.577	0.021	0.133	0.5	0.527
Change in other student-related expenditures	0.489	0.515	34.2	0.000 *	0.199	0.209	6.1	0.032 *
Change in non-student-related expenditures	0.023	-0.007	0.0	0.953	0.334	0.239	10.1	0.007 *
Change in philanthropic revenue	-0.007	-0.177	2.0	0.147	0.130	0.194	1.1	0.341
Change in revenue from government appropriations	0.227	-0.229	10.7	0.002 *	-0.147	-0.205	16.7	0.001 * [b]
Change in revenue from government grants and contracts	-0.047	-0.077	0.4	0.504	-0.250	-0.239	7.4	0.019 *
Change in the amount by which E&G revenues exceed/ fall short of E&G expenditures	0.106	0.201	6.3	0.011 *	-0.111	0.155	11.6	0.007 * [b]
Change in institutional scholarships and fellowships	0.008	-0.150	0.3	0.578	0.165	0.290	2.1	0.193
Change in ratio of graduate to total enrollment	-0.236	-3130.482	4.4	0.032 *	0.095	3154.084	3.1%	0.119

—Not applicable.

*Relatively strong relationship.

[a]Change in institutional aid was correlated with change in philanthropic revenue (r = .752). Removing both variables from the model decreased R squared by 6.8 percentage points.

[b]Change in government appropriations was correlated with change in amount by which E&G revenue exceeded/fell short of E&G expenditures (r = .744). Removing both variables from the model decreased R squared by 17.8 percentage points.

NOTE: In order to deal with outliers, two percentiles were trimmed from the top and bottom of several variables: change in government appropriations, change in amount by which E&G revenues exceed/fall short of E&G expenditures, and change in undergraduate tuition. The model, in following the GAO framework, was not reduced, and therefore may be misspecified. Interpretation of the regression coefficients should be more cautious than if the model had been reduced.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

Other variables accounted for lower proportions of the variation in in-state undergraduate tuition:

- *Change in revenue from government grants and contracts.* Schools with larger increases in these revenues tended to have smaller increases in in-state undergraduate tuition. This variable accounted for 7.6 percent of the variation in the change in tuition, after accounting for the other independent variables.
- *Change in philanthropic revenue*. Schools that had larger increases in endowment income and private gifts, grants, and contracts tended to have smaller increases in in-state undergraduate tuition. This variable accounted for 6.8 percent of the variation in the change in tuition.
- *Change in institutional scholarships and fellowships.* Contrary to the expected direction, institutions with *smaller* increases in institutional aid appeared to have greater increases in in-state undergraduate tuition.[30] This variable accounted for 4.4 percent of the variation in the change in tuition, after accounting for the other independent variables.
- *Change in other student-related expenditures.* Like non-student-related expenditures, bachelor's institutions with greater increases in expenditures for academic support, institutional support, and plant operations and maintenance tended to have larger increases in in-state undergraduate tuition. This variable accounted for 4.1 percent of the variation in the change in tuition. The change in other student-related expenditures became an important variable during the 1990–91 to 1994–95 sub-period, accounting for 34.2 percent of the variance.

Public 2-year Institutions

When the regression model was applied to 2-year institutions, the 11 independent variables (the graduate enrollment measure was not included) accounted for only 7.3 percent of the variation in in-district undergraduate tuition over the period 1988–89 to 1997–98. As with the other groups of institutions, the model had the strongest "explanatory" power in the 1990–91 to 1994–95 sub-period, during which time tuition was increasing the fastest (table 16). In general, however, the variables in the model left most of the variation in tuition changes unexplained. Although some of the independent variables had relationships with the change in tuition, the associations were relatively small. Similar findings characterized the analyses of the three sub-periods, where generally the proportions of the variation explained were low. This group of institutions had the largest number of cases, allowing factors to have a relationship with the dependent variable yet at the same time account for small proportions of the variance. Variables

[30]It appears that institutional aid is acting as a suppressor variable, i.e., a variable that changes the prediction value of another variable (or set of variables) by its inclusion in the regression equation. This could have resulted from a disordinal interaction effect (in which the direction of a relationship between two variables is different depending on the value of some other variable), it could be a statistical artifact of the sample, or the model could be misspecified.

Table 16.—Coefficients for the regression of the change in in-district, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public 2-year institutions

Time period	1988–89 to 1997–98				1988–89 to 1990–91			
Multiple R-squared	0.073				0.077			
Adjusted R-squared	0.058				0.063			
Model significance	0.000 *				0.000 *			
N	736				740			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after ontrolling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after ontrolling for other factors	Probability
Constant	—	274.308	—	0.000 *	—	87.667	—	0.000 *
Level of in-district undergraduate tuition in base year	0.152	0.058	1.2	0.003 *	-0.157	-0.050	2.5	0.000 *
Change in instruction expenditures	-0.036	0.036	1.5	0.009 * [b]	-0.053	0.048	0.7	0.012 *
Change in research expenditures	-0.104	-0.438	0.4	0.087	0.012	0.077	0.1	0.446
Change in student services expenditures	0.051	0.140	2.0	0.000 *	0.010	0.081	0.4	0.070
Change in other student-related expenditures	-0.028	0.037	[a]	0.032 *	-0.044	0.052	1.2	0.007 *
Change in non-student-related expenditures	0.028	0.060	[a]	0.066	-0.035	0.056	[c]	0.159
Change in philanthropic revenue	0.065	0.160	0.4	0.056	-0.005	-0.028	[c]	0.787
Change in revenue from government appropriations	-0.111	-0.063	2.8	0.000 * [b]	-0.073	-0.084	3.0	0.000 *
Change in revenue from government grants and contracts	-0.015	-0.048	1.9	0.019 *	-0.030	-0.055	1.4	0.029 *
Change in the amount by which E&G revenues exceed/fall short of E&G expenditures	-0.011	0.033	0.8	0.090	0.120	0.095	3.2	0.000 *
Change in institutional scholarships and fellowships	0.029	0.081	0.2	0.237	0.065	0.336	0.9	0.009 *

Table 16.—Coefficients for the regression of the change in in-district, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public 2-year institutions—Continued

Time period	1990–91 to 1994–95				1994–95 to 1997–98			
Multiple R-squared	0.143				0.047			
Adjusted R-squared	0.130				0.032			
Model significance	0.000 *				0.000 *			
N	743				729			
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after ontrolling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after ontrolling for other factors	Probability
Constant	—	148.61	—	0.000 *	—	61.899	—	0.000 *
Level of in-district undergraduate tuition in base year	0.198	0.052	1.7	0.000 *	0.094	0.020	0.6	0.043 *
Change in instruction expenditures	0.074	0.123	4.4	0.000 * [e]	-0.090	0.026	0.7	0.082 [g]
Change in research expenditures	0.044	0.284	0.3	0.108	-0.065	-0.230	0.2	0.228
Change in student services expenditures	0.084	0.142	1.2	0.001 *	-0.069	0.012	0.5	0.726
Change in other student-related expenditures	0.124	0.148	5.4	0.000 * [e]	-0.043	0.042	1.0	0.010 *
Change in non-student-related expenditures	0.107	0.239	3.7	0.000 *	-0.027	0.032	0.3	0.390
Change in philanthropic revenue	0.065	-0.025	[d]	0.767	-0.033	-0.099	[f]	0.878
Change in revenue from government appropriations	0.024	-0.165	6.8	0.000 * [e]	-0.132	-0.048	2.1	0.000 * [g]
Change in revenue from government grants and contracts	0.067	-0.114	3.1	0.000 *	-0.084	-0.058	1.8	0.002 *

Table 16.—Coefficients for the regression of the change in in-district, full-time, full-year, undergraduate tuition on selected revenue and expenditure variables for public 2-year institutions—Continued

Time period	1990–91 to 1994–95				1994–95 to 1997–98			
Multiple R-squared		0.143				0.047		
Adjusted R-squared		0.130				0.032		
Model significance		0.000 *				0.000 *		
N		743				729		
	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after ontrolling for other factors	Probability	Correlation coefficient with change in tuition	Regression coefficient	Portion of variation accounted for after ontrolling for other factors	Probability
Change in the amount by which E&G revenues exceed/fall short of E&G expenditures	0.011	0.149	5.3	0.000 *	-0.050	0.019	0.7	0.259
Change in institutional scholarships and fellowships	0.132	0.344	1.8	0.000 *	0.019	0.071	0.3	0.135

— Not applicable.

*Relatively strong relationship.

[a]Deleting these independent variables actually increases the R squared rather than lessening it.

[b]Change in government appropriations was correlated with change in instruction expenditures (r = .733). Removing both variables from the model decreased R squared by 4.4 percentage points.

[c]For this sub-period, deleting these independent variables actually increases the R squared slightly rather than lessening it.

[d]For this sub-period, deleting philanthropic revenue as an independent variable actually increases the R squared slightly rather than lessening it.

[e]Change in government appropriations was correlated with change in instructional expenditures (r = .764) and with other student-related expenditures (r = .700). Removing all three variables from the model decreased R squared by 7.9 percentage points.

[f]For this sub-period, deleting philanthropic revenue as an independent variable actually increases the R squared slightly rather than lessening it.

[g]Change in government appropriations was correlated with change in instructional expenditures (r = .704). Removing both variables from the model decreased R squared by 2.1 percentage points.

NOTE: In order to deal with outliers, one percentile was trimmed from the top and bottom of several variables: change in government appropriations, change in instruction expenditures, change in student services, change in other student-related expenditures, change in other non-student-related expenditures, change in amount by which E&G revenues exceed/fall short of E&G expenditures, change in philanthropic revenue, change in government grants and contracts. The model, in following the GAO framework, was not reduced, and therefore may be misspecified. Interpretation of the regression coefficients should be more cautious than if the model had been reduced.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

that accounted for some of the variation in in-district undergraduate tuition over the period 1988–89 to 1997–98 include the following:

- *Change in revenue from government appropriations.* After taking into account the other variables, institutions with greater declines in appropriations per FTE student had slightly larger increases in tuition. This variable accounted for 2.8 percent of the variation in the change in tuition, after accounting for the other independent variables.
- *Change in student services expenditures.* Schools with larger increases in these expenditures tended to have slightly smaller increases in in-district undergraduate tuition. This variable accounted for 2 percent of the variation in the change in tuition.
- *Change in revenue from government grants and contracts.* Schools with larger increases in these revenues tended to have smaller increases in in-district undergraduate tuition. This variable accounted for 1.9 percent of the variation in the change in tuition.
- *Change in instruction expenditures*. Schools that had greater decreases in instruction expenditures tended to have smaller increases in in-district undergraduate tuition. This variable accounted for 1.5 percent of the variation in the change in tuition.
- *Level of in-district undergraduate tuition in the base year.* Institutions with higher levels of tuition in 1988–89 tended to have greater increases in tuition. This variable accounted for 1.2 percent of the variation in the change in tuition.

A number of possible reasons may prevent this regression model from "explaining" the variation in changes in tuition at 2-year institutions. It is possible that the model is inappropriately specified for this group of institutions. Two-year institutions differ from 4-year institutions in many ways, but less research is available regarding their financing structures. Furthermore, this large group of institutions is a very diverse group, with substantial variations in governance, sources of funding, student characteristics, and other factors.[31] It is also important to note that the selection criteria were slightly different for 2-year institutions, as the percentage of students who attended on a full-time basis was not used to exclude 2-year institutions from the panel, as it was for public 4-year institutions.

Discussion

Across all types of public institutions, the trend analysis found that, on average, in-state undergraduate tuition rose in inflation-adjusted terms and that gross tuition revenue accounted for increasing proportions of total E&G revenue over the period 1988–89 to 1997–98. On the other hand, state appropriations revenue made up decreasing proportions of total E&G revenue over

[31]Note that California institutions make up 7 percent of the universe of public 2-year institutions used for this analysis, and have a proportionate influence on the results of the model (California institutions also accounted for 14 percent of the total fall enrollment at public 2-year institutions in the universe in 1997–98).

the period and, in some cases, even experienced average annual declines. Nevertheless, in general, public institutions continued to rely more on revenue from state appropriations than on tuition revenue. On the expenditure side, instruction expenditures continued to constitute the largest proportion of total E&G expenditures, while institutional scholarships and fellowships was one of the fastest growing expenditure categories (see table 17).

Table 17.—Summary of inflation-adjusted trends in tuition and selected revenue and expenditures categories at public institutions: 1988–89 to 1997–98

	Research/ doctoral	Compre-hensive	Bachelor's	2-year
Average annual percent change in in-state undergraduate tuition for FY, FT students	4.1	4.2	4.3	3.4
Tuition revenue:				
Average annual percent change	4.4	4.8	4.9	2.9
Average proportion of total E&G revenue	21.9	28.3	28.9	19.9
Percentage point change as a proportion of total E&G revenue	5.4	8.4	8.0	5.6
State appropriations revenue:				
Average annual percent change	-1.0	-1.2	0.0	-1.2
Average proportion of total E&G revenue	42.6	50.9	47.1	41.7
Percentage point change as a proportion of total E&G revenue	-9.8	-11.3	-6.9	-3.2
Instruction expenditures:				
Average annual percent change	1.0	0.6	1.1	-0.9
Average proportion of total E&G expenditures	35.6	42.1	38.5	44.1
Percentage point change as a proportion of total E&G expenditures	-1.9	-2.5	-1.6	-4.1
Scholarships and fellowships expenditures:				
Average annual percent change	4.5	3.6	2.5	4.3
Average proportion of total E&G expenditures	6.9	11.0	14.2	11.2
Percentage point change as a proportion of total E&G expenditures	1.7	2.2	1.0	3.9
Average annual percent change in institutional scholarships and fellowships	8.1	7.7	8.0	6.8

NOTE: Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

These trends appear to be consistent with the findings of the correlational regression models (see table 18). The change in tuition at public institutions over the period 1988–89 to 1997–98 was clearly associated with changes in revenue from government appropriations, and state appropriations comprised the majority of this revenue. The association between tuition and government appropriations at public institutions was not surprising given the results of prior research. The results suggest that changes in revenue from government appropriations are a greater predictor of changes in tuition, particularly at public 4-year institutions, than other factors included in the models.

Table 18.—Significant relationships with the change in in-state undergraduate tuition at public institutions: 1988–89 to 1997–98

	Research/ doctoral	Compre-hensive	Bachelor's	2-year
Change in revenue from government appropriations	**	**	**	*
Change in instruction expenditures	*	**	**	*
Change in other student-related expenditures	*	*	*	*
Change in revenue from government grants and contracts		**	*	*
Change in non-student-related expenditures	*	*	**	
Change in institutional scholarships and fellowships	*	*	*	
Change in philanthropic revenue	*	*	*	
Change in student services expenditures	*	*		*
Change in the amount by which E&G revenues exceed/fall short of E&G expenditures		**	**	
Level of in-state undergraduate tuition in base year			*	*
Change in ratio of graduate to total enrollment		*		
Change in research expenditures				

*Relatively strong relationship.
**Identified as "important."

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1998.

According to the model results, the change in instruction expenditures also had a positive association with the change in tuition for each type of public institution, although this variable did not "explain" as much of the variation as did the change in state appropriations revenue.[32] Other revenue and expenditure variables also had associations with the change in tuition at public institutions over the period 1988–89 to 1997–98, varying by type of institution. In addition, the variables associated with changes in tuition tended to differ among the sub-periods, and the amount of variation in the change in tuition accounted for by the independent variables was highest for the 1990–91 to 1994–95 sub-period (the longest sub-period and the one in which in-state

[32]Although the proportions of variation in tuition changes accounted for by changes in appropriations and changes in instruction expenditures were closer for public bachelor's institutions than for the other groups of public institutions.

undergraduate tuition levels were rising the fastest) in each of the models. These differences among sub-periods suggest that any analysis of changes in tuition and financial variables needs to consider relationships between those variables over a long period of time in order to accurately portray change.

The model results were consistent with the findings of the original GAO study, which examined public 4-year institutions over the period 1989–90 to 1994–95 and found that the size of tuition increases was most strongly associated with the amount of change in revenue from non-tuition sources and certain expenditure categories. The most important variables in the GAO study, which together accounted for about half of the variation in changes in tuition, were: the change in government appropriations; the change in instruction expenditures; the change in revenue from grants, contracts, and other sources; the change in the amount by which revenues exceeded or fell short of expenditures; the change in other student-related expenditures; the change in non-student-related expenditures; and the change in research expenditures.

Finally, it is important to keep in mind that in several of these models—particularly for public 2-year institutions—the R-squared values are relatively low, with more of the variance in tuition changes remaining unexplained than "explained" by the variables included in the models. Tuition policies at public institutions are likely to be influenced by state and local policy decisions that were outside the parameters of this model, such as limits on enrollment and student aid practices. Nonetheless, the results of these models point to associations between variables that are consistent with the findings of previous research and contribute to an understanding of financial patterns at public institutions.

Chapter IV: Revenues, Expenditures, and Prices at Private Not-for-Profit Four-Year Institutions

This chapter focuses on the results of the second analytical component of the study, the trend analysis and modeling of expenditures, revenues, and prices for private not-for-profit 4-year institutions. The chapter describes changes over time in various expenditure and revenue categories as well as in tuition levels for private not-for-profit 4-year institutions. This chapter also presents the results of a structural model examining relationships at private not-for-profit institutions.

Data and Methods

In order to examine comparative changes over time, trend data on expenditures, revenues, enrollment, and prices were calculated for the period 1988–89 to 1995–96, using a panel of private not-for-profit 4-year institutions. These data capture both average, inflation-adjusted dollar changes over the whole period and average annual percentage changes. In addition, shifts in the composition of E&G revenues and expenditures are described.

To better understand the statistical relationships between various factors and tuition, a structural model presented in a report by Westat Inc. and Pelavin Associates (1994) under contract with the U.S. Department of Education, *An Analysis of Institutional Decision Making—Final Report on Estimation Results* (hereafter referred to as the Westat/Pelavin model), was updated. The study developed a simultaneous equation model, which attempted to capture the factors influencing the supply of and demand for college placements and describe the competitive environments of private not-for-profit 4-year institutions over the period 1984 to 1989. The structure of the model allowed observed levels of tuition to be viewed as "equilibrium" prices at a specific point in time, while the equations also included various factors that were expected to influence schools' and students' decisions regarding enrollment.[33] The model assumed that prices and new enrollments simultaneously determine each other and are "endogenous" (jointly depend-

[33]"Equilibrium" prices occur at the point at which the demand and supply curves intersect, and where the quantity demanded is equal to the quantity supplied. The standard formulation of demand/supply curve equations places the quantity demanded/supplied (new enrollments in this case) on the left side of the equations and price (tuition) on the right, where the quantity demanded/supplied is a function of price plus other factors. In order to focus on prices, the Westat/Pelavin model re-expressed the equations' functional forms so that price is a function of enrollment plus other factors, leading to *inverse* demand/supply curves.

ent), while other factors included in the model were assumed to be "exogenous" (predetermined or derived externally).[34]

One equation in the model tried to capture students' perspectives of prices given certain characteristics of the institutions and the market in which they operate (in other words, measures of the external environment). In this equation, prices (tuition levels) were assumed to be a function of new enrollments, plus other factors:[35]

- Instructional quality, represented by the proxies of per student expenditures on instruction, research, and physical plant maintenance, as well as the faculty/student ratio, for the previous year;
- Prestige, represented by endowment income, admissions test scores, and percentage of applicants admitted the previous year;
- The provision of ancillary services and resources, represented by student services for the previous year;
- The cost of attending alternative institutions, as measured by the average tuition at public institutions in the same state and the proportion of students attending private institutions in the state; and
- The availability of financial aid, represented by expenditures on institutional scholarships and fellowships.

Much of the information available to prospective students is from the previous year, and the measures reflected that reality. In order to model the equation, the general factors had to be represented by specific, measurable variables. Many of these variables were proxies and may not accurately capture the influences they attempt to represent; this is likely to be particularly true for instructional quality and institutional prestige, which are extremely difficult to measure (Bradburd and Mann 1990).

The second equation tried to capture institutions' internal perspectives on prices charged, given their costs of production and other internal factors. From this perspective, institutions must raise tuition to the level at which it will cover their current budgets (alternatively, they can only

[34]Another way of describing these terms is that "endogenous" variables are determined within the economic model, while "exogenous" variables are taken as a given by the model.

[35]More accurately, prices and new enrollments are a function of each other; however, this characterization describes the functional form of the equations, which set price on the left side of the equations. Thus, in the presentation of model results in this chapter, price is described as the dependent variable and other factors—including new enrollments—are described as independent variables, as reflected in the output of standard statistical software.

spend what they raise). In this equation, prices also were assumed to be a function of new enrollments, plus other factors:[36]

- The cost of inputs needed to educate students, represented by average faculty salaries, as well as expenditures on instruction, administration, student services, and student aid;[37] and
- Other revenue that may offset the costs incurred in educating students, such as endowment income.

It is important to note that in this model, some variables were used in both equations, but as proxies for different aspects of the relationships characterized by the two equations. For example, institutional aid expenditures represent the availability of financial aid from the student perspective (which reduces the price they must pay) in one equation, but represents part of an institution's cost of educating students from the internal perspective in the other equation.

In the model, natural logarithms were taken of the variables on both sides of the equations, so that the results would express "elasticities," or the percentage change in the independent variables associated with a one percent change in the dependent variable (price). The model also tried to identify the extent of tuition increases that were not accounted for by other factors in the equation, by including dummy variables for each year (other than the base year, 1984 in the Westat/Pelavin study). Each dummy variable was defined so that it was equal to 1 if an observation was for a specific year (e.g., 1987), and 0 if the observation was for another year (e.g., any year but 1987).[38] Because observations for the base year were coded 0 in all of the dummy variables, each dummy variable year is measured relative to the base year (1984). The estimates for these dummy variables can be interpreted as representing factors that had not been included in the model that were associated with prices over time. Three-stage least squares regression was used to simultaneously estimate the coefficients of both equations for each group of private not-for-profit institutions.[39] In addition, reduced form regressions were performed for each sector.[40]

[36]It should be noted that private not-for-profit institutions typically have a target for enrollment that does not allow for unlimited growth.

[37]When direct measures of the prices of inputs were not available, per-student expenditures were used in several categories.

[38]Note that each institution has multiple observations, one for each year of data included in the model.

[39]The three-stage least squares procedure allows estimation of systems of structural equations where some equations contain endogenous variables among the explanatory variables. See Appendix A for details.

[40]Reduced form regressions incorporate all exogenous variables from both equations into one model, with tuition as the dependent variable (enrollment is excluded because it is endogenous, in other words, jointly determined with the dependent variable). Whereas structural equations explore the direct relationships among variables (and are based on a stronger set of assumptions), reduced form equations capture the aggregate effect of the exogenous factors on the endogenous variables (tuition and enrollment), including the indirect effects of the exogenous variables as well as direct effects. Nevertheless, they are useful to support the findings of the economic model. The coefficient estimates can be interpreted descriptively as the proportional change in tuition associated with a proportional change in the exogenous variables.

The models presented in the following section update the Westat/Pelavin model, with a few minor modifications, using data for a later time period, 1989–90 to 1995–96 (table 19).[41] Therefore, 1989–90 represents the base year of the updated model. Two of the three proxy measures of institutional reputation/prestige were eliminated from the first equation due to unavailability of data. Conversely, a few independent variables were added to the model to capture additional "external" and "internal" factors that were expected to be associated with prices. The models include the following variables (see table 20):

Equation 1 ("external" factors):

- Dependent variable: Undergraduate tuition and required fees[42]
- First-time freshmen FTE students[43]
- Indicators of the competitive environment:
  - Average in-state undergraduate tuition at public institutions in the state[44]
  - Proportion of undergraduates in the state enrolled at private not-for-profit 4-year institutions
- Proxies for quality of instruction:
  - Previous year's instruction expenditures
  - Previous year's expenditures on plant maintenance, plus transfers
  - Previous year's research expenditures
  - Previous year's student/faculty ratio
- Proxy for institutional prestige/recognition:

[41]Note that because of the need for lagged variables, the time period for the model extends from 1989–90 to 1995–96, while the data (for some variables) begin in 1988–89.

[42]In general, in-state tuition does not differ much, if at all, from out-of-state tuition at private not-for-profit institutions. In fact, in 1995–96, in-state differed from out-of-state undergraduate tuition at only five of the 690 private not-for-profit institutions in the panel, and the average tuition levels differed by less than one-half of one percent. Therefore, although the variable for in-state tuition was used in the analysis, it is referred to here simply as undergraduate tuition.

[43]For simplification, first-time freshmen were chosen as the enrollment measure. It is possible that total undergraduate enrollment is also associated with price.

[44]This indicator represents competition for students within the state; however, competition with public institutions for out-of-state students may also be relevant, especially for private not-for-profit institutions that draw from a national base. According to NCES data from the National Postsecondary Student Aid Study (NPSAS), in 1995–96, almost 65 percent of undergraduates attending all private not-for-profit 4-year institutions were attending an institution in the state of their legal residence; for private not-for-profit research/doctoral institutions, the percentage was about 48 percent, while for comprehensive and bachelor's institutions, the percentage was over 70 percent. U.S. Department of Education, National Center for Education Statistics, 1995–96 National Postsecondary Student Aid Study (NPSAS:96), Undergraduate Data Analysis System.

Table 19.—Characteristics of simultaneous equation model for private not-for-profit institutions

Equation 1 ("external" factors):	**1994 Westat/Pelavin Model**	**Updated Model**
Dependent variable:	Log of published tuition	Log of full-time, full-year undergraduate tuition and required fees
Independent variables:	Log of new enrollments	Log of first-time freshmen FTE students
Indicators of competitive environment	Log of the average tuition of public institutions in the state	Log of average in-state undergraduate tuition at public 4-year institutions in the state
	Log of the proportion of students in the state attending private institutions	Log of the proportion of undergraduates enrolled at degree-granting, Title IV participating higher education institutions in the state in the fall semester who were attending private not-for-profit 4-year institutions
Quality of instruction	Log of previous year's instruction expenditures per student	Same
	Log of previous year's expenditures per student on maintenance and operation of physical plant, plus transfer payments	Same
	Log of previous year's research expenditures per student	Same
	Log of previous year's faculty/student ratio	Log of previous year's ratio of total FTE students to total full-time instructional faculty
Indicators of prestige and recognition	Log of previous year's top SAT quartile	Eliminated due to lack of data
	Log of previous years' percent accepted	Eliminated due to lack of data
	Log of total endowment income	Add revenue from private gifts, grants, and contracts, to get log of philanthropic revenue per student
Financial aid	Log of expenditures per student on institutional aid	Same
Ancillary services	Log of previous year's student service expenditures per student	Same

Table 19.—Characteristics of simultaneous equation model for private not-for-profit institutions—Continued

Equation 1 ("external" factors):

	1994 Westat/Pelavin Model	Updated Model
Consumer purchasing power		Add: log of per capita income in the state
Cumulative rate of increase from other sources	1985	1991
	1986	1992
	1987	1993
	1988	1994
	1989	1995
		1996

Equation 2 ("internal" institutional factors):

	1994 Westat/Pelavin Model	Updated Model
Dependent variable:	Log of published tuition	Log of in-state, full-time, full-year undergraduate tuition and required fees
Independent variables:	Log of new enrollments	Log of first-time freshmen FTE students
Price of inputs	Log of instruction expenditures per student	Same
	Log of institutional aid per student	Same
	Log of average faculty salary	Log of average salary and fringe benefits for full-time instructional faculty on 9/10-month or 11/12-month contracts
	Log of administrative expenditures per student	Separate into two variables: log of institutional support expenditures per student, and log of academic support expenditures per student
	Log of student services expenditures per student	Same
		Add: ratio of graduate FTE enrollment to total FTE enrollment

Table 19.—Characteristics of simultaneous equation model for private not-for-profit institutions—Continued

Equation 2 ("internal" institutional factors):		
	1994 Westat/Pelavin Model	**Updated Model**
Available revenue	Log of total endowment income	Add revenue from private gifts, grants, and contracts, to get log of philanthropic revenue per student Add: log of federal grants and contracts less federal aid funds Add: log of appropriations and grants and contracts from state and local sources, less state/local aid funds
Cumulative rate of increase from other sources	1985 1986 1987 1988 1989	1991 1992 1993 1994 1995 1996

SOURCE: Westat Inc. and Pelavin Associates. 1994. *An Analysis of Institutional Decision-Making—Final Report on Estimation Results.* Prepared for the U.S. Department of Education, Office of the Under Secretary.

Table 20.—Variables included in the simultaneous equation model for private not-for-profit institutions

Equation 1 (“external” factors):	
tfuglg	Log of undergraduate tuition
ftefflg	Log of first-time freshmen FTE students
avtflg	Log of average in-state undergraduate tuition at public 4-year institutions in the state
perprlg	Log of the proportion of undergraduates enrolled in the state who were attending private not-for-profit 4-year institutions
instln	Log of previous year’s instruction expenditures per student
pltrln	Log of previous year’s expenditures per student on plant maintenance, plus transfer payments
resln	Log of previous year’s research expenditures per student
stufcln	Log of previous year’s student/faculty ratio
phillg	Log of philanthropic revenue per student
iaidlg	Log of expenditures per student on institutional aid
studln	Log of previous year’s student service expenditures per student
stinclg	Log of per capita income in the state
dummy91	Dummy variable for 1991
dummy92	Dummy variable for 1992
dummy93	Dummy variable for 1993
dummy94	Dummy variable for 1994
dummy95	Dummy variable for 1995
dummy96	Dummy variable for 1996
reslnd	Dummy variable for zero values in resln (research/doctoral, comprehensive, bachelor's)
pltrlnd	Dummy variable for zero values in pltrln (research/doctoral, comprehensive, bachelor's)
phillgd	Dummy variable for zero values in phillg (comprehensive)
ftelgd	Dummy variable for zero values in ftefflg (bachelor's)
iaidlgd	Dummy variable for zero values in iaidlg (bachelor's)
tfuglgd	Dummy variable for zero values in tfuglg (bachelor's)
studlnd	Dummy variable for zero values in studln (bachelor's)

Table 20.—Variables included in the simultaneous equation model for private not-for-profit institutions—Continued

Equation 2 ("internal" institutional factors):	
tfuglg	Log of undergraduate tuition
ftefflg	Log of first-time freshmen FTE students
instlg	Log of instruction expenditures per student
iaidlg	Log of institutional aid per student
avcmplg	Log of average faculty compensation
insplg	Log of institutional support expenditures per student
acadlg	Log of academic support expenditures per student
studlg	Log of student services expenditures per student
pergd	Ratio of graduate FTE enrollment to total FTE enrollment
phillg	Log of philanthropic revenue per student
fdgrlg	Log of federal grants and contracts less federal aid funds
stlolg	Log of appropriations and grants and contracts from state and local sources, less state/local aid
dummy91	Dummy variable for 1991
dummy92	Dummy variable for 1992
dummy93	Dummy variable for 1993
dummy94	Dummy variable for 1994
dummy95	Dummy variable for 1995
dummy96	Dummy variable for 1996
stlolgd	Dummy variable for zero values in stlolg (research/doctoral, comprehensive, bachelor's)
fdgrlgd	Dummy variable for zero values in fdgrlg (comprehensive, bachelor's)
phillgd	Dummy variable for zero values in phillg (comprehensive)
ftelgd	Dummy variable for zero values in ftefflg (bachelor's)
tfuglgd	Dummy variable for zero values in iaidlg (bachelor's)
iaidlgd	Dummy variable for zero values in tfuglg (bachelor's)
studlgd	Dummy variable for zero values in studlg (bachelor's)

NOTE: Dummy variables were required for certain logged variables in order to identify zero values, which were inserted in cases with missing data or negative values (for which logarithms return no value).

    - Philanthropic revenue (endowment income plus private gifts, grants, and contracts)[45]
- Availability of financial aid:
    - Expenditures on institutional aid[46]
- Indicator of ancillary services:
    - Previous year's expenditures on student services
- Measure of in-state consumer purchasing power:[47]
    - Average per capita income in the state
- Measures of change over time in the relationship between price and enrollment, not accounted for by other independent variables in the equation:
    - Dummy variables for 1991, 1992, 1993, 1994, 1995, 1996 (base year = 1990)

Equation 2 ("internal" factors):

- Dependent variable: Undergraduate tuition and required fees
- First-time freshmen FTE students
- Proxies for price of inputs:
    - Instruction expenditures
    - Institutional aid expenditures
    - Average faculty compensation
    - Academic support expenditures
    - Institutional support expenditures
    - Student services expenditures
    - Ratio of graduate to total FTE enrollment

[45]Note that the other two indicators of prestige from the Westat/Pelavin model, SAT scores and the percentage of applicants admitted, had to be dropped due to the lack of data. Endowment income was combined with private gifts revenue, on the premise that both were associated with institutional prestige. Note that some revenue from private grants and contracts also is included.

[46]Other forms of student aid, such as aid from federal, state, or local governments, were not captured in the original Westat/Pelavin model and are not included in the updated model. This is partly due to the limitations of IPEDS prior to the changes in FASB standards, as it does not fully account for aid—for example, revenue from federal student loans generally shows up in revenue from tuition and fees. Chapter V attempts to explore the relationship, if any, of various forms of aid with college prices.

[47]This measure reflects *in-state* consumer purchasing power, whereas many private not-for-profit institutions draw a substantial proportion of their students from out-of-state. For those institutions that have relatively small proportions of out-of-state students, however, state per capita income may be a proxy for consumer purchasing power in general. According to data from the National Postsecondary Student Aid Study (NPSAS), in 1995–96 almost half of undergraduates attending private not-for-profit research/doctoral institutions were in-state residents, compared to 74 percent attending private not-for-profit comprehensive institutions and 72 percent attending bachelor's institutions. U.S. Department of Education, National Center for Education Statistics, 1995–96 National Postsecondary Student Aid Study (NPSAS:96), Undergraduate Data Analysis System.

- Measures of available nontuition revenue:
  - Philanthropic revenue (endowment income plus private gifts, grants, and contracts)
  - Federal grants and contracts, less federal aid funds
  - Revenue from state and local sources, less state/local aid
- Measures of change over time in the relationship between price and enrollment, not accounted for by other independent variables in the equation:
  - Dummy variables for 1991, 1992, 1993, 1994, 1995, 1996 (base year = 1990)

As in the 1994 model, many of these variables are proxies, assumed to measure certain "external" and "internal" factors that were expected to be associated with tuition levels. In addition several of the variables are included in both equations but represent different aspects of the relationships.

Data Sources, Panel Selection, and Statistical Procedures

The primary source of data for both the trend analysis and the simultaneous equation modeling is the IPEDS surveys for 1988–89 to 1995–96. In addition, estimates of state per capita income were compiled from the Bureau of Economic Analysis. The use of available data for the analysis is based on some important assumptions and limitations on the time periods examined. Because the revenue and expenditure data are not broken down by level of student (while the dependent variable is undergraduate tuition), the analysis attempted to limit the universe of institutions to those with primarily undergraduate enrollment and added a variable to the model to reflect the proportion of graduate students at private not-for-profit institutions. In addition, a consistent time series of finance data for private not-for-profit institutions was available only up to 1995–96, due to changes in Financial Accounting Standards Board (FASB) accounting standards that were incorporated into IPEDS in Fiscal Year 1997. Therefore, the time period of the analysis is two years shorter than the analysis of public institutions presented in Chapter III.

The universe of private not-for-profit institutions was drawn from Title IV-participating, degree-granting, 4-year institutions located in the 50 states and the District of Columbia. The institutions were further divided by Carnegie classification into research/doctoral, comprehensive, and bachelor's institutions. The following institutions were eliminated from the universe: institutions that enrolled less than 200 FTE students; institutions with less than 50 percent undergraduate enrollment as a percentage of total fall headcount enrollment; and institutions with less than 25 percent full-time enrollment as a percentage of total fall headcount enrollment.[48] The final dataset comprises three panels of institutions with data for all eight years. The total number of

[48]Data for 1995–96 were used to define and measure all of these selection criteria.

institutions remaining in the panels was 690 (research/doctoral = 47; comprehensive = 192; bachelor's = 451).[49] All financial data were adjusted for inflation using the Consumer Price Index (CPI-U, 1982–84 = 100), to constant 1999 dollars. Revenue and expenditure variables were calculated on a per FTE student basis, where FTE was generated from reported or estimated fall instructional activity (credit hours).

In updating the simultaneous equation model, natural logarithms were taken of variables in both equations.[50] In cases in which variables contained zero or negative values, zero values were inserted into the logged variables.[51] The final structure of the data for the modeling includes seven observations for each institution, one for each year of the analysis.

Three-stage least squares was used to estimate the model coefficients simultaneously. Following the framework of the 1994 study, the results of the models are presented for each institutional type, including the following statistics for each equation: R-squared; root mean square error (RMSE); the model probability; the number of valid observations; the estimated coefficients for each independent variable; the standard error of the estimate; and the probability of the Z statistic for each independent variable.[52] The estimated coefficients of the logged independent variables can be interpreted as "elasticities"—in other words, each estimate represents the percentage change in tuition (the dependent variable) associated with a one percent change in an independent variable, adjusting statistically for the covariation of all other independent variables.[53] Conversely, the reciprocal of the estimate can be interpreted as the percentage change in an independent variable associated with a one percent change in tuition, again adjusting statistically for the covariation of all other independent variables. Through a simple calculation, the coefficients of the dummy variables for years can be interpreted as the change in tuition since the base year

[49]The original number of private not-for-profit 4-year institutions in the IPEDS dataset in 1995–96 was 2,004. The various selection criteria and missing data procedures eliminated 1,314 institutions, 66 percent of the total. However, institutions remaining in the panel comprised 66 percent of the total undergraduate enrollment at all private not-for-profit 4-year institutions in 1995–96. Selection criteria are comparable to those used in most contemporary studies of higher education costs and prices. See Appendix A for details on how many institutions were eliminated at each step, as well as bias analyses of the differences in the characteristics of institutions included in and excluded from the final universes.

[50]The only exception is the ratio of graduate to total enrollment. Logs were not taken of this ratio due to the large number of zero values, especially for comprehensive and bachelor's institutions.

[51]Negative values occurred in some computed variables due to the imputation process. Logarithms cannot be taken of missing, zero, or negative values; therefore, zero values were inserted for these cases. Separate dummy variables were then created to identify these cases. See Appendix A for details.

[52]Note that because the population is a census, some of these statistics were displayed not to measure significance, but rather to gauge the explanatory power of the model as a whole (model probability) or the strength of the relationships between the independent variables and the dependent variable (probability of the Z statistic).

[53]As noted above, according to the model, tuition and enrollment actually determine each other; therefore a change in either one requires an external cause. However, given the functional form of the equations, the presentation of the results treats enrollment as an independent variable. In this case, the elasticity represents the proportional change in tuition associated with a change in enrollment, but the change in enrollment must have some exogenous cause. See Westat Inc. and Pelavin Associates (1994).

(1989–90), adjusting statistically for the covariation of the independent variables included in the equations.[54]

Reduced form regressions also were performed within each institutional type, and the results are presented.[55] The statistics provided are similar to those from the simultaneous equation models, with the addition of adjusted R-squared, which attempts to compensate for the fact that simply adding more independent variables tends to increase the value of multiple R-squared. Pearson's correlation coefficients of each independent variable with the dependent variable (tuition) also are presented. (See Appendix A for details regarding data and statistical procedures.)

Trends in Enrollment, Tuition, Revenues, and Expenditures

The results of the trend analysis for private not-for-profit institutions highlight several major findings for each institutional type. In each set of findings, average amounts and percentage changes are reported on an inflation-adjusted basis wherever applicable.

Research/Doctoral Institutions

The sub-group of 47 private not-for-profit research/doctoral institutions comprised 2.5 percent of undergraduate enrollment at all public and private not-for-profit institutions in fall 1997. Over the period between 1988–89 and 1995–96, undergraduate tuition at private not-for-profit research/doctoral institutions increased by about $3,783 in constant 1999 dollars, or by 3.6 percent annually. On average, total headcount and FTE fall enrollment at research/doctoral institutions did not change over this period, while FTE first-time freshmen enrollment decreased slightly (table 21.)

Private not-for-profit institutions, which include research/doctoral institutions, rely heavily on tuition as a source of revenue. Thus, tuition revenue at research/doctoral institutions made up the largest proportion of total E&G revenue, 49.0 percent on average. In addition, tuition rose at one of the highest rates of average annual increase among the various sources of revenue, at 3.5 percent in real dollar terms; in comparison, total E&G revenue increased annually by 3.1 percent on average. The second largest proportion of E&G revenue was federal grants and contracts, which on average accounted for 16.4 percent of the total and increased annually by 2.5 percent (table 21).

[54]The calculation is as follows: take the inverse log (to base e) of the estimated dummy coefficient, and subtract 1 from it.

[55]In the reduced form regressions, the coefficients are not elasticities, but can be interpreted descriptively as the proportional change in tuition associated with a proportional change in the exogenous variables.

Table 21.—Average change in price, enrollment, revenue, and expenditures at private not-for-profit research/doctoral institutions: 1988–89 to 1995–96

	Average change, in constant 1999 dollars	Average annual percentage change	Proportion of total revenues/ expenditures, on average	Proportion of total E&G revenues/ expenditures, on average
Undergraduate tuition for FY, FT students	$3,783	3.6	—	—
Graduate tuition	3,382	3.7	—	—
Total fall enrollment	—	0.1	—	—
FTE fall enrollment	—	-0.1	—	—
FTE first time enrollment	—	-1.0	—	—
Revenue (per FTE) by source:				
Tuition	3,702	3.5	35.9	49.0
Federal appropriations	0	0.0	0.0	0.0
State appropriations	-102	-5.2	0.5	0.6
Local appropriations	0 *	1.8	0.0 *	0.0 *
Federal grants and contracts	893	2.5	12.0	16.4
State grants and contracts	173	4.4	1.3	1.8
Local grants and contracts	81	13.8	0.2	0.3
Private gifts, grants, and contracts	373	1.8	7.1	9.7
Endowment income	249	1.4	6.1	8.4
Sales and services of educational activities	748	5.4	4.9	6.7
Other	612	4.2	5.2	7.1
Auxiliary enterprises	268	0.9	9.5	—
Hospital	1,408	3.5	14.8	—
Independent operations	134	1.8	2.6	—
Total revenue	8,666	2.9	100.0	—
E&G revenue	6,730	3.1	—	100.0
Expenditures (per FTE) by function:				
Instruction	2,525	3.3	26.5	36.0
Research	853	2.7	10.3	14.0
Public service	205	5.2	1.3	1.8
Academic support	299	1.7	6.2	8.4
Student services	309	2.9	3.5	4.8
Institutional support	460	2.0	7.6	10.3
Plant operations/maintenance	145	1.0	4.7	6.4
Scholarships and fellowships	1,824	6.7	9.4	12.8
Mandatory transfers	42	1.2	1.4	2.0
Nonmandatory transfers	1,133	17.6	2.9	4.0
Auxiliary enterprises	193	0.7	9.2	—
Hospital	1,318	3.3	14.3	—
Independent operations	162	2.3	2.5	—
Total expenditures	9,469	3.2	100.0	—
Total E&G	6,872	3.2	—	100.0
Institutional scholarships and fellowships	1,771	8.7	—	—
Average faculty compensation	3,562	0.7	—	—

N = 47

— Not applicable.

* Value rounds to less than $1 or less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

Gross tuition revenue also accounted for slightly increasing proportions of total E&G revenue at research/doctoral institutions over this period. From 1988–89 to 1995–96, the proportion of E&G revenue made up of tuition revenue increased by 1.3 percentage points. The proportion of revenue from other, nontuition sources decreased slightly over this period—for example, revenue from endowment income and private gifts, grants, and contracts combined decreased as a proportion of E&G revenue by about 2 percentage points (table 22).

On the expenditure side, instruction made up the largest proportion of total E&G expenditures, 36.0 percent on average. Research expenditures constituted the second largest proportion, at 14.0 percent, with scholarships and fellowships following at 12.8 percent of total E&G expenditures and institutional support at 10.3 percent. The inflation-adjusted, average annual rates of growth of these expenditures varied, from 3.3 percent for instruction and 2.7 percent for research, compared to 3.2 percent for E&G expenditures as a whole. Institutional scholarships and fellowships were one of the fastest growing expenditure categories, increasing annually by 8.7 percent on average (table 21). As a result, the composition of E&G expenditures shifted over this period. Scholarships and fellowships made up an increasing proportion of total E&G expenditures, increasing by 3.0 percentage points. The proportion of instruction expenditures remained relatively stable, while the proportions for academic support, institutional support, and plant operations and maintenance fell slightly (table 22).

Comprehensive Institutions

The sub-group of 192 private not-for-profit comprehensive institutions comprised 3.7 percent of undergraduate enrollment at all public and private not-for-profit institutions in fall 1997. Undergraduate tuition at comprehensive institutions increased by about $2,992 in constant 1999 dollars, or by 4.1 percent annually, over the period 1988–89 to 1995–96. On average, total headcount and FTE fall enrollment at these schools increased annually, by 1.5 percent and 1.3 percent respectively, while FTE first-time freshmen enrollment decreased slightly (table 23).

Tuition revenue made up the largest proportion of total E&G revenue, 72.0 percent on average, and rose at one of the highest rates of average annual increase among the various sources of revenue, 3.8 percent in real dollar terms. In comparison, total E&G revenue increased annually by 2.8 percent on average. The source of revenue providing the second largest proportion of E&G revenue was private gifts, grants, and contracts, 8.3 percent on average (table 23). Tuition revenue accounted for slightly increasing proportions of total E&G revenue at comprehensive institutions over this period, increasing by 5.1 percentage points. As with research/doctoral institutions, the proportion of revenue from endowment income and private gifts, grants, and contracts decreased slightly over this period, by 3.1 percentage points for both sources (table 24).

Table 22.—Percentage composition of E&G revenue and expenditure at private not-for-profit research/doctoral institutions, on average: 1988–89 to 1995–96

	1988–89	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96
Tuition	48.0	48.1	48.7	48.8	49.2	49.9	49.6	49.3
Federal appropriations	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
State appropriations	0.9	0.9	0.8	0.5	0.5	0.4	0.5	0.5
Local appropriations	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *
Federal grants and contracts	16.8	16.4	16.4	16.6	16.7	16.4	16.1	16.1
State grants and contracts	1.8	1.7	1.7	1.7	1.7	1.8	2.1	1.9
Local grants and contracts	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.4
Private gifts, grants, and contracts	10.3	10.1	10.0	9.8	9.5	9.4	8.9	9.4
Endowment income	9.4	9.1	8.8	8.3	7.8	7.7	7.8	8.3
Sales and services of educational activities	5.9	6.2	6.5	6.6	6.9	7.2	7.3	6.9
Other	6.6	7.2	7.0	7.4	7.3	6.9	7.3	7.1
E&G revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Instruction	35.1	35.7	35.9	35.8	35.9	36.7	37.0	35.4
Research	14.7	14.2	13.9	13.8	13.9	13.7	13.9	14.2
Public service	1.8	1.6	1.7	1.7	1.8	1.8	1.9	2.0
Academic support	9.0	8.3	8.7	8.6	8.6	8.2	7.7	8.1
Student services	4.8	4.8	4.9	4.9	4.7	4.7	4.7	4.8
Institutional support	11.1	10.5	10.4	10.3	10.0	10.2	10.0	10.2
Plant operation/maintenance	7.0	6.7	6.5	6.5	6.3	6.3	6.1	6.1
Scholarships and fellowships	11.3	11.5	12.0	12.8	13.3	13.6	14.0	14.3
Mandatory transfers	2.1	2.2	2.0	1.9	1.9	1.9	1.9	1.8
Nonmandatory transfers	3.8	4.3	4.2	3.8	3.7	2.9	2.8	6.2
E&G expenditures	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N = 47

* Values round to less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before percentage shares were calculated. All revenue and expenditure categories are per full-time equivalent (FTE) student.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

Table 23.—Average change in price, enrollment, revenue, and expenditures at private not-for-profit comprehensive institutions: 1988–89 to 1995–96

	Average change, in constant 1999 dollars	Average annual percentage change	Proportion of total revenues/ expenditures, on average	Proportion of total E&G revenues/ expenditures, on average
Undergraduate tuition for FY, FT students	$2,992	4.1	—	—
Graduate tuition	1,721	3.6	—	—
Total fall enrollment	—	1.5	—	—
FTE fall enrollment	—	1.3	—	—
FTE first time enrollment	—	-0.6	—	—
Revenue (per FTE) by source:				
Tuition	2,739	3.8	61.4	72.0
Federal appropriations	31	3.1	0.9	1.1
State appropriations	-64	-9.3	0.5	0.5
Local appropriations	0 *	24.6	0.0 *	0.0 *
Federal grants and contracts	75	1.5	6.2	7.3
State grants and contracts	64	2.7	2.6	3.1
Local grants and contracts	-14	-5.8	0.1	0.1
Private gifts, grants, and contracts	-68	-0.2	7.0	8.3
Endowment income	-42	-1.0	2.8	3.3
Sales and services of educational activities	-6	-0.4	0.9	1.1
Other	81	2.6	2.7	3.1
Auxiliary enterprises	40	0.2	14.6	—
Hospital	13	55.4	0.1	—
Independent operations	-3	-0.2	0.4	—
Total revenue	2,891	2.4	100.0	—
E&G revenue	2,795	2.8	—	100.0
Expenditures (per FTE) by function:				
Instruction	627	1.9	28.4	32.7
Research	112	10.9	1.0	1.2
Public service	7	0.8	1.0	1.1
Academic support	161	2.3	5.9	6.8
Student services	333	3.4	8.3	9.6
Institutional support	84	0.5	13.7	15.7
Plant operations/maintenance	28	0.4	7.0	8.0
Scholarships and fellowships	1,324	6.6	17.7	20.4
Mandatory transfers	65	3.4	1.9	2.1
Nonmandatory transfers	32	1.8	2.3	2.6
Auxiliary enterprises	-127	-0.8	12.5	—
Hospital	11	36.9	0.1	—
Independent operations	-17	-2.9	0.4	—
Total expenditures	2,641	2.2	100.0	—
Total E&G	2,824	2.8	—	100.0
Institutional scholarships and fellowships	1,284	10.2	—	—
Average faculty compensation	3,791	1.0	—	—

N = 192

— Not applicable.

* Value rounds to less than $1 or less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

Table 24.—Percentage composition of E&G revenue and expenditure at private not-for-profit comprehensive institutions, on average: 1988–89 to 1995–96

	1988–89	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96
Tuition	68.4	69.9	71.7	72.0	73.6	73.5	73.7	73.5
Federal appropriations	1.1	1.1	1.2	1.1	1.0	1.0	1.0	1.1
State appropriations	0.9	0.7	0.7	0.5	0.5	0.4	0.3	0.3
Local appropriations	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0
Federal grants and contracts	7.5	7.7	7.0	7.4	7.5	7.1	7.9	6.7
State grants and contracts	3.0	3.1	2.9	3.4	3.1	3.0	3.1	2.9
Local grants and contracts	0.2	0.1	0.1	0.1	0.1	0.1	0.0 *	0.0 *
Private gifts, grants, and contracts	10.1	9.0	8.5	8.2	7.3	8.3	7.1	7.9
Endowment income	4.0	3.9	3.7	3.2	3.1	2.9	2.9	3.1
Sales and services of educational activities	1.2	1.3	1.2	1.1	1.0	1.0	1.0	1.0
Other	3.6	3.3	3.1	3.0	2.9	2.8	3.0	3.5
E&G revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Instruction	33.6	33.0	33.4	32.9	32.7	32.3	31.8	31.7
Research	0.9	0.9	0.9	1.0	1.1	1.3	1.8	1.5
Public service	1.2	1.2	1.1	1.1	1.1	1.2	1.2	1.1
Academic support	6.9	6.9	6.9	6.8	6.8	6.6	6.5	6.7
Student services	9.3	9.4	9.7	9.6	9.6	9.7	9.7	9.8
Institutional support	17.1	16.9	16.6	15.7	15.1	15.0	14.6	14.7
Plant operation/maintenance	8.8	8.6	8.3	8.0	7.7	7.7	7.5	7.5
Scholarships and fellowships	17.6	18.3	18.8	20.5	21.3	21.7	22.0	22.6
Mandatory transfers	2.0	2.2	2.0	2.2	2.2	2.1	2.3	2.1
Nonmandatory transfers	3.0	3.0	2.6	2.2	2.4	2.3	2.7	2.6
E&G expenditures	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N = 192
* Values round to less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before percentage shares were calculated. All revenue and expenditure categories are per full-time equivalent (FTE) student.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

Instruction expenditures made up the largest proportion of total E&G expenditures at comprehensive institutions, 32.7 percent on average. Scholarships and fellowships made up the second largest proportion, at 20.4 percent, with institutional support following at 15.7 percent of total E&G expenditures. Instruction expenditures experienced real average annual increases of 1.9 percent over this period and institutional support expenditures remained relatively flat, compared to 2.8 percent for E&G expenditures as a whole. Institutional scholarships and fellowships was one of the fastest growing expenditure categories, increasing annually by 10.2 percent on average (table 23). As a result of these differences in rates of growth, the composition of E&G expenditures shifted over time at comprehensive institutions. Scholarships and fellowships made up an increasing proportion of total E&G expenditures, increasing by 5.0 percentage points. The proportion of instruction-related expenditures decreased by 1.9 percentage points while the proportion for institutional support fell by 2.4 percentage points (table 24).

Bachelor's Institutions

The sub-group of 451 private not-for-profit bachelor's institutions comprised 5 percent of undergraduate enrollment at all public and private not-for-profit institutions in fall 1997. Undergraduate tuition at bachelor's institutions increased by about $2,841 in constant 1999 dollars over the whole period, or by 3.7 percent annually. Although total headcount and FTE fall enrollment increased slightly, by 1.6 percent and 1.4 percent annually, FTE first-time freshmen enrollment remained almost flat (table 25).

Bachelor's institutions relied heavily on tuition revenue, which made up the largest proportion of total E&G revenue (64.1 percent on average). Tuition also had one of the highest rates of average annual increase among the various sources of revenue, at 3.4 percent in inflation-adjusted terms. Private gifts, grants, and contracts revenue made up the second largest proportion of E&G revenue, 12.9 percent on average, with endowment income third at 8.8 percent. These sources of revenue experienced small annual increases over this period of 1.1 percent and 1.5 percent, respectively (table 25). Given its relatively high rate of increase, tuition revenue accounted for an increasing proportion of total E&G revenue, increasing by 4.2 percentage points over this period. The proportion of revenue from endowment income and private gifts, grants, and contracts decreased slightly, by 2.2 percentage points for both sources (table 26).

As for the other groups of institutions, instruction expenditures made up the largest proportion of total E&G expenditures at these schools (28.7 percent). Scholarships and fellowships made up the second largest proportion (23.4 percent), with institutional support (16.6 percent) and student services (10.2 percent) following. Instruction expenditures increased annually by 2.0 percent in real terms over this period, institutional support expenditures by 1.3 percent, and

Table 25.—Average change in price, enrollment, revenue, and expenditures at private not-for-profit bachelor's institutions: 1988–89 to 1995–96

	Average change, in constant 1999 dollars	Average annual percentage change	Proportion of total revenues/ expenditures, on average	Proportion of total E&G revenues/ expenditures, on average
Undergraduate tuition for FY, FT students	$2,841	3.7	—	—
Graduate tuition	1,890	3.4	—	—
Total fall enrollment	—	1.6	—	—
FTE fall enrollment	—	1.4	—	—
FTE first time enrollment	—	0.1	—	—
Revenue (per FTE) by source:				
Tuition	2,635	3.4	53.1	64.1
Federal appropriations	-48	-0.3	0.1	0.1
State appropriations	-50	-13.6	0.2	0.3
Local appropriations	-6	-0.3	0.0 *	0.0 *
Federal grants and contracts	-81	-0.8	5.9	7.1
State grants and contracts	38	1.2	2.5	3.0
Local grants and contracts	3	18.4	0.0 *	0.0 *
Private gifts, grants, and contracts	158	1.1	10.7	12.9
Endowment income	144	1.5	7.3	8.8
Sales and services of educational activities	-3	0.1	0.3	0.4
Other	207	5.4	2.7	3.3
Auxiliary enterprises	48	0.2	17.1	—
Hospital	0	0.0	0.0	—
Independent operations	-24	-3.0	0.3	—
Total revenue	3,095	2.0	100.0	—
E&G revenue	2,998	2.4	—	100.0
Expenditures (per FTE) by function:				
Instruction	717	2.0	24.5	28.7
Research	49	5.3	0.6	0.7
Public service	23	2.3	0.8	0.9
Academic support	188	2.2	5.6	6.6
Student services	314	2.4	8.7	10.2
Institutional support	286	1.3	14.2	16.6
Plant operations/maintenance	5	0.0 *	7.6	8.9
Scholarships and fellowships	1,526	5.4	20.0	23.4
Mandatory transfers	8	0.4	1.5	1.8
Nonmandatory transfers	-204	-4.1	2.0	2.4
Auxiliary enterprises	-144	-0.7	14.1	—
Hospital	-6	0.0 *	0.0 *	—
Independent operations	-23	-3.1	0.3	—
Total expenditures	2,739	1.8	100.0	—
Total E&G	3,049	2.4	—	100.0
Institutional scholarships and fellowships	1,593	8.5	—	—
Average faculty compensation	2,982	0.8	—	—

N = 451
— Not applicable.
* Value rounds to less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the ten-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

Table 26.—Percentage composition of E&G revenue and expenditure at private not-for-profit bachelor's institutions, on average: 1988–89 to 1995–96

	1988–89	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96
Tuition	60.6	61.9	63.3	64.1	65.0	66.4	66.6	64.8
Federal appropriations	0.3	0.3	0.2	0.2	0.2	0.0 *	0.0	0.0
State appropriations	0.4	0.4	0.4	0.3	0.3	0.2	0.1	0.1
Local appropriations	0.1	0.0 *	0.0 *	0.0	0.0	0.0	0.0	0.0
Federal grants and contracts	7.7	7.4	6.9	7.2	7.5	7.0	6.8	6.1
State grants and contracts	3.0	3.0	2.9	3.2	3.2	3.0	3.0	2.8
Local grants and contracts	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.0 *	0.1
Private gifts, grants, and contracts	14.4	13.6	13.2	12.4	12.6	12.1	11.9	13.0
Endowment income	9.6	9.5	9.3	9.2	8.1	8.1	8.2	8.8
Sales and services of educational activities	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.3
Other	3.5	3.5	3.3	3.2	2.8	2.8	3.1	4.0
E&G revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Instruction	29.1	28.9	29.3	28.9	28.7	28.4	28.3	28.3
Research	0.7	0.7	0.6	0.7	0.7	0.7	0.8	0.8
Public service	0.9	1.0	1.0	0.8	0.9	0.9	1.0	0.9
Academic support	6.7	6.8	6.7	6.6	6.5	6.5	6.6	6.6
Student services	10.3	10.2	10.3	10.2	10.2	10.2	10.2	10.3
Institutional support	17.5	17.2	17.1	16.6	16.2	16.1	16.0	16.3
Plant operation/maintenance	9.8	9.5	9.3	8.9	8.7	8.6	8.4	8.3
Scholarships and fellowships	20.6	21.0	21.7	23.5	24.6	24.9	25.5	25.1
Mandatory transfers	2.0	1.9	1.8	1.7	1.7	1.7	1.8	1.7
Nonmandatory transfers	3.5	3.6	2.7	2.1	2.0	1.9	1.4	1.9
E&G expenditures	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N = 451
*Values round to less than .1 percent.

NOTE: Percentages may not sum to 100 due to rounding. Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before percentage shares were calculated. All revenue and expenditure categories are per full-time equivalent (FTE) student.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

student services expenditures by 2.4 percent, compared to 2.4 percent for E&G expenditures as a whole. Institutional scholarships and fellowships were one of the fastest growing expenditure categories, increasing annually by 8.5 percent on average (table 25). As a result of these different rates of change, the composition of E&G expenditures at bachelor's institutions shifted over time. Scholarships and fellowships made up an increasing proportion of total E&G expenditures—increasing by 4.5 percentage points, from 20.6 percent to 25.1 percent. The proportions of instruction expenditures and student services remained relatively stable, while the proportion for institutional support fell by 1.2 percentage points (table 26).

Model Results

The results of the simultaneous equation modeling for private not-for-profit institutions highlight several findings for each institutional type. In each set of findings, variables associated with tuition are reported in increasing order of the percentage increase in the independent variable that is associated with a one percent increase in tuition.

Research/Doctoral Institutions

The simultaneous equations model appeared to be a relatively good fit for research/doctoral institutions over the period 1989–90 to 1995–96. In Equation 1 (which represents "external" factors), the independent variables explained about 81.5 percent of the variation in tuition. In Equation 2 (which represents "internal," institutional factors), the independent variables explained about 62.0 percent of the variation (table 27).

In Equation 1, higher tuition levels were associated with slightly higher enrollment levels.[56] In addition, several of the variables representing "external" factors were associated with tuition at research/doctoral institutions, including the following:

- *Availability of financial aid.* Higher tuitions at research/doctoral institutions were associated with higher levels of institutional aid. A 3.5 percent increase in institutional aid was associated with a one percent increase in tuition.

[56]In this model, the measure of price is published tuition and fees, which indicates "sticker price" rather than net price (institutional aid is represented as an expenditure rather than as a discount in the price). Issues of institutional reputation and the so-called "Chivas Regal" effect may be incorporated into the relationship between enrollment and sticker price; in the absence of good information about quality or prestige, price may act as a signal of an institution's elite status**.** Some researchers also note that students' sensitivity to sticker price is low; see Bradburd and Mann (1990). Also see Lapovsky's commissioned paper in Volume 2 for a discussion of tuition discounting.

Table 27.—Coefficients for the simultaneous equation estimation of undergraduate tuition on selected institutional and external characteristics for private not-for-profit research/doctoral institutions: 1989–90 to 1995–96

	N	Root mean square error (RMSE)	"R-squared"	Model significance
Equation 1 ("external" factors)	329	0.115	0.815	0.000 *
Equation 2 ("internal" institutional factors)	329	0.165	0.620	0.000 *
Equation 1	Coefficient (percentage change in tuition associated with a 1 percent change in the independent variable)	Percentage change in the independent variable associated with a 1 percent change in tuition	Standard error of the estimate	Probability
Log of first-time freshmen FTE students	0.095	10.5	0.021	0.000 *
Log of previous year's instruction expenditures	0.048	20.7	0.025	0.052
Log of average tuition at public 4-year institutions in the state	0.106	9.5	0.020	0.000 *
Log of previous year's expenditures on plant maintenance and transfers	-0.020	-49.0	0.011	0.068
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	0.004	272.1	0.016	0.816
Log of previous year's research expenditures	0.048	20.8	0.011	0.000 *
Log of previous year's student service expenditures	0.103	9.7	0.019	0.000 *
Log of expenditures on institutional aid	0.286	3.5	0.018	0.000 *
Log of previous year's student/faculty ratio[a]	0.220	4.5	0.032	0.000 *
Log of philanthropic revenue[a]	-0.034	-29.2	0.015	0.024 *
Log of per capita income in the state	0.182	5.5	0.065	0.005 *
1991	0.000	—	0.023	0.987
1992	-0.022	—	0.024	0.347
1993	-0.014	—	0.024	0.564
1994	-0.010	—	0.025	0.684
1995	-0.013	—	0.026	0.626
1996	-0.008	—	0.027	0.774
Dummy variable for zero values in log of previous year's research expenditures	0.399	—	0.063	0.000 *
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	-0.187	—	0.114	0.100
Constant	2.281	—	0.828	0.006 *

Table 27.—Coefficients for the simultaneous equation estimation of undergraduate tuition on selected institutional and external characteristics for private not-for-profit research/doctoral institutions: 1989–90 to 1995–96—Continued

Equation 2	Coefficient (percentage change in tuition associated with a 1 percent change in the independent variable)	Percentage change in the independent variable associated with a 1 percent change in tuition	Standard error of the estimate	Probability
Log of first-time freshmen FTE students	-0.210	-4.8	0.067	0.002 *
Log of instruction expenditures	0.005	205.1	0.036	0.892
Log of expenditures on institutional aid	0.284	3.5	0.028	0.000 *
Log of average faculty compensation	0.684	1.5	0.165	0.000 *
Log of institutional support expenditures	0.079	12.6	0.030	0.007 *
Log of academic support expenditures	-0.003	-344.9	0.021	0.890
Log of student services expenditures	-0.051	-19.7	0.040	0.210
Log of philanthropic revenue	-0.120	-8.3	0.021	0.000 *
Log of federal grants and contracts	0.083	12.0	0.017	0.000 *
Log of revenue from state and local sources	-0.018	-56.8	0.007	0.015 *
Ratio of graduate FTE enrollment to total FTE enrollment	-0.369	—	0.149	0.013 *
1991	-0.004	—	0.034	0.912
1992	-0.025	—	0.035	0.478
1993	-0.024	—	0.036	0.498
1994	-0.003	—	0.036	0.941
1995	0.014	—	0.036	0.694
1996	0.052	—	0.037	0.159
Dummy variable for zero values in log of revenue from state and local sources	-0.193	—	0.053	0.000 *
Constant	1.410	—	1.258	0.262
Endogenous variables: Log of undergraduate tuition; log of first-time freshmen FTE students Exogenous variables: all other variables				

—Not applicable.

*Relatively strong relationship.

[a]These variables may be acting as suppressor variables in Equation 1. This could have resulted from a disordinal interaction effect, it could be a statistical artifact of the sample, or the model could be misspecified.

NOTE: "N" refers to the number of observations, not the number of institutions; each institution has one observation for each year. For logged independent variables, the second column is the reciprocal of the first. The coefficients of the dummy variables for the years can be interpreted as the change in tuition since the base year (1990), adjusting statistically for the covariation of the independent variables, by taking the inverse log (to base e) of the estimated coefficient and subtracting 1 from it. In the case of research/doctoral institutions, for example, the change from 1990 to 1996 is 0.8 percent in Equation 1 and 5.4 percent in Equation 2.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958–98, released July 1999.

- *In-state consumer purchasing power.* Higher tuitions at private not-for-profit research/doctoral institutions were associated with a higher level of per capita income in the state.[57] In fact, a 5.5 percent increase in state income levels was associated with a one percent increase in tuition at this group of institutions.
- *Price competition with the public sector.* Higher tuitions at research/doctoral institutions were associated with higher average tuition levels at public 4-year institutions in the state.
- *Ancillary services.* Higher tuitions were associated with higher expenditures per student on student services.
- *Proxies for quality of instruction.* Higher tuitions at research/doctoral institutions were associated with higher research expenditures, as well as with higher expenditures on student services.

Contrary to the expected relationships—which assumed that philanthropic revenue and student/faculty ratios could function as proxies for institutional reputation and instructional quality, respectively, from the perspective of students—higher tuitions at research/doctoral institutions were associated with lower revenue from philanthropic sources and higher student/faculty ratios. It is possible that these variables are weak proxies for institutional reputation and quality.[58] The issue of students' perceptions of institutional quality, as well as the difficulty of measuring reputation and quality, may be relevant in this regard.

In Equation 2, higher tuitions at research/doctoral institutions were associated with lower enrollments.[59] In addition, "internal" factors were associated with tuition at research/doctoral institutions, including the following:

- *Price of inputs.* Higher tuitions at research/doctoral institutions were associated with higher expenditures—for institutional aid, institutional support expenditures, and average faculty compensation levels. A 1.5 percent increase in average faculty compensation levels or a 3.5 percent increase in institutional aid was associated with a tuition increase of one percent, accounting for the covariance of all other variables in the equation. Higher undergraduate tuition levels also were associated with lower proportions of graduate enrollment, which may affect cost structures as well as the internal distribution of subsidies.

[57]Although private not-for-profit research/doctoral institutions may draw students nationally, on average almost half the undergraduates attending these schools in 1995–96 were in-state residents, according to data from U.S. Department of Education, National Center for Education Statistics, 1995–96 National Postsecondary Student Aid Study (NPSAS:96), Undergraduate Data Analysis System.

[58]In addition, these variables may be acting as suppressor variables i.e., a variable that changes the prediction value of another variable (or set of variables) by its inclusion in the regression equation. This could have resulted from a disordinal interaction effect (in which the direction of a relationship between two variables is different depending on the value of some other variable), it could be a statistical artifact of the sample, or the model could be misspecified.

[59]It is possible that research/doctoral institutions placed a limit on the quantity of places they were willing to supply in order to maintain the quality of their student bodies, or that the model was misspecified.

- *Availability of nontuition revenue.* Higher tuition levels at research/doctoral institutions were associated with lower levels of philanthropic revenue. An 8.3 percent decrease in philanthropic revenue was associated with a one percent increase in tuition. Higher tuition also was associated with lower levels of state and local revenue, but with slightly higher levels of revenue from federal grants and contracts.
- *Change over time.* After adjusting statistically for the covariation of enrollment, expenditure, and revenue levels (the independent variables in the equation), prices increased slightly over time, about 5.4 percent over six years.

The estimates from the reduced form equation generally support these findings (table 28). However, two other variables were related to tuition: the proportion of students in the state attending private institutions in Equation 1, and academic support expenditures in Equation 2. Conversely, research expenditures and state income levels were no longer related to tuition in Equation 1, as was true with institutional support expenditures in Equation 2.

Comprehensive Institutions

The simultaneous equation model captured some of the "external" and "internal" factors associated with prices at comprehensive institutions over the period 1989–90 to 1995–96. In Equation 1, the independent variables (which represented "external" factors) explained about 59.5 percent of the variation in tuition; in Equation 2, the independent variables (representing "internal" factors) explained 58.9 percent of the variation (table 29).

In Equation 1, higher levels of tuition were associated with higher amounts of first-time freshmen enrollment. In addition, several of the variables representing "external" factors were associated with tuition at comprehensive institutions, including the following:

- *Availability of financial aid.* Higher tuitions were related to higher expenditures on institutional aid. A 4.1 percent increase in institutional aid was associated with a one percent increase in tuition.
- *Proxies for quality of instruction.* Higher tuitions were related to higher instruction, which was assumed in this model to represent the quality of the product offered. A 6.8 percent increase in instruction expenditures was associated with a one percent increase in tuition. Higher tuitions also were associated with lower research expenditures, however.
- *In-state consumer purchasing power.* Higher tuitions at comprehensive institutions were associated with higher per capita incomes in the state.
- *Ancillary services.* Higher tuitions were associated with higher expenditures per student on student services.

Table 28.—Coefficients for the reduced form regression of undergraduate tuition on selected institutional and external characteristics for private not-for-profit research/doctoral institutions: 1989–90 to 1995–96

	N	R-squared	Adjusted R-squared	Model significance
Model	329	0.849	0.836	0.000 *
	Correlation coefficient with dependent variable	Reduced form coefficient	Standard error of the estimate	Probability
Log of previous year's instruction expenditures	0.551	-0.038	0.068	0.577
Log of average tuition at public 4-year institutions in the state	0.357	0.096	0.020	0.000 *
Log of previous year's expenditures on plant maintenance and transfers	0.342	-0.017	0.012	0.158
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	0.481	0.064	0.018	0.001 *
Log of previous year's research expenditures	0.573	0.011	0.016	0.484
Log of previous year's student service expenditures	0.469	0.201	0.061	0.001 *
Log of expenditures on institutional aid	0.801	0.244	0.018	0.000 *
Log of previous year's student/faculty ratio	-0.283	0.244	0.035	0.000 *
Log of philanthropic revenue	0.511	-0.032	0.017	0.065
Log of per capita income in the state	0.294	0.071	0.074	0.343
Log of instruction expenditures	0.541	0.030	0.068	0.656
Log of average faculty compensation	0.547	0.253	0.057	0.000 *
Log of institutional support expenditures	0.443	0.002	0.022	0.913
Log of academic support expenditures	0.507	0.052	0.016	0.001 *
Log of student services expenditures	0.458	-0.139	0.060	0.021 *
Log of federal grants and contracts	0.683	0.050	0.014	0.000 *
Log of revenue from state and local sources	0.319	-0.004	0.006	0.488
Ratio of graduate FTE enrollment to total FTE enrollment	0.219	0.044	0.091	0.628
1991	-0.117	0.005	0.023	0.812
1992	-0.066	-0.020	0.023	0.387
1993	0.010	-0.011	0.024	0.649
1994	0.067	0.004	0.025	0.868
1995	0.108	0.010	0.025	0.696
1996	0.159	0.028	0.026	0.286
Dummy variable for zero values in log of previous year's research expenditures	-0.126	0.298	0.080	0.000 *
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	-0.047	-0.271	0.125	0.031 *
Dummy variable for zero values in log of revenue from state and local sources	-0.139	0.037	0.039	0.352
Constant	—	1.893	0.948	0.047 *

— Not applicable.

*Relatively strong relationship.

NOTE: "N" refers to the number of observations, not the number of institutions; each institution has one observation for each year.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958–98, released July 1999.

Table 29.—Coefficients for the simultaneous equation estimation of undergraduate tuition on selected institutional and external characteristics for private not-for-profit comprehensive institutions: 1989–90 to 1995–96

	N	Root mean square error (RMSE)	"R-squared"	Model significance
Equation 1 ("external" factors)	1344	0.178	0.595	0.000 *
Equation 2 ("internal" institutional factors)	1344	0.180	0.589	0.000 *
Equation 1	Coefficient (percentage change in tuition associated with a 1 percent change in the independent variable)	Percentage change in the independent variable associated with a 1 percent change in tuition	Standard error of the estimate	Probability
Log of first-time freshmen FTE students	0.076	13.2	0.011	0.000 *
Log of previous year's instruction expenditures	0.148	6.8	0.016	0.000 *
Log of average tuition at public 4-year institutions in the state	0.032	31.7	0.008	0.000 *
Log of previous year's expenditures on plant maintenance and transfers	0.005	212.5	0.005	0.380
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	-0.002	-616.9	0.005	0.750
Log of previous year's research expenditures	-0.012	-84.3	0.004	0.002 *
Log of previous year's student service expenditures	0.032	30.9	0.012	0.005 *
Log of expenditures on institutional aid	0.245	4.1	0.009	0.000 *
Log of previous year's student/faculty ratio[a]	0.037	26.9	0.012	0.001 *
Log of philanthropic revenue[a]	-0.068	-14.6	0.006	0.000 *
Log of per capita income in the state	0.124	8.0	0.022	0.000 *
1991	0.001	—	0.017	0.945
1992	0.012	—	0.017	0.499
1993	0.006	—	0.017	0.718
1994	0.017	—	0.018	0.323
1995	0.022	—	0.018	0.217
1996	0.037	—	0.018	0.040 *
Dummy variable for zero values in log of previous year's research expenditures	-0.040	—	0.013	0.002 *
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	0.048	—	0.048	0.313
Dummy variable for zero values in log of philanthropic revenue	-0.467	—	0.126	0.000 *
Constant	4.402	—	0.274	0.000 *

Table 29.—Coefficients for the simultaneous equation estimation of undergraduate tuition on selected institutional and external characteristics for private not-for-profit comprehensive institutions: 1989–90 to 1995–96—Continued

Equation 2	Coefficient (percentage change in tuition associated with a 1 percent change in the independent variable)	Percentage change in the independent variable associated with a 1 percent change in tuition	Standard error of the estimate	Probability	
Log of first-time freshmen FTE students	0.022	46.3	0.020	0.271	
Log of instruction expenditures	0.083	12.0	0.016	0.000	*
Log of expenditures on institutional aid	0.252	4.0	0.009	0.000	*
Log of average faculty compensation	0.226	4.4	0.066	0.001	*
Log of institutional support expenditures	-0.005	-215.2	0.014	0.736	
Log of academic support expenditures	-0.004	-226.8	0.006	0.492	
Log of student services expenditures	0.025	39.8	0.013	0.049	*
Log of philanthropic revenue	-0.079	-12.6	0.007	0.000	*
Log of federal grants and contracts	0.000	-4088.3	0.000	0.615	
Log of revenue from state and local sources	0.001	682.4	0.002	0.420	
Ratio of graduate FTE enrollment to total FTE enrollment	-0.017	—	0.044	0.702	
1991	-0.003	—	0.018	0.850	
1992	0.005	—	0.018	0.797	
1993	0.001	—	0.018	0.937	
1994	0.021	—	0.018	0.251	
1995	0.026	—	0.018	0.157	
1996	0.049	—	0.018	0.008	*
Dummy variable for zero values in log of revenue from state and local sources	-0.008	—	0.010	0.414	
Dummy variable for zero values in log of federal grants and contracts	0.002	—	0.009	0.811	
Dummy variable for zero values in log of philanthropic revenue	-0.527	—	0.130	0.000	*
Constant	4.540	—	0.487	0.000	*
Endogenous variables: Log of undergraduate tuition; log of first-time freshmen FTE students Exogenous variables: all other variables					

—Not applicable.

*Relatively strong relationship.

[a]These variables may be acting as suppressor variables in Equation 1. This could have resulted from a disordinal interaction effect, it could be a statistical artifact of the sample, or the model could be misspecified.

NOTE: "N" refers to the number of observations, not the number of institutions; each institution has one observation for each year. For logged independent variables, the second column is the reciprocal of the first. The coefficients of the dummy variables for the years can be interpreted as the change in tuition since the base year (1990), adjusting statistically for the covariation of the independent variables, by taking the inverse log (to base e) of the estimated coefficient and subtracting 1 from it. In the case of comprehensive institutions, for example, the change from 1990 to 1996 is 3.7 percent in Equation 1 and 5.0 percent in Equation 2.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958–98, released July 1999.

- *Price competition with the public sector*. Higher tuitions were associated with higher average tuition levels at public 4-year institutions in the state.
- *Change over time.* After adjusting statistically for the covariation of enrollment levels and other independent variables in the equation, prices increased by 3.7 percent over six years.

As in the case of research/doctoral institutions, the relationships between tuition and philanthropic revenue and tuition and the student/faculty ratio at comprehensive institutions were contrary to the expected directions, which assumed that these variables could function as proxies for institutional reputation and instructional quality, respectively.[60]

In Equation 2, tuition was unrelated to enrollment levels at comprehensive institutions.[61] In addition, several "internal" factors were associated with tuition at comprehensive institutions:

- *Price of inputs.* Higher tuitions at comprehensive institutions were associated with higher expenditures, including instruction expenditures, institutional aid expenditures, student services expenditures, and average faculty compensation levels. A 4.0 percent increase in institutional aid, or a 4.4 percent increase in average faculty compensation levels, was associated with a one percent increase in tuition.
- *Availability of nontuition revenue.* Higher tuition was associated with lower levels of philanthropic revenue. After adjusting statistically for the covariation of other independent variables, a 12.6 percent decrease in philanthropic revenue was associated with a one percent increase in tuition.
- *Change over time.* After accounting for enrollment and other independent variables in the equation, prices increased by 5.0 percent over the six-year period.

The reduced form regression generally supports these findings, but did not show a relationship between tuition and student services expenditures. Some other independent variables were related to tuition, however, including plant maintenance and transfers, academic support expenditures, and the ratio of graduate to total enrollment (table 30).

Bachelor's Institutions

Over the period 1989–90 to 1995–96, the simultaneous equation model captured some of the "external" and "internal" factors associated with prices at bachelor's institutions, although not as well as for the other two groups of institutions. In Equation 1 (representing "external"

[60]These variables may be acting as suppressor variables. This could have resulted from a disordinal interaction effect, it could be a statistical artifact of the sample, or the model could be misspecified.

[61]This type of relationship might exist if the cost of educating additional students is relatively low and essentially constant, as for schools with excess capacity; see Baum (1996).

Table 30.—Coefficients for the reduced form regression of undergraduate tuition on selected institutional and external characteristics for private not-for-profit comprehensive institutions: 1989–90 to 1995–96

	N	R-squared	Adjusted R-squared	Model significance
Model	1344	0.679	0.672	0.000 *
	Correlation coefficient with dependent variable	Reduced form coefficient	Standard error of the estimate	Probability
Log of previous year's instruction expenditures	0.413	0.082	0.041	0.046 *
Log of average tuition at public 4-year institutions in the state	0.416	0.174	0.016	0.000 *
Log of previous year's expenditures on plant maintenance and transfers	0.122	0.023	0.009	0.014 *
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	0.184	0.007	0.009	0.454
Log of previous year's research expenditures	0.206	-0.011	0.004	0.011 *
Log of previous year's student service expenditures	0.323	0.017	0.032	0.592
Log of expenditures on institutional aid	0.644	0.228	0.008	0.000 *
Log of previous year's student/faculty ratio	-0.163	0.038	0.022	0.083
Log of philanthropic revenue	-0.061	-0.039	0.007	0.000 *
Log of per capita income in the state	0.386	0.250	0.042	0.000 *
Log of instruction expenditures	0.421	0.018	0.041	0.658
Log of average faculty compensation	0.536	0.279	0.037	0.000 *
Log of institutional support expenditures	0.284	0.011	0.016	0.491
Log of academic support expenditures	0.349	0.044	0.010	0.000 *
Log of student services expenditures	0.345	0.010	0.033	0.755
Log of federal grants and contracts	0.022	0.000	0.001	0.876
Log of revenue from state and local sources	0.183	-0.020	0.003	0.000 *
Ratio of graduate FTE enrollment to total FTE enrollment	0.187	0.143	0.050	0.004 *
1991	-0.125	-0.003	0.016	0.850
1992	-0.054	-0.013	0.017	0.439
1993	0.006	-0.028	0.017	0.100
1994	0.068	-0.028	0.017	0.101
1995	0.115	-0.032	0.018	0.069
1996	0.166	-0.027	0.018	0.131
Dummy variable for zero values in log of previous year's research expenditures	-0.234	-0.056	0.023	0.016 *
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	0.019	0.165	0.087	0.056
Dummy variable for zero values in log of revenue from state and local sources	-0.182	-0.057	0.017	0.001 *
Dummy variable for zero values in log of federal grants and contracts	-0.048	0.002	0.015	0.879
Dummy variable for zero values in log of philanthropic revenue	-0.012	-0.258	0.123	0.036 *
Constant	—	-0.668	0.467	0.153

—Not applicable.

*Relatively strong relationship.

NOTE: "N" refers to the number of observations, not the number of institutions; each institution has one observation for each year.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958–98, released July 1999.

factors), the independent variables explained about 47.5 percent of the variation in tuition; in Equation 2 (representing "internal" factors), the independent variables explained 49.9 percent of the variation (table 31).

In Equation 1, higher tuitions were associated with slightly higher first-time freshmen enrollments at bachelor's institutions. In addition, variables representing "external" factors were associated with tuition, including the following:

- *Availability of financial aid.* Higher tuitions were associated with higher institutional aid at bachelor's institutions. A 3.9 percent increase in institutional aid was associated with a one percent increase in tuition.
- *Proxies for quality of instruction.* Higher tuitions were related to higher instruction expenditures. A 5.0 percent increase in instruction expenditures was associated with a one percent increase in tuition.
- *In-state consumer purchasing power.* Higher tuitions were associated with higher per capita incomes in the state.
- *Competitive environment.* Higher tuitions at bachelor's institutions were associated with both higher average tuition levels at public 4-year institutions in the state and lower proportions of students enrolled at private institutions.
- *Ancillary services.* Higher tuitions were associated with higher expenditures per student on student services.
- *Change over time.* After adjusting statistically for the covariation of enrollment levels and other independent variables in the equation, prices increased by 2.2 percent over six years.

As in the case of the other two groups of institutions, the relationships between tuition and philanthropic revenue and tuition and the student/faculty ratio at bachelor's institutions were contrary to the expected directions, which assumed that philanthropic revenue and student/faculty ratios could function as proxies for institutional reputation and instructional quality, respectively.[62]

In Equation 2, higher tuitions at bachelor's institutions were associated with higher enrollment levels. In addition, several "internal" factors were associated with tuition at bachelor's institutions:

[62]These variables may be acting as suppressor variables. This could have resulted from a disordinal interaction effect, it could be a statistical artifact of the sample, or the model could be misspecified.

Table 31.—Coefficients for the simultaneous equation estimation of undergraduate tuition on selected institutional and external characteristics for private not-for-profit bachelor's institutions: 1989–90 to 1995–96

	N	Root mean square error (RMSE)	"R-squared"	Model significance
Equation 1 ("external" factors)	3157	0.384	0.475	0.000 *
Equation 2 ("internal" institutional factors)	3157	0.376	0.499	0.000 *
Equation 1	Coefficient (percentage change in tuition associated with a 1 percent change in the independent variable)	Percentage change in the independent variable associated with a 1 percent change in tuition	Standard error of the estimate	Probability
Log of first-time freshmen FTE students	0.154	6.5	0.018	0.000 *
Log of previous year's instruction expenditures	0.198	5.0	0.017	0.000 *
Log of average tuition at public 4-year institutions in the state	0.058	17.3	0.014	0.000 *
Log of previous year's expenditures on plant maintenance and transfers	-0.015	-68.8	0.008	0.060
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	-0.022	-45.6	0.010	0.036 *
Log of previous year's research expenditures	0.001	677.1	0.003	0.658
Log of previous year's student service expenditures	0.050	19.8	0.012	0.000 *
Log of expenditures on institutional aid	0.256	3.9	0.010	0.000 *
Log of previous year's student/faculty ratio[a]	0.032	31.6	0.014	0.028 *
Log of philanthropic revenue[a]	-0.077	-13.0	0.009	0.000 *
Log of per capita income in the state	0.195	5.1	0.037	0.000 *
1991	0.000	—	0.024	0.986
1992	-0.005	—	0.024	0.819
1993	-0.001	—	0.024	0.983
1994	0.000	—	0.024	0.997
1995	0.013	—	0.025	0.583
1996	0.022	—	0.025	0.382
Dummy variable for zero values in log of previous year's research expenditures	0.006	—	0.017	0.707
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	-0.116	—	0.062	0.062
Dummy variable for zero values in log of FTE students	0.904	—	0.202	0.000 *
Dummy variable for zero values in log of expenditures on institutional aid	1.646	—	0.117	0.000 *
Dummy variable for zero values in log of undergraduate tuition	-9.264	—	0.357	0.000 *
Dummy variable for zero values in log of previous year's student service expenditures	0.335	—	0.187	0.072
Constant	2.560	—	0.454	0.000 *

Table 31.—Coefficients for the simultaneous equation estimation of undergraduate tuition on selected institutional and external characteristics for private not-for-profit bachelor's institutions: 1989–90 to 1995–96—Continued

Equation 2	Coefficient (percentage change in tuition associated with a 1 percent change in the independent variable)	Percentage change in the independent variable associated with a 1 percent change in tuition	Standard error of the estimate	Probability	
Log of first-time freshmen FTE students	0.074	13.4	0.034	0.028	*
Log of instruction expenditures	0.158	6.3	0.018	0.000	*
Log of expenditures on institutional aid	0.252	4.0	0.011	0.000	*
Log of average faculty compensation	0.281	3.6	0.082	0.001	*
Log of institutional support expenditures	-0.001	-1378.4	0.015	0.962	
Log of academic support expenditures	-0.001	-1743.1	0.008	0.941	
Log of student services expenditures	0.038	26.1	0.014	0.007	*
Log of philanthropic revenue	-0.099	-10.1	0.009	0.000	*
Log of federal grants and contracts	0.001	1440.9	0.001	0.270	
Log of revenue from state and local sources	0.001	1638.3	0.002	0.770	
Ratio of graduate FTE enrollment to total FTE enrollment	-0.051	—	0.079	0.520	
1991	-0.006	—	0.024	0.800	
1992	-0.006	—	0.024	0.796	
1993	0.005	—	0.024	0.821	
1994	0.015	—	0.024	0.527	
1995	0.030	—	0.024	0.218	
1996	0.049	—	0.024	0.040	*
Dummy variable for zero values in log of revenue from state and local sources	-0.016	—	0.011	0.152	
Dummy variable for zero values in log of federal grants and contracts	0.000	—	0.009	0.995	
Dummy variable for zero values in log of FTE students	0.481	—	0.253	0.058	
Dummy variable for zero values in log of on institutional aid	-9.171	—	0.354	0.000	*
Dummy variable for zero values in log of expenditures undergraduate tuition	1.627	—	0.118	0.000	*
Dummy variable for zero values in log of student service expenditures	0.357	—	0.188	0.057	
Constant	3.028	—	0.514	0.000	*
Endogenous variables: Log of undergraduate tuition; log of first-time freshmen FTE students					
Exogenous variables: all other variables					

—Not applicable.

*Relatively strong relationship.

[a]These variables may be acting as suppressor variables in Equation 1. This could have resulted from a disordinal interaction effect, it could be a statistical artifact of the sample, or the model could be misspecified.

NOTE: "N" refers to the number of observations, not the number of institutions; each institution has one observation for each year. For logged independent variables, the second column is the reciprocal of the first. The coefficients of the dummy variables for the years can be interpreted as the change in tuition since the base year (1990), adjusting statistically for the covariation of the independent variables, by taking the inverse log (to base e) of the estimated coefficient and subtracting 1 from it. In the case of bachelor's institutions, for example, the change from 1990 to 1996 is 2.2 percent in Equation 1 and 5.1 percent in Equation 2.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958–98, released July 1999.

- *Price of inputs.* Higher tuitions at bachelor's institutions were associated with higher expenditures, including instruction expenditures, institutional aid expenditures, student services expenditures, and average faculty compensation levels. A 3.6 percent increase in average faculty compensation levels, a 4.0 percent increase in institutional aid, or a 6.3 percent increase in instruction expenditures—controlling for all of the other independent variables—was associated with a one percent increase in tuition.
- *Availability of nontuition revenue.* Higher tuition was associated with lower levels of philanthropic revenue. A 10.1 percent decrease in philanthropic revenue was associated with a one percent increase in tuition.
- *Change over time.* After controlling for enrollment and other independent variables in the equation, prices increased by 5.1 percent over the six-year period.

The results of the reduced form equation generally support these findings. While the student/faculty ratio was not related to tuition, several other factors were, including plant maintenance and transfers, research expenditures, institutional support expenditures, and the ratio of graduate to total enrollment (table 32).

Discussion

Across the three groups of private not-for-profit institutions, the trend analysis found that, on average, undergraduate tuition rose in inflation-adjusted terms and that gross tuition revenue accounted for increasing proportions of total E&G revenue over the period 1988–89 to 1995–96 (table 33). At the same time, the proportion of revenue from endowment income and private gifts, grants, and contracts decreased. On the expenditure side, instruction expenditures continued to constitute the largest proportion of total E&G expenditures, while institutional scholarships and fellowships was one of the fastest growing expenditure categories and made up an increasing proportion of total E&G expenditures.

The models suggest that pricing decisions at private not-for-profit institutions over the period 1989–90 to 1995–96 were related to both "internal" institutional budget circumstances (which are reflected in aggregate in the trend data) and "external" factors (table 34). At research/doctoral institutions, for example, higher institutional costs—especially institutional aid and average faculty compensation levels—and lower levels of revenue from nontuition sources, such as endowment income and private gifts, grants, and contracts, were associated with higher levels of undergraduate tuition. At the same time, variables representing "external" factors also were related to tuition levels, such as the price of attending public institutions in the same state, in-state consumer purchasing power (as measured by average per capita state income), and the availability of financial aid for students (as measured by institutional aid expenditures). Similar results were found for private not-for-profit comprehensive and bachelor's institutions, although

Table 32.—Coefficients for the reduced form regression of undergraduate tuition on selected institutional and external characteristics for private not-for-profit bachelor's institutions: 1989–90 to 1995–96

	N	R-squared	Adjusted R-squared	Model significance
Model	3157	0.589	0.585	0.000*
	Correlation coefficient with dependent variable	Reduced form coefficient	Standard error of the estimate	Probability
Log of previous year's instruction expenditures	0.527	0.141	0.046	0.002*
Log of average tuition at public 4-year institutions in the state	0.400	0.203	0.024	0.000*
Log of previous year's expenditures on plant maintenance and transfers	0.184	-0.081	0.012	0.000*
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	0.269	-0.017	0.014	0.226
Log of previous year's research expenditures	0.356	0.024	0.007	0.000*
Log of previous year's student service expenditures	0.403	0.021	0.034	0.540
Log of expenditures on institutional aid	0.457	0.164	0.011	0.000*
Log of previous year's student/faculty ratio	-0.272	0.041	0.031	0.179
Log of philanthropic revenue	0.151	-0.126	0.011	0.000*
Log of per capita income in the state	0.410	0.359	0.062	0.000*
Log of instruction expenditures	0.535	0.056	0.047	0.233
Log of average faculty compensation	0.591	0.489	0.045	0.000*
Log of institutional support expenditures	0.330	0.068	0.020	0.001*
Log of academic support expenditures	0.404	0.027	0.013	0.046*
Log of student services expenditures	0.416	0.112	0.034	0.001*
Log of federal grants and contracts	0.079	0.000	0.001	0.974
Log of revenue from state and local sources	0.188	-0.023	0.004	0.000*
Ratio of graduate FTE enrollment to total FTE enrollment	0.120	0.212	0.093	0.023*
1991	-0.063	-0.002	0.023	0.916
1992	-0.028	-0.035	0.023	0.134
1993	-0.007	-0.040	0.023	0.091
1994	0.035	-0.047	0.024	0.048*
1995	0.062	-0.040	0.024	0.094
1996	0.086	-0.039	0.025	0.111
Dummy variable for zero values in log of previous year's research expenditures	-0.319	0.029	0.033	0.376
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	-0.043	-0.724	0.109	0.000*
Dummy variable for zero values in log of revenue from state and local sources	-0.213	-0.114	0.024	0.000*
Dummy variable for zero values in log of federal grants and contracts	-0.067	0.043	0.018	0.016*
Dummy variable for zero values in log of expenditures on institutional aid	-0.048	1.087	0.117	0.000*
Dummy variable for zero values in log of undergraduate tuition	-0.310	-8.753	0.343	0.000*
Dummy variable for zero values in log of student service expenditures	0.024	0.793	0.427	0.064
Dummy variable for zero values in log of previous year's student service expenditures	0.024	0.098	0.428	0.819
Constant	—	-4.387	0.626	0.000*

—Not applicable.

*Relatively strong relationship.

NOTE: "N" refers to the number of observations, not the number of institutions; each institution has one observation for each year.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958–98, released July 1999.

Table 33.—Summary of inflation-adjusted trends in tuition and selected revenue and expenditures categories at private not-for-profit institutions: 1988–89 to 1995–96

	Research/doctoral	Comprehensive	Bachelor's
Average annual percent change in in-state undergraduate tuition for FY, FT students	3.6	4.1	3.7
Tuition revenue:			
Average annual percent change	3.5	3.8	3.4
Average proportion of total E&G revenue	49.0	72.0	64.1
Percentage point change as a proportion of total E&G revenue	1.3	5.1	4.2
Revenue from endowment and private gifts:			
Average annual percent change, endowment income	1.4	-1.0	1.5
Average annual percent change, private gifts	1.8	-0.2	1.1
Average proportion of total E&G revenue, both sources	18.1	11.6	21.7
Percentage point change as a proportion of total E&G revenue, both sources	-2.0	-3.1	-2.2
Instruction expenditures:			
Average annual percent change	3.3	1.9	2.0
Average proportion of total E&G expenditures	36.0	32.7	28.7
Percentage point change as a proportion of total E&G expenditures	0.3	-1.9	-0.8
Scholarships and fellowships expenditures:			
Average annual percent change	6.7	6.6	5.4
Average proportion of total E&G expenditures	12.8	20.4	23.4
Percentage point change as a proportion of total E&G expenditures	3.0	5.0	4.5
Average annual percent change in institutional scholarships and fellowships	8.7	10.2	8.5

NOTE: Dollar amounts were converted to constant 1999 dollars using the CPI-U (1982–84 = 100) before annual changes were calculated. Average percentage changes were calculated as averages of the annual changes. All revenue and expenditure categories are per full-time equivalent (FTE) student. Shares of total revenues and expenditures were calculated as averages over the eight-year period.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996.

there were some differences in the costs that were found to have a relationship with tuition. In particular, instruction expenditures were related to tuition at private not-for-profit comprehensive and bachelor's institutions.

In general, the results of the model were comparable with those of the original Westat/Pelavin study, suggesting that many of the factors associated with prices at private not-for-

Table 34.—Significant relationships with undergraduate tuition at private not-for-profit institutions: 1989–90 to 1995–96

	Research/ doctoral	Comprehensive	Bachelor's
Equation 1 ("external" factors):			
Log of first-time freshmen FTE students	*	*	*
Log of previous year's instruction expenditures		*	*
Log of average tuition at public 4-year institutions in the state	*	*	*
Log of previous year's expenditures on plant maintenance and transfers			
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions			*
Log of previous year's research expenditures	*	*	
Log of previous year's student service expenditures	*	*	*
Log of expenditures on institutional aid	*	*	*
Log of previous year's student/faculty ratio	*	*	*
Log of philanthropic revenue	*	*	*
Log of per capita income in the state	*	*	*
Equation 2 ("internal" institutional factors):			
Log of first-time freshmen FTE students	*		*
Log of instruction expenditures		*	*
Log of expenditures on institutional aid	*	*	*
Log of average faculty compensation	*	*	*
Log of institutional support expenditures	*		
Log of academic support expenditures			
Log of student services expenditures		*	*
Log of philanthropic revenue	*	*	*
Log of federal grants and contracts	*		
Log of revenue from state and local sources	*		
Ratio of graduate FTE enrollment to total FTE enrollment	*		

*Relatively strong relationship.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958–98, released July 1999.

profit institutions in the late 1980s continued to be related in the 1990s. As in the original study, the model results suggest that the three groups of institutions—research/doctoral, comprehensive, and bachelor's institutions—face different competitive environments and institutional budgeting decisions. Various cost elements were related to tuition, but differently for specific types of private not-for-profit institutions. Nontuition revenue was related to prices at research/doctoral institutions, where nontuition revenue makes up a higher proportion of total E&G revenue on average. Institutional aid was related to tuition levels at all three groups of institutions, but made up higher proportions of total E&G expenditures at comprehensive and bachelor's institutions, which may face more competitive environments.

In considering these findings, it is important to keep in mind that many of the variables included in the models were acting as proxies for expected relationships. Given an improved ability to measure certain factors, the model results would likely differ to an unknown extent. Nonetheless, the results of the models are generally consistent with theoretical expectations regarding the institutional budget constraints and external, competitive environments faced by private not-for-profit institutions.

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Chapter V: Financial Aid and Prices at Higher Education Institutions

This chapter focuses on the last analytical component of Phase I of the NCES Study of College Costs and Prices, an analysis of the potential relationship of financial aid to prices. In the 1998 mandate, Congress asked NCES to explore how institutional financial aid affects price increases, and the extent to which federal financial aid is involved in this relationship. To fully address this question, two conditions are important: 1) the development (or determination) of appropriate theoretical models of institutional behavior given relationships among prices, institutional aid, federal aid, and other relevant factors, by type of aid and for different groups of institutions; and 2) the availability of data that measure these relationships over time at the institutional level. Neither of these conditions is satisfactorily met. Although the analysis presented in this chapter cannot fully answer the questions posed by Congress, it contributes to the knowledge framing the debate by combining a discussion of the current status of research models and available data with an analysis of newly available data on tuition and financial aid at public and private not-for-profit institutions.

The following sections first highlight the previous theoretical and empirical work conducted in this area, including different perspectives about the nature of the relationship between various forms of financial aid and prices at colleges and universities. Some of the limitations of currently available data are then described, along with the impact of these limitations on research models. Finally, the results of a series of correlational linear regression models are presented, using recent data on tuition and aid packaging that were collected as a result of a mandate in the 1998 amendments.

Review of Previous Work

The issue of whether various forms of financial aid "cause" tuition increases remains unresolved. Since the mid-1980s, some analysts and policymakers have argued that increases in the availability of federal aid provide incentives to institutions to increase tuition levels. According to this perspective, although the incentives may have lessened in recent years—particularly in aid programs in which most students already receive the maximum amounts—federal aid may still "enable" tuition increases by making college attendance more affordable, therefore increasing demand. Others have argued that most higher education institutions do not function like for-

profit entities, since all students in public and private not-for-profit institutions receive a "discount" on full prices because of public or institutional subsidies. Institutions may choose instead to use increased aid subsidies to lower their tuition levels. Still others have argued that a theoretical basis for the relationship between the volume of federal loan aid (as opposed to loan terms and conditions) and price cannot be established.[63] In the 1990s, the debate appears to have differentiated between types of aid and become focused on the possible relation of federal *loan aid* to price.[64]

Federal Grant Aid and Tuition

Given that grant aid directly decreases the net price paid by students,[65] some have surmised that colleges would raise their tuition to capture additional grant aid dollars if they could. In one study, McPherson and Schapiro (1991) tested the hypothesis that increases in federal student aid are related to increased tuition growth. Using data from academic years 1978–79 and 1985–86, they developed a simultaneous-equations model of various institutional choices, using changes in per student levels of various financial variables including tuition and federal grant aid. They found no evidence of a relationship between federal grant aid and tuition increases for private not-for-profit 4-year institutions. They did find, however, that during this time period public 4-year institutions tended to raise tuition by $50 for every $100 increase in federal student aid. This finding was consistent with their hypothesis that only public institutions would have tuition levels that would give them an incentive to increase tuition to capture additional student aid.[66]

More recently, however, McPherson and Schapiro have cautioned that those incentives may no longer exist, given current public tuition levels and federal aid maximums. A subsequent analysis by Coopers and Lybrand (1997), using data for academic years 1989–90 and 1994–95, appeared to confirm McPherson and Schapiro's results regarding the lack of a relationship between changes in federal aid and changes in tuition at private not-for-profit institutions. The findings regarding public 4-year institutions were weak, and the authors felt that the relationship between federal grants and tuition may no longer hold. This research was persuasive to the Na-

[63]There also exists a theoretical difficulty in establishing the proper incentive valuation for loans.

[64]For discussions of different aspects of these arguments, see Winston (1998); McPherson and Schapiro (1991, 1998); Hauptman and Krop (1998).

[65]Although not necessarily on a dollar-for-dollar basis because of other institutional decisions, such as institutional aid; see Turner (1998).

[66]The average awards in the Federal Pell Grant program are relatively low and "only in the rare case where Pell meets full need below the maximum would an increase in a college's tuition allow that student to receive a larger Pell grant" (McPherson and Schapiro 1998, p. 83). Turner (1998) also postulates that the greatest pressure on sticker price would occur at institutions that have a price of attendance below the maximum award amount, as well as at institutions that have considerable market power or a high percentage of Pell Grant eligible students. Another way to look at this issue would be to examine the proportion of aid recipients who are "maxed-out," and therefore raising tuition would not bring additional aid dollars into the institutions for those students.

tional Commission on the Cost of Higher Education in its report to Congress in 1998, which concluded that the evidence showed no relationship between federal grant aid and prices. Nevertheless, some methodological drawbacks to these studies have been noted,[67] and the studies did not explicitly address the issue of a possible impact through student demand. The issue is unlikely to be fully resolved until better data become available and/or more research is conducted.

Federal Student Loans and Tuition

Research on the possible relationship of federal loan aid to prices has been even less conclusive, suggesting that if such a relationship does exist, it may be indirect. Some researchers have pointed to the fact of rapidly escalating loan volumes and increases in college prices over time. In a paper prepared for the National Commission on the Cost of Higher Education, Hauptman and Krop (1998) used trend data to support a theory that the increases in availability of revenue through growth in federal loan volume has "facilitated the ability" of colleges and universities, especially private ones, to raise tuition and engage in the practice of tuition discounting. Other researchers failed to find evidence to support the theory. The Coopers and Lybrand study, which tested the relation between federal aid and tuition (based on McPherson and Schapiro's model) but also included data on student loan subsidies, found a small negative relationship in the private not-for-profit 4-year sector but no relationship in the public 4-year sector. After reviewing the available research, the Cost Commission decided that the research did not allow them to reach a definitive conclusion about the possible relation of federal loan aid to college prices.[68]

To complicate the issue, loan volume may not affect tuition levels directly, but rather may influence student demand through the impact of loan *terms and conditions* (e.g., interest rates). Economic theory assumes the existence of capital markets—in other words, financing mechanisms, such as consumer loans, are available to allow economic transactions—while loan terms and conditions may affect prices through their impact on consumer preferences (leading to shifts in the demand curve). However, to date empirical research has not attempted to model this system of relationships.

A recent study (Berkner 2000) examined the issue from the perspective of students' increasing demand for student loans due to higher costs of attendance. According to the study, which looked at public and private not-for-profit 4-year institutions over two periods (1989–90 to

[67]For example, both studies were based on changes measured between two specific years, and some relevant variables may not have been included in the models. See Oberg (1997); Pearson and Baldi (1998).

[68]Note that increased loan volume might reflect students' choices about how to fund their non-tuition costs. As noted by Johnstone in his commissioned paper (see Volume 2), most of these non-tuition costs are outside the control of the institution or government, and would be incurred regardless of whether or not the student attended college.

1992–93 and 1992–93 to 1995–96), the borrowing rates of full-time, first-time undergraduates did not vary directly with tuition levels. For public institutions, the average increases in tuition were the same in both periods, while the increases in borrowing were much greater during the second period. In addition, borrowing rates increased to similar levels regardless of the tuition level. At private not-for-profit institutions, tuition increases were greater during the first period, while borrowing rates and average loan amounts were greater during the second period. With some exceptions, borrowing rates increased to similar levels regardless of whether tuition was relatively low or high.

Federal Tax Credits and Tuition

A relatively new issue related to federal aid and prices has been added to the mix, with the federal tuition tax credits enacted in 1997. Several analysts have speculated that the tax credits will provide incentives to institutions and states to increase their tuitions and/or to change their financial aid policies.[69] The data that would allow this issue to be researched empirically are not yet available; therefore, to date it has not been addressed in the research literature.

Institutional Aid, Federal Aid, and Tuition

Regardless of whether institutional aid is viewed as a reduction in the price faced by students (a price discount) or as an expenditure item, it is inextricably bound up in the debate surrounding college prices and financial aid. The use of institutional financial aid to discount tuition has become a complex but important part of understanding institutional financing, especially among private not-for-profit institutions. Several studies have documented the recent increases in institutional aid as well as comparative trends in net prices, gross revenue trends, enrollment trends, and other factors at private not-for-profit institutions.[70] Nevertheless, little research has been done that examines the direct and indirect relationships among these factors as well as financial aid, accounting for all of the relevant interrelationships, in large part due to the lack of national data that would allow such analysis.[71]

Many observers have postulated that tuition levels might have risen less if less revenue had been put into institutional aid. The results presented in the previous two chapters of this report provide support for a positive correlation between changes in institutional aid expenditures and

[69]See for example Conklin (1998); Kane (1999); Wolanin (2001).

[70]Evidence presented in the commissioned paper submitted by Lapovsky (presented in Volume 2 of this study, along with the other commissioned papers) highlights recent increases in tuition discounting. Also see Redd (2000) for a discussion of tuition discounting compared with net tuition revenue, enrollment, and other factors at private not-for-profit institutions.

[71]The practice of discounting also has implications for access, borrowing, and other factors that complicate the issue.

changes in price—in other words, larger increases in expenditures on institutional aid are associated with larger increases in tuition.[72] For private not-for-profit 4-year institutions, a simultaneous equations model found institutional aid to have a positive relationship with tuition for research/doctoral, comprehensive, and bachelor's institutions. For public institutions, a correlational regression model found that changes in institutional aid expenditures had a positive association with changes in tuition for research/doctoral and comprehensive institutions.[73] However, a simple correlation over time between nominal tuition and institution aid in the aggregate cannot capture the whole picture of whether institutional grants are "driving" tuition increases;[74] ideally, net prices should be examined in a more complex model capturing the simultaneous relationships among net prices, sticker prices, costs, enrollment demand, and other factors.

Various arguments also have been made regarding the effect of federal aid on the use of institutional aid by higher education institutions. Federal aid may offset or substitute for an institution's own financial aid through the aid packaging process, thereby allowing the institution to reduce or shift its aid spending. In some cases, federal aid such as matching grants may actually encourage higher levels of institutional aid.[75] The available evidence is conflicting. In their paper, Hauptman and Krop (1998) argue that the growing availability of federal loans made it possible for a "high tuition/high aid" strategy at many private not-for-profit institutions, in which loans made up a large proportion of the greater amount of aid required by students who became "needy" as a result of the higher prices being charged. McPherson and Schapiro's (1991) analysis found a relationship between increases in federal grant aid and *increases* in institutional aid spending at private not-for-profit institutions. They hypothesized that these institutions do not use federal aid—at least, federal grants—as a substitute for institutional aid, but rather as a complement. The Coopers and Lybrand (1997) study also found a positive relationship between federal grant aid and institutional aid at private not-for-profit institutions, but found a small redistribution of institutional aid to needy students for public 4-year institutions.

It is likely that the relationship between federal aid and institutional aid depends on the type of aid as well as the specific characteristics of institutions. For example, results of research by Oberg (1997) suggest that different federal grant aid programs may have different effects on institutional aid; Pell Grants offset institutional aid, while campus-based grants that have matching requirements spurred increases in institutional aid. The effect of student loans on institutional aid

[72]The models, which were updates of previous models, did not include any other forms of financial aid.

[73]The model found a negative correlation between changes in institutional aid and tuition for the small number of public bachelor's institutions, suggesting that institutional aid was acting as a suppressor variable.

[74]In fact, in the public sector, a positive association between nominal tuition and institutional aid may signal that net prices faced by students are falling, because institutional grants at some institutions would need to be financed out of nontuition revenue.

[75]For example, because of the increased need to support needy students with institutional resources; see McPherson and Schapiro (1998).

is not clear and has not been addressed by much research. At the same time, in presenting a theoretical framework for how the allocation of financial aid by institutions might adjust to an infusion of federal subsidies (Pell Grants), Turner (1998) suggests that outcomes will vary depending on institutions' initial resource levels and preferences for need-based financial aid.[76] In thinking about this issue, it is also helpful to consider the extent of the overlap of aid recipients. Even if every dollar of aid was offset, not all students receive both federal and institutional aid; therefore, there would still be a reduction in the aggregate net prices paid.

Interrelationships Among Factors

The above-mentioned relationships are likely to be further complicated by simultaneous interrelationships. As noted by Pearson and Baldi (1998), correlations between financial aid and tuition may (or may not) appear to exist, but in any case the "true" relationships are probably not direct links. There may be simultaneous effects of changes in revenue on expenditures, of expenditures on tuition, of institutional aid on tuition, of tuition on institutional aid, of federal aid on tuition, of federal aid on institutional aid, of tuition on student need, and many other factors. Thus, any analysis of the impact of changes in financial aid on tuition needs to recognize that other factors influence tuition, not solely those related to institutional behavior.

For example, when external financial aid does not meet student need, there may be increased demand for institutionally funded aid. This is consistent with the hypothesis that when federal student aid is falling, institutions will increase tuition in order to pay for more institutional aid (and vice versa: in times of increasing federal aid, this suggests that the rate of increase in tuition will be slower). The complication, however, is that increases in federal aid may simultaneously increase the need for additional institutional aid, if they encourage additional low-income students to enroll. The direct net effect of increased federal aid on institutional aid, and its indirect effect on tuition, is therefore unclear *a priori*. A longitudinal structural model that takes into account the relationships among independent variables would be necessary to fully unravel these relationships (Pearson and Baldi 1998). Estimation of such a model, however, requires that variables can be defined and measured with available data.

[76]Although the Pell program increases the total reservoir of funds available for financial aid, it does not reduce net costs equally across different types of institutions. A dollar for dollar reduction in the net cost to students would occur only under very restrictive assumptions. The Pell subsidy changes the effective budget constraint, and the initial position of the institution is relevant to the outcome. Institutions with large financial aid budgets before the introduction of Pell subsidies would have smaller changes in net cost. See Turner (1998).

Data and Methods

In 1999, NCES administered the Institutional Prices and Student Financial Aid Survey (IPSFA) for the first time, a new web-based survey that attempted to capture recent data on tuition and financial aid packaging for each college and university, including the percentage of students receiving federal grants, state grants, institutional grants, and student loans, as well as the average amounts received. The data focus on first-time, full-time, degree/certificate-seeking undergraduates. This new data collection was initiated in response to the 1998 HEA amendments, which mandated that NCES improve its data collection process and make timely data available to parents and students in an easily understandable format. These new data provide an opportunity to re-examine the possibility of a relationship between financial aid and tuition in the late 1990s on a preliminary basis.

To understand existing patterns of student aid at higher education institutions, descriptive statistics are presented in the following section for each of seven institutional types: private not-for-profit 4-year institutions (divided into research/doctoral, comprehensive, and bachelor's institutions), public 4-year institutions (also divided into research/doctoral, comprehensive, and bachelor's institutions), and public 2-year institutions. These statistics include the average percentage of undergraduates receiving each type of aid, as well as the average amounts of aid received by these students. In addition, data are provided on the average numbers of first-time, full-time, degree/certificate-seeking undergraduates and changes in the typical amount of tuition charged to these students.

The data were analyzed through linear regression procedures in order to explore the relationship, if any, between the change in tuition over time (the dependent variable) and aid packaging, while accounting for other variables such as changes in revenues/expenditures, student characteristics, market characteristics, and other independent variables. The model attempts to identify variables *associated with* larger or smaller tuition increases, i.e., the characteristics of institutions with larger or smaller tuition increases, but does not attempt to identify the potential interdependence among decisions to increase tuition and other decisions related to expenditures, revenues, and institutional aid. Therefore, the findings must be interpreted within the context of a dynamic decisionmaking environment that involves indirect as well as direct effects.

The seven groups of institutions were examined separately. In each of these models, the following variables from the IPSFA dataset were included:

- Dependent variable: Real dollar change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates[77]
- Independent variables:
  - Tuition level in the base year
  - Number of first-time, full-time, degree/certificate-seeking undergraduates
  - Percentage of undergraduates who are first time, full time, and seeking a degree or certificate, multiplied times the percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source
  - Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving federal grants multiplied times the average amount received
  - Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving state grants multiplied times the average amount received
  - Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving institutional grants multiplied times the average amount received
  - Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving student loans multiplied times the average amount received

Although variables measuring the *change* in financial aid over time would be more appropriate, only one year of aid data was available at the time of this analysis. These variables were included in the models in order to test the theory that financial aid is related to changes in tuition levels, while controlling for some additional variables that are relevant to pricing decisions. Additional independent variables were added to each model in order to capture factors, other than financial aid, that appear to be associated with pricing decisions (see table 35 for the list of variables.)

The choice of these variables took into account the models and results presented in Chapters III and IV. The following bullets describe the basis for the additional variables chosen for the financial aid models presented in this chapter, for each type of institution:

- For private not-for-profit 4-year institutions, the chosen variables had relationships with undergraduate tuition in the reduced form models presented in Chapter IV. In these cases, the independent variables were expected to be associated with the pricing decisions of these institutions, and the results of the Chapter IV models appeared to

[77]In general, in-state tuition does not differ much, if at all, from out-of-state tuition at private not-for-profit institutions. In fact, in 1999–2000, in-state differed from out-of-state undergraduate tuition at only 4 of the 770 private not-for-profit institutions included in the universe, and the average tuition levels differed by less than one-half of one percent. Therefore, although the variable for in-state tuition was used in the analysis, it is referred to here simply as undergraduate tuition when it applies to private not-for-profit institutions.

Table 35.—Variables included in the financial aid regression models

INSTATCH	Dollar change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant dollars (dependent variable)
INSTAC98	1997–98 tuition, in constant dollars
FTUG99	Number of first-time, full-time, degree/certificate-seeking undergraduates in 1999
FTUGAP2	Percentage of first-time, full-time, degree/certificate-seeking undergraduates who receive any aid times the percentage of first-time, full-time, degree/certificate-seeking undergraduates
FEDGPAC	Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving federal grants times the average amount received, in constant dollars
STGPAC	Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving state grants times the average amount received, in constant dollars
INGPAC	Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving institutional grants times the average amount received, in constant dollars
LOANPAC	Percentage of first-time, full-time,degree/certificate-seeking undergraduates receiving student loans times the average amount received, in constant dollars
ACADIFF	Dollar change in academic support expenditures, in constant dollars (1995–96 to 1997–98 for publics, 1993–94 to 1995–96 for private not-for-profit)
AVC2DIFF	Dollar change in average faculty compensation, in constant dollars (1995–96 to 1997–98 for private not-for-profit)
AVTFDIFF	Dollar change in average tuition at public four-year institutions in the state, in constant dollars (1995–96 to 1997–98 for private not-for-profit)
FDGRDIFF	Dollar change in revenue from federal grants and contracts, in constant dollars (1995–96 to 1997–98 for publics, 1993–94 to 1995–96 for private not-for-profit); for private not-for-profit, less federal aid
INSPDIFF	Dollar change in institutional support expenditures, in constant dollars (1995–96 to 1997–98 for publics, 1993–94 to 1995–96 for private not-for-profit)
INSTDIFF	Dollar change in instruction expenditures, in constant dollars (1995–96 to 1997–98 for publics, 1993–94 to 1995–96 for private not-for-profit)
LOCALE	Degree of urbanicity of the institution, where 1=large city, 2=mid-size city, 3=urban fringe of large city, 4=urban fringe of mid-size city, 5=large town, 6=small town, 7=rural (public two-years)
PCTCERT	Percentage of awards granted in 1996–97 that were certificates (public two-years)
PERFT98R	Percent of total fall 1998 enrollment that was full time (publics)
PERMIN98	Percent of total fall 1998 enrollment that was minority (publics)
PHILDIFF	Dollar change in revenue from endowment and private gifts, in constant dollars (1993–94 to 1995–96 for private not-for-profit)
PLNTDIFF	Dollar change in plant maintenance expenditures, in constant dollars (1995–96 to 1997–98 for publics)

Table 35.—Variables included in the financial aid regression models—Continued

PLTRDIFF	Dollar change in plant operations and maintenance plus transfers, in constant dollars (1993–94 to 1995–96 for private not-for-profit)
RESDIFF	Dollar change in research expenditures, in constant dollars (1993–94 to 1995–96 for private not-for-profit)
STAPDIFF	Dollar change in revenue from state appropriations, in constant dollars (1995–96 to 1997–98 for publics)
STGRDIFF	Dollar change in revenue from state grants and contracts, in constant dollars (1995–96 to 1997–98 for publics)
STINCDIF	Dollar change in average per capita income by state, in constant dollars (1995–96 to 1997–98 for private not-for-profit)
STLODIFF	Dollar change in state/local revenue less state/local aid, in constant dollars (1993–94 to 1995–96 for private not-for-profit)
STUDDIFF	Dollar change in student services expenditures, in constant dollars (1993–94 to 1995–96 for private not-for-profit)
TRIBAL98	Dummy variable for public 2-year institutions that were classified as tribal colleges in 1998
YRINDFAD	Dummy variable for cases that use 1997–98 financial aid data instead of 1998–99 data
FTUGAPDM	Dummy variable for cases in which percentage of students receiving any aid were missing
ACADUMD	Dummy variable for cases in which data for ACADDIFF were missing
AVC2DUMD	Dummy variable for cases in which data for AVC2DIFF were missing
FDGRDUMD	Dummy variable for cases in which data for FDGRDIFF were missing
INSPDUMD	Dummy variable for cases in which data for INSPDIFF were missing
INSTDUMD	Dummy variable for cases in which data for INSTDIFF were missing
LOCALDUM	Dummy variable for cases in which data for LOCALE were missing
CERTDUM	Dummy variable for cases in which data for PCTCERT were missing
PERFTDUM	Dummy variable for cases in which data for PERFT98R were missing
PERMIND	Dummy variable for cases in which data for PERMIN98 were missing
PHILDUMD	Dummy variable for cases in which data for PHILDIFF were missing
PLNTDUMD	Dummy variable for cases in which data for PLNTDIFF were missing
PLTRDUMD	Dummy variable for cases in which data for PLTRDIFF were missing
RESDUMD	Dummy variable for cases in which data for RESDIFF were missing
STAPDUMD	Dummy variable for cases in which data for STAPDIFF were missing
STGRDUMD	Dummy variable for cases in which data for STGRDIFF were missing
STLODUMD	Dummy variable for cases in which data for STLODIFF were missing
STUDDUMD	Dummy variable for cases in which data for STUDDIFF were missing

confirm the expected relationships. The relationships of these variables with tuition may reflect internal institutional budget constraints or external conditions such as student choices.

- For public 4-year institutions, the chosen variables had associations with the change in in-state undergraduate tuition in regression models that included a range of institutional revenue and expenditure variables, from Chapter III. The most important variable that appeared to be related to tuition-setting decisions was the change in revenue from state appropriations, an association that is supported by expectations regarding public control over pricing, financial aid, and admissions decisions at these institutions. In addition, two variables related to student characteristics that were not in the Chapter III models were added in an attempt to capture the possible effects of differences in the composition of student bodies on institutional costs: the percentage of students that attended full time, and the percentage of students who were minorities.
- Public 2-year institutions posed a special case, as the regression model in Chapter III did not appear to fit the data well and any associations were small.[78] In this case, the variables that had the highest correlations with the dependent variable (change in tuition) were chosen from a range of revenue and expenditure variables, student enrollment characteristics, and other factors that appeared to measure differences among public 2-year institutions.[79]

As mentioned above, these regression models allow a preliminary exploration of the relationship between changes in tuition for undergraduate students and student financial aid, revenue and expenditure changes, and student enrollment and other characteristics. However, there are considerable data limitations in these models: for example, the availability of only one year of financial aid data and a lack of comparably recent financial data (especially for private not-for-profit institutions).[80] IPSFA data on loans include all sources of student loans; federal subsidized and unsubsidized, institutional, and private loans cannot be disaggregated. In addition, the IPSFA aid variables focus on the packaging of various forms of student aid in terms of the percentage of students receiving aid and the average amount received, and therefore cannot be used to explore the possibility of a revenue interaction at the institutional level between federal aid and institutional aid. Due in large part to the accounting standards used by the institutions themselves, information on financial aid collected through the IPEDS system for the available years is incomplete, especially regarding student loan volume, which cannot be isolated from tuition revenue in the IPEDS Finance survey data. Finally, financial data such as instruction expendi-

[78]In addition, in the Chapter III model, in-district tuition and fees was used as the dependent variable; however, in-district tuition was not available through IPSFA to be used in the model in this chapter.

[79]The latter variables were chosen because of their relevance to distinguishing public 2-year institutions, as described in Phipps, Shedd, and Merisotis (2001).

[80]For example, the most recent IPEDS finance data that is available for private not-for-profit institutions is for 1995–96, due to changes in the survey instrument to reflect the new FASB standards.

tures cannot be isolated for undergraduate students, making any comparison with undergraduate tuition inexact.

The models presented here attempt to add to the previous work in this area by providing an initial examination of tuition and financial aid—including student loan aid—with newly available data on patterns of receipt and average amounts of financial aid. Given the limitations highlighted above, however, it is important to point out that the models cannot fully address the questions asked in the 1998 HEA amendments. Ideally, a more detailed analysis might examine the changes in aid packaging over time in comparison to changes in tuition and other relevant factors, while accounting for simultaneous interrelationships among expenditures, revenues, and prices (in particular, the potential effects of tuition revenue on expenditures and the potential effects of the availability of federal aid revenue on the use of institutional aid). Studies might also test the effect of loan subsidies (terms and conditions) on demand over time, keeping in mind that different models will be applicable for different institutional types, as market and political forces have varying influences on tuition-setting at public and private not-for-profit institutions.

Data Sources

The main source of data for the regression analyses is IPSFA, which includes institutional information on price of attendance (for three years, 1997–98 to 1999–2000) and student financial aid (for one year, either 1997–98 or 1998–99). These data were supplemented with data from IPEDS for 1993–94 to 1997–98, depending on the most recent year available. Academic tuition, financial aid, finance, and salary variables were adjusted for inflation to 1999 dollars using the Consumer Price Index (CPI-U, 1982–84 = 100).

The universe of institutions was drawn from public 2-year and 4-year and private not-for-profit 4-year institutions that are Title-IV participating, degree-granting, and located in the 50 states and the District of Columbia. Public and private not-for-profit 4-year institutions were further divided by Carnegie classification into research/doctoral, comprehensive, and bachelor's institutions.[81] As the financial aid variables in the IPSFA dataset are based on first-time, full-time, degree/certificate-seeking undergraduate students, institutions that enrolled less than 50 first-time, full-time, degree/certificate-seeking undergraduate students were excluded from the analysis.[82] In addition, the analysis excluded cases in which tuition data were missing (or zero), cases that were missing data for the financial aid variables (federal grants, state grants, institutional grants, and loans), and cases in which the financial aid year indicator was missing. The to-

[81]Private not-for-profit bachelor's institutions were further divided into tuition quartiles during the regression modeling, due to an interaction effect (see findings below).

[82]IPSFA data for 1999–2000 were used to define and measure all of these selection criteria.

tal number of public institutions remaining in the universe was 1,407 (research/doctoral = 145; comprehensive = 254; bachelor's = 74; 2-year = 934). The total number of private not-for-profit institutions was 770 (research/doctoral = 77; comprehensive = 222; bachelor's = 471).[83]

For the remaining institutions, missing data were addressed by inserting the mean amounts for each variable (calculated by institutional type).[84] Prior to the regression modeling, the frequency distributions of each variable were examined and bivariate relationships between variables were explored through scatterplots and correlation matrices. In addition, averages were compiled for each institutional type, including such variables as the change in tuition, the number of first-time, full-time, degree/certificate-seeking undergraduates, the percentage of students receiving various forms of financial aid, and the average amounts of aid received.

The regression models were reduced in order to eliminate variables that did not add to the model's ability to explain the variation in the dependent variable, and to avoid spurious findings.[85] Each model was reduced (and the coefficients were estimated) using the backward elimination method.[86] The results of the financial aid models are presented for each institutional type, including the following statistics: multiple and adjusted R-squared; the model probability; the number of valid cases; the Pearson's correlation coefficient of each independent variable with the dependent variable; the regression coefficients; the standardized (Beta) coefficients; and the probability of the t statistic for each independent variable.[87] (See Appendix A for details regarding data and regression procedures.)

Trends in Tuition and Financial Aid

Average amounts and percentage changes are reported on an inflation-adjusted basis wherever applicable.

[83]The original number of public 2-year and 4-year institutions in the IPSFA dataset was 1,794. The various selection criteria and missing data procedures eliminated 387 institutions, 22 percent of the total. For private not-for-profit 4-year institutions, the original number in the IPSFA dataset was 1,571 and 801 were eliminated through the selection criteria and cleaning process (51 percent of the total). Although many institutions were eliminated from the original dataset through this process, the final groups of institutions enroll 94 percent of first-time, full-time, degree/certificate-seeking undergraduates at public 4-year and 2-year institutions and 93 percent of the total number at private not-for-profit 4-year institutions. See Appendix A for details on how many institutions were eliminated at each step, as well as bias analyses of the differences in the characteristics of institutions included in and excluded from the final universe.

[84]Separate dummy variables were created to identify the cases with missing data.

[85]In previous chapters, already existing models were being updated; they were not reduced because the original models had not been reduced.

[86]In the backward elimination method, all of the independent variables are entered, then at each step the variable that changes R-squared the least is removed. The procedure continues until the removal of any variable in the model results in a meaningful change in R-squared.

[87]Note that because the population is a census, some of these statistics were displayed not to measure significance, but rather to gauge the explanatory power of the model as a whole (model probability) or the strength of the relationships between the independent variables and the dependent variable (probability of the t statistic).

Public Research/Doctoral Institutions

The sub-group of 145 public research/doctoral institutions comprised 21.1 percent of first-time, full-time, degree/certificate-seeking undergraduate enrollment at all public and private not-for-profit institutions in 1999. Between 1997–98 and 1999–2000, in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates at public research/doctoral institutions increased by 2.9 percent on average, or $73 in constant 1999 dollars. These institutions averaged 2,646 first-time, full-time, degree/certificate-seeking undergraduates in 1999, 16.6 percent of all undergraduate students enrolled. An average of 68.5 percent of these first-time, full-time undergraduates received aid from any source (table 36).

Table 36.—Average changes in tuition, numbers of first-time, full-time, degree/certificate-seeking undergraduates, percentages receiving aid, and aid amounts received at public research/doctoral institutions

Change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant 1999 dollars	$73
Percentage change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000	2.9
Number of first-time, full-time, degree/certificate-seeking undergraduates, 1999–2000	2,646
Percentage of all undergraduates who are first-time, full-time, degree/certificate-seeking, 1999–2000	16.6
Percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source	68.5
Percentage receiving federal grants	28.3
Average amount of federal grants received	$2,262
Percentage receiving state grants	26.9
Average amount of state grants received	$1,742
Percentage receiving institutional grants	30.9
Average amount of institutional grants received	$2,576
Percentage receiving student loans	45.4
Average amount of student loans received	$3,490

N = 145

NOTE: Aid variables are for either 1997–98 or 1998–99.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

The percentages of these undergraduates who received aid, as well as the average amounts of aid received, varied by type of aid. On average, 28.3 percent received federal grant aid, with an average amount of $2,262. About 26.9 percent received an average amount of $1,742 in state grant aid, 30.9 percent received an average of $2,576 in institutional grant aid, and 45.4 percent received an average of $3,490 in student loans.

Public Comprehensive Institutions

The sub-group of 254 public comprehensive institutions comprised 15.4 percent of first-time, full-time, degree/certificate-seeking undergraduate enrollment at all public and private not-for-profit institutions in 1999. At public comprehensive institutions, in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates increased by 3.3 percent between 1997–98 and 1999–2000, or $84 in constant 1999 dollars. The average number of first-time, full-time, degree/certificate-seeking undergraduates was 1,107, 17.4 percent of all undergraduates enrolled at these institutions. An average of 71.3 percent of these first-time, full-time, degree/certificate-seeking undergraduates received aid from any source (table 37).

Table 37.—Average changes in tuition, numbers of first-time, full-time, degree/certificate-seeking undergraduates, percentages receiving aid, and aid amounts received at public comprehensive institutions

Change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant 1999 dollars	$84
Percentage change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000	3.3
Number of first-time, full-time, degree/certificate-seeking undergraduates, 1999–2000	1,107
Percentage of all undergraduates who are first-time, full-time, degree/certificate-seeking, 1999–2000	17.4
Percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source	71.3
Percentage receiving federal grants	38.0
Average amount of federal grants received	$2,098
Percentage receiving state grants	31.6
Average amount of state grants received	$1,414
Percentage receiving institutional grants	25.8
Average amount of institutional grants received	$1,696
Percentage receiving student loans	47.1
Average amount of student loans received	$2,689

N = 254

NOTE: Aid variables are for either 1997–98 or 1998–99.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

The percentages of students receiving aid and the average amounts of aid they received varied by type of aid. About 38.0 percent of first-time, full-time, degree/certificate-seeking undergraduates received federal grant aid, with an average amount of $2,098. On average, 31.6 percent received an average amount of $1,414 in state grant aid, 25.8 percent received an average of $1,696 in institutional grant aid, and 47.1 percent received an average of $2,689 in student loans.

Public Bachelor's Institutions

The sub-group of 74 public bachelor's institutions comprised 2 percent of first-time, full-time, degree/certificate-seeking undergraduate enrollment at all public and private not-for-profit institutions in 1999. At public bachelor's institutions, an average of 480 first-time, full-time, degree/certificate-seeking undergraduates were enrolled at each institution in 1999, about 17.8 percent of all undergraduate students enrolled in that year. The typical in-state tuition charged to these students increased by 3.4 percent between 1997–98 and 1999–2000, or $82 in constant 1999 dollars. An average of 71.5 percent of these undergraduates received aid from any source (table 38).

Table 38.—Average changes in tuition, numbers of first-time, full-time, degree/certificate-seeking undergraduates, percentages receiving aid, and aid amounts received at public bachelor's institutions

Change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant 1999 dollars	$82
Percentage change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000	3.4
Number of first-time, full-time, degree/certificate-seeking undergraduates, 1999–2000	480
Percentage of all undergraduates who are first-time, full-time, degree/certificate-seeking, 1999–2000	17.8
Percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source	71.5
Percentage receiving federal grants	44.1
Average amount of federal grants received	$2,064
Percentage receiving state grants	29.2
Average amount of state grants received	$1,259
Percentage receiving institutional grants	28.3
Average amount of institutional grants received	$1,613
Percentage receiving student loans	49.5
Average amount of student loans received	$2,659

N = 74

NOTE: Aid variables are for either 1997–98 or 1998–99.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

As at other institutions, the percentage and average amounts varied by type of aid. About 44.1 percent of these students received federal grant aid, with an average amount of $2,064. On average, 29.2 percent received an average of $1,259 in state grant aid, 28.3 percent received an average of $1,613 in institutional grant aid, and 49.5 percent received an average of $2,659 in student loans.

Public 2-Year Institutions

The sub-group of 934 public 2-year institutions comprised 27.1 percent of first-time, full-time, degree/certificate-seeking undergraduate enrollment at all public and private not-for-profit institutions in 1999. The average in-state tuition charged to first-time, full-time, degree/certificate-seeking undergraduates at public 2-year institutions increased by 4.9 percent between 1997–98 and 1999–2000. These institutions averaged 528 first-time, full-time, degree/certificate-seeking undergraduates in 1999, 15.9 percent of all undergraduates enrolled, and 56.8 percent of these undergraduates received aid from any source (table 39).

Table 39.—Average changes in tuition, numbers of first-time, full-time, degree/certificate-seeking undergraduates, percentages receiving aid, and aid amounts received at public 2-year institutions

Change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant 1999 dollars	$32
Percentage change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000	4.9
Number of first-time, full-time, degree/certificate-seeking undergraduates, 1999–2000	528
Percentage of all undergraduates who are first-time, full-time, degree/certificate-seeking, 1999–2000	15.9
Percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source	56.8
Percentage receiving federal grants	40.9
Average amount of federal grants received	$1,846
Percentage receiving state grants	25.9
Average amount of state grants received	$758
Percentage receiving institutional grants	14.0
Average amount of institutional grants received	$683
Percentage receiving student loans	16.6
Average amount of student loans received	$1,789

N = 934

NOTE: Aid variables are for either 1997–98 or 1998–99.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Given their relatively low tuition levels, both the average amounts of aid received and percentages of students receiving various types of aid tended to be low in comparison with 4-year institutions. About 40.9 percent of first-time, full-time, degree/certificate-seeking undergraduates at public 2-year institutions received federal grant aid, with an average amount of $1,846. On average, 25.9 percent received $758 in state grant aid, 14.0 percent received $683 in institutional grant aid, and 16.6 percent received an average of $1,789 in student loans.

Private Not-for-Profit Research/Doctoral Institutions

The sub-group of 77 private not-for-profit research/doctoral institutions comprised 5.8 percent of first-time, full-time, degree/certificate-seeking undergraduate enrollment at all public and private not-for-profit institutions in 1999. On average, private not-for-profit research/doctoral institutions had 1,375 first-time, full-time, degree/certificate-seeking undergraduates in 1999, about 23.6 percent of all undergraduate students enrolled. The typical tuition charged to these students increased by about 5.0 percent between 1997–98 and 1999–2000, or about $905 (table 40).

Table 40.—Average changes in tuition, numbers of first-time, full-time, degree/certificate-seeking undergraduates, percentages receiving aid, and aid amounts received at private not-for-profit research/doctoral institutions

Change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant 1999 dollars	$905
Percentage change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000	5.0
Number of first-time, full-time, degree/certificate-seeking undergraduates, 1999–2000	1,375
Percentage of all undergraduates who are first-time, full-time, degree/certificate-seeking, 1999–2000	23.6
Percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source	72.0
Percentage receiving federal grants	24.7
Average amount of federal grants received	$3,276
Percentage receiving state grants	23.8
Average amount of state grants received	$3,259
Percentage receiving institutional grants	64.7
Average amount of institutional grants received	$9,640
Percentage receiving student loans	55.4
Average amount of student loans received	$3,968

N = 77

NOTE: Aid variables are for either 1997–98 or 1998–99.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

On average, 72.0 percent of these undergraduates received aid from any source. As at public institutions, both the percentages of students receiving aid and the average amounts received vary by type of aid. About 24.7 percent of first-time, full-time, degree/certificate-seeking undergraduates received federal grant aid, with an average amount of $3,276. About 23.8 percent received an average amount of $3,259 in state grant aid, 64.7 percent received an average of $9,640 in institutional grant aid, and 55.4 percent received an average of $3,968 in student loans.

Private Not-for-Profit Comprehensive Institutions

The sub-group of 222 private not-for-profit comprehensive institutions comprised 5.6 percent of first-time, full-time, degree/certificate-seeking undergraduate enrollment at all public and private not-for-profit institutions in 1999. On average, tuition for first-time, full-time, degree/certificate-seeking undergraduates at private not-for-profit comprehensive institutions increased by 5.2 percent between 1997–98 and 1999–2000, or about $660. These institutions averaged 461 first-time, full-time, degree/certificate-seeking undergraduates, 20.8 percent of all undergraduate students enrolled. An average of 86.5 percent of these first-time, full-time, degree/certificate-seeking undergraduates received aid from any source (table 41). On average, 32.9 percent of these undergraduates received federal grant aid, with an average amount of $2,528, 36.8 percent received an average of $2,734 in state grant aid, 79.4 percent received an average of $5,475 in institutional grant aid, and 66.8 percent received an average of $3,705 in student loans.

Table 41.—Average changes in tuition, numbers of first-time, full-time, degree/certificate-seeking undergraduates, percentages receiving aid, and aid amounts received at private not-for-profit comprehensive institutions

Change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant 1999 dollars	$660
Percentage change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000	5.2
Number of first-time, full-time, degree/certificate-seeking undergraduates, 1999–2000	461
Percentage of all undergraduates who are first-time, full-time, degree/certificate-seeking, 1999–2000	20.8
Percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source	86.5
Percentage receiving federal grants	32.9
Average amount of federal grants received	$2,528
Percentage receiving state grants	36.8
Average amount of state grants received	$2,734
Percentage receiving institutional grants	79.4
Average amount of institutional grants received	$5,475
Percentage receiving student loans	66.8
Average amount of student loans received	$3,705

N = 222

NOTE: Aid variables are for either 1997–98 or 1998–99.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Private Not-for-Profit Bachelor's Institutions

The sub-group of 471 private not-for-profit bachelor's institutions comprised 8.3 percent of first-time, full-time, degree/certificate-seeking undergraduate enrollment at all public and private not-for-profit institutions in 1999. On average, private not-for-profit bachelor's institutions enrolled 320 first-time, full-time, degree/certificate-seeking undergraduates in 1999, 27.7 percent of all undergraduates. The typical tuition charged to these undergraduates increased by 4.6 percent between 1997–98 and 1999–2000, or about $571. About 85.7 percent of these students received aid from any source. On average, 35.5 percent received federal grant aid, with an average amount of $2,502; 38.8 percent received $2,521 in state grant aid, 76.9 percent received $6,063 in institutional grant aid, and 65.9 percent received an average of $3,514 in student loans (table 42).

Table 42.—Average changes in tuition, numbers of first-time, full-time, degree/certificate-seeking undergraduates, percentages receiving aid, and aid amounts received at private not-for-profit bachelor's institutions

	All institutions	Highest tuition quartile	Middle two tuition quartiles	Lowest tuition quartile
Change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000, in constant 1999 dollars	$571	$649	$588	$457
Percentage change in in-state tuition for first-time, full-time undergraduates, 1997–98 to 1999–2000	4.6	3.2	4.8	5.8
Number of first-time, full-time, degree/certificate-seeking undergraduates, 1999–2000	320	437	267	311
Percentage of all undergraduates who are first-time, full-time, degree/certificate-seeking, 1999–2000	27.7	31.8	25.5	28.2
Percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source	85.7	75.7	89.9	87.3
Percentage receiving federal grants	35.5	20.9	35.3	50.7
Average amount of federal grants received	$2,502	$2,879	$2,436	$2,259
Percentage receiving state grants	38.8	24.8	44.0	42.5
Average amount of state grants received	$2,521	$2,739	$2,589	$2,164
Percentage receiving institutional grants	76.9	71.7	86.4	63.0
Average amount of institutional grants received	$6,063	$10,980	$5,155	$2,984
Percentage receiving student loans	65.9	59.0	71.1	62.2
Average amount of student loans received	$3,514	$3,546	$3,615	$3,276

N = 471

NOTE: Aid variables are for either 1997–98 or 1998–99. Tuition quartiles are based on in-state undergraduate tuition for 1997–98.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Model Results

Overall, the regression models found no associations between most of the aid packaging variables and the change in tuition. The single exception is institutional aid, which was found to have a positive association for two groups of institutions: public comprehensive institutions and private not-for-profit comprehensive institutions. These results, although focusing on the aspect of aid packaging rather than aid volume or subsidies, generally confirm the findings of previous statistical modeling efforts. As discussed, the regression models presented here are limited in terms of their ability to capture changes in aid packaging over time or to address the interaction of revenue from federal loan aid and institutional aid.

Below, the results of the reduced regression models for public and private not-for-profit institutions are highlighted for each institutional type. For each regression model, the independent variables remaining after the backward elimination procedure are presented; removal of each of these variables would mean a meaningful decrease in the "explanatory" power of the model. One can interpret the results as pointing to the independent variables that have an *association* with the change in tuition, adjusting statistically for the covariation of all other variables in the model.

Public Research/Doctoral Institutions

The reduced regression model did not reveal a relationship between the aid variables and the change in tuition at public research/doctoral institutions (table 43). Several variables did have a relationship with the change in tuition, however, including the following:

- *The change in revenue from state appropriations.* Larger increases in tuition were associated with larger decreases in the revenue from state appropriations. This is consistent with the findings of Chapter III, which suggest that changes in government appropriations are related to tuition-setting decisions at public institutions.
- *The percentage of students who were minorities.* Larger increases in tuition were associated with lower proportions of minority students.
- *The number of first-time, full-time, degree/certificate-seeking undergraduates.* Larger increases in tuition were associated with higher numbers of these students.
- *The percentage of students who were attending full time.* Larger increases in tuition were associated with lower proportions of full-time students.
- *The tuition level in the base year.* Larger increases in tuition were associated with lower tuition levels in the base year.

Table 43.—Coefficients for reduced regression of the change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for public research/doctoral institutions

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	145	0.289	0.259	0.000*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	594.725	—	0.000*
Base year (1997–98) tuition level	-0.162	-0.037	-0.166	0.026*
Number of first-time, full-time, degree/certificate-seeking undergraduates	0.021	0.049	0.272	0.003*
Change in revenue from state appropriations	-0.336	0.000	-0.403	0.000*
Dummy variable for cases in which data for PLNTDIFF were missing	0.168	191.264	0.175	0.016*
Percent of total fall 1998 enrollment that was minority	-0.249	-3.702	-0.222	0.003*
Percent of total fall 1998 enrollment that was full time	-0.149	-4.990	-0.245	0.005*
Excluded variables: FTUGAP2, FTUGAPDM, YRINDFAD, FEDGPAC, STGPAC, INGPAC, LOANPAC, ACADDIFF, INSPDIFF, PLNTDIFF				

—Not applicable.

*Relatively strong relationship.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Together, the variables remaining in the regression model after the backward elimination process accounted for 28.9 percent of the variation in the change in in-state tuition at these schools.

Public Comprehensive Institutions

When the regression model was applied to this group of schools, the institutional aid variable had a positive association with the change in tuition. However, the model did not reveal relationships for the other aid variables (table 44). Other variables that had a relationship with the change in tuition are the following:

- *The change in revenue from state appropriations.* As expected for public institutions, larger increases in tuition were associated with larger decreases in the revenue from state appropriations.
- *The change in instruction expenditures.* Larger increases in tuition were associated with larger increases in expenditures for instruction.

Table 44.—Coefficients for reduced regression of the change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for public comprehensive institutions

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	254	0.214	0.198	0.000*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	161.160	—	0.003*
Base year (1997–98) tuition level	-0.044	-0.043	-0.166	0.005*
Number of first-time, full-time, degree/certificate-seeking undergraduates	0.009	0.057	0.154	0.015*
Percentage of FT, FT undergraduates receiving institutional grants times the average amount received	0.103	0.001	0.159	0.006*
Change in revenue from state appropriations	-0.322	0.000	-0.466	0.000*
Change in instruction expenditures	0.185	0.000	0.207	0.000*
Excluded variables: FTUGAP2, FTUGAPDM, YRINDFAD, FEDGPAC, STGPAC, LOANPAC, STAPDUMD, PERMIN98, PERFT98R, FDGRDIFF, FDGRDUMD, STGRDIFF, STGRDUMD				

— Not applicable.

*Relatively strong relationship.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

- *The tuition level in the base year.* Larger increases in tuition were associated with lower tuition levels in the base year.
- *The number of first-time, full-time, degree/certificate-seeking undergraduates.* Larger increases in tuition were associated with higher numbers of these students.

Together, the variables remaining in the reduced regression model accounted for 21.4 percent of the variation in the change in in-state tuition at public comprehensive institutions.

Public Bachelor's Institutions

The reduced regression model did not reveal a relationship between any of the aid variables and the change in tuition at public bachelor's institutions (table 45). However, the change in the revenue from state appropriations did have an association, with institutions with larger decreases in state appropriations revenue tending to have larger increases in tuition. Together, the variables remaining in the reduced regression model, including the change in state appropriations, accounted for only 14.3 percent of the variation in the change in tuition.

Table 45.—Coefficients for reduced regression of the change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for public bachelor's institutions

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	74	0.143	0.119	0.004*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	115.146	—	0.000*
Change in revenue from state appropriations	-0.197	0.000	-0.280	0.013*
Dummy variable for cases in which data for PERFT98R were missing	0.254	451.180	0.260	0.021*
Excluded variables: INSTAC98, FTUG99, FTUGAP2, YRINDFAD, FEDGPAC, STGPAC, INGPAC, LOANPAC, STAPDUMD, INSTDIFF, ACADDIFF, INSPDIFF, PLNTDIFF, PERMIN98, PERFT98R				

— Not applicable.
*Relatively strong relationship.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Public 2-Year Institutions

The reduced regression model did not reveal a relationship between the aid variables and the change in tuition at public 2-year institutions (table 46). Several variables did have an association, including the following:

- *The change in revenue from state grants and contracts.* Larger increases in tuition were associated with larger decreases in the revenue from state grants and contracts.
- *The percentage of students who were minorities.* Larger increases in tuition were associated with lower proportions of minority students.
- *The tuition level in the base year*. Larger increases in tuition were associated with lower tuition levels in the base year.
- *The percentage of awards granted that were certificates.* Institutions that awarded higher proportions of certificates tended to have larger increases in tuition.

Table 46.—Coefficients for reduced regression of the change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for public 2-year institutions

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	934	0.084	0.077	0.000*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	91.618	—	0.000*
Base year (1997–98) tuition level	-0.006	-0.023	-0.114	0.003*
Dummy variable for cases that use 1997–98 financial aid data	-0.153	-66.721	-0.124	0.000*
Change in revenue from state grants and contracts	-0.133	0.000	-0.147	0.000*
Percent of total fall 1998 enrollment that was minority	-0.149	-1.295	-0.139	0.000*
Dummy variable for cases in which data for PERMIN98 were missing	0.061	119.066	0.065	0.040*
Dummy variable for public 2-year institutions that were classified as tribal colleges	-0.123	-218.831	-0.088	0.007*
Percentage of awards granted that were certificates	0.108	0.791	0.086	0.009*
Excluded variables: FTUG99, FTUGAP2, FTUGAPDM, FEDGPAC, STGPAC, INGPAC, LOANPAC, STGRDUMD, LOCALE, LOCALDUM, CERTDUM				

— Not applicable.
*Relatively strong relationship.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Together, the variables remaining in the reduced regression model accounted for only 8.4 percent of the variation in the change in tuition. As in the model presented in Chapter III, this suggests that there are many factors affecting pricing decisions at public 2-year institutions that are not captured by this model.

Private Not-for-Profit Research/Doctoral Institutions

None of the variables remained in the reduced regression model for private not-for-profit research/doctoral institutions after the backward elimination procedure. Thus, the reduced regression model did not reveal an association between any of the independent variables and the change in tuition. The variable closest to having a relationship was the number of first-time, full-time, degree/certificate-seeking undergraduates, which had a positive association at the .10 level (table 47).

Table 47.—Coefficients for reduced regression of the change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for private not-for-profit research/doctoral institutions

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	77	0.044	0.031	0.069
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	725.282	—	0.000*
Number of first-time, full-time, degree/certificate-seeking undergraduates	0.209	0.131	0.209	0.069[a]
Excluded variables: INSTAC98, FTUGAP2, YRINDFAD, FEDGPAC, STGPAC, INGPAC, LOANPAC, STUDDIFF, ACADDIFF, FDGRDIFF, ACADDUMD, FDGRDUMD, AVC2DIFF, AVTFDIFF				

— Not applicable.

*Relatively strong relationship.

[a]This model actually reduced to the constant, with a regression coefficient of 904.852. However, the prior model is presented here for informational purposes.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Private Not-for-Profit Comprehensive Institutions

When the regression model was applied to this group of institutions, the institutional aid variable had a positive association with the change in tuition. However, the model did not reveal relationships for the other aid variables (table 48). Other variables that had an association were the following:

- *The number of first-time, full-time, degree/certificate-seeking undergraduates.* Larger increases in tuition were associated with higher numbers of these students.
- *The change in average per capita income in the state*. Institutions located in states in which average incomes increased the most tended to have larger increases in tuition.

Together, the variables remaining in the reduced regression model accounted for only about 10 percent of the variation in the change in tuition, indicating that this model does not capture pricing decisions well at these institutions.

Table 48.—Coefficients for reduced regression of the change in tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for private not-for-profit comprehensive institutions

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	222	0.100	0.088	0.000*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	102.418	—	0.455
Number of first-time, full-time, degree/certificate-seeking undergraduates	0.219	0.320	0.217	0.001*
Percentage of FT, FT undergraduates receiving institutional grants times the average amount received	0.188	0.000	0.186	0.004*
Change in average state per capita income	0.138	0.149	0.130	0.044*
Excluded variables: INSTAC98, FTUGAP2, FTUGAPDM, YRINDFAD, FEDGPAC, STGPAC, LOANPAC, ACADDIFF, ACADDUMD, AVC2DIFF, AVC2DUMD, AVTFDIFF, PHILDIFF, PHILDUMD, RESDIFF, STLODIFF, STLODUMD				

— Not applicable.

*Relatively strong relationship.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Private Not-for-Profit Bachelor's Institutions

The initial reduced regression model for all private not-for-profit bachelor's institutions indicated a *negative* association between the institutional aid variable and the change in tuition when controlling for all other factors (in comparison, the bivariate correlation between the two variables was small and positive). Further examination of the data suggested that this relationship was influenced by an interaction effect between the institutional aid variable and the base level of tuition in 1997–98.[88] When private not-for-profit bachelor's institutions were divided into subgroups based on the base year tuition level (highest quartile, middle quartiles, and lowest quartile), the results were the following:

[88]An interaction effect occurs when the strength or direction of a relationship between two (or more) variables is different depending on the value of some other variable. The interaction was detected by examining the partial correlations of institutional aid and the change in tuition, accounting for each of the independent variables, which suggested that the base year of tuition was modifying the relationship (the partial correlation was -.1143, compared to the simple correlation of .015). In addition, the interaction term for the base year level of tuition and institutional aid was related to the dependent variable in a one-way analysis of variance, ANOVA (where the two variables suspected of interacting were dichotomized around their median values) and when adding a multiplicative interaction term to the equation and re-running the regression. Suspected interaction effects were not examined in Chapters III and IV because the analyses used previously existing models and further exploration of the results was beyond the scope of the analyses.

The reduced regression models for all three subgroups did not reveal a relationship between the aid variables and the change in tuition for first-time, full-time, degree/certificate-seeking undergraduates between 1997–98 and 1999–2000 (tables 49, 50, and 51).

- For institutions in the highest tuition quartile, the number of first-time, full-time, degree/certificate-seeking undergraduates had a positive relationship with the change in tuition. It accounted for 3.6 percent of the variation in the change in tuition.
- For institutions in the middle tuition quartiles, two dummy variables representing missing data were the only variables remaining in the reduced regression model, accounting for 2.6 percent of the variation in the change in tuition.
- For institutions in the lowest tuition quartile, several variables had a positive relationship with the change in tuition, including the base level of tuition and the change in research expenditures. Together, the variables remaining in the reduced regression model accounted for 9.5 percent of the variation in the change in tuition.

Table 49.—Coefficients for reduced regression of the change in tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for private not-for-profit bachelor's institutions in the highest tuition quartile

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	117	0.036	0.028	0.040*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	361.968	—	0.021*
Number of first-time, full-time, degree/certificate-seeking undergraduates	0.191	0.658	0.191	0.040*
Excluded variables: INSTAC98, FTUGAP2, YRINDFAD, FEDGPAC, STGPAC, INGPAC, LOANPAC, ACADDIFF, AVC2DIFF, AVC2DUMD, AVTFDIFF, PHILDIFF, RESDIFF, RESDUMD, STLODIFF, STLODUMD, STINCDIF, STUDDIFF, PLTRDIFF, PLTRDUMD, INSPDIFF, INSTDIFF, INSTDUMD				

— Not applicable.

*Relatively strong relationship.

NOTE: Tuition quartile is based on in-state undergraduate tuition for 1997–98.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Table 50.—Coefficients for reduced regression of the change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for private not-for-profit bachelor's institutions in the middle tuition quartiles

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	237	0.026	0.018	0.046*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	582.306	—	0.000*
Dummy variable for cases in which data for STLODIFF were missing	0.074	831.370	0.297	0.014*
Dummy variable for cases in which data for PLTRDIFF were missing	-0.016	-875.350	-0.266	0.027*
Excluded variables: INSTAC98, FTUG99, FTUGAP2, FTUGAPDM, YRINDFAD, FEDGPAC, STGPAC, INGPAC, LOANPAC, ACADDIFF, AVC2DIFF, AVTFDIFF, PHILDIFF, RESDIFF, RESDUMD, STLODIFF, STINCDIF, STUDDIFF, PLTRDIFF, INSPDIFF, INSTDIFF, INSTDUMD				

— Not applicable.

*Relatively strong relationship.

NOTE: Tuition quartile is based on in-state undergraduate tuition for 1997–98.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Table 51.—Coefficients for reduced regression of the change in tuition for first-time, full-time, degree/certificate-seeking undergraduates on selected financial aid, revenue, expenditure, and institutional characteristics for private not-for-profit bachelor's institutions in the lowest tuition quartile

	N	Multiple R-squared	Adjusted R-squared	Model significance
Model	117	0.095	0.071	0.010*
	Correlation coefficient with change in tuition	Regression coefficient	Standardized (Beta) coefficient	Probability
Constant	—	-88.826	—	0.725
Base year (1997–98) tuition level	0.180	0.065	0.181	0.046*
Dummy variable for cases that use 1997–98 financial aid data	0.162	399.566	0.187	0.040*
Change in research expenditures	0.180	0.001	0.178	0.050*
Excluded variables: FTUG99, FTUGAP2, FTUGAPDM, FEDGPAC, STGPAC, INGPAC, LOANPAC, ACADDIFF, AVC2DIFF, AVC2DUMD, AVTFDIFF, PHILDIFF, RESDUMD, STLODIFF, STLODUMD, STINCDIF, STUDDIFF, PLTRDIFF, PLTRDUMD, INSPDIFF, INSTDIFF, INSTDUMD				

—Not applicable.

*Relatively strong relationship.

NOTE: Tuition quartile is based on in-state undergraduate tuition for 1997–98.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Discussion

The IPSFA data revealed that patterns of financial aid differ considerably among the types of institutions. Nevertheless, some trends appear to be common within each broad institutional sector (table 52):

- At public 4-year institutions, the percentage of first-time, full-time, degree/certificate-seeking undergraduates who received aid from any source tended to be more than two-thirds on average, ranging from 68.5 percent at research/doctoral institutions to 71.5 percent at bachelor's institutions. The average percent receiving aid and average amount received varied by type of aid, but in general the highest figures were for student loan aid at all three groups of public 4-year institutions.
- Public 2-year institutions presented a distinctly different situation, in which on average 56.8 percent of first-time, full-time, degree/certificate-seeking undergraduates received aid from any source, the highest percentage and average amount was for federal grant aid, and relatively low percentages of students received student loans or institutional aid.
- At private not-for-profit 4-year institutions, about three-quarters of first-time, full-time, degree/certificate-seeking undergraduates received aid from any source, ranging from 72.0 percent at research/doctoral institutions to 86.5 percent at comprehensive institutions. For all three groups of private not-for-profit institutions, the highest average percentages of students receiving aid were for institutional aid, and the average amounts of institutional aid received were considerably higher than the amounts of other aid. The averages for other types of aid varied according to institutional type, although student loan aid had the second highest percentages and average amounts.

In the 1998 amendments to the HEA, Congress directed NCES to explore how institutional financial aid affects price increases, and the extent to which federal financial aid is involved in this relationship. These questions propose specific relationships to be tested, i.e., the possibility of a direct relationship between financial aid and tuition increases, as well as an indirect relationship through the interaction of federal aid and institutional aid. Given the limitations described in this chapter, the regression models presented examined associations between recent measures of student aid and tuition using the IPSFA data, while recognizing that evaluating relationships among independent variables would involve a more complex and dynamic framework. The relationships found in these regression models point to the independent variables that have an *association* with the change in tuition, adjusting for the covariation of all other variables in the model. The associations were inevitably influenced by the chosen model, involving the variables that were included, as well as those variables that were excluded due to data limitations.[89]

[89]Note especially that "sticker" price is used as the dependent variable in these models, rather than net price. If the ratio of net price to sticker price is changing over time, the models may be misspecified.

Table 52.—Summary of financial aid patterns at public and private not-for-profit institutions

	Public				Private not-for-profit		
	Research/ doctoral	Compre- hensive	Bachelor's	2-year	Research/ doctoral	Compre- hensive	Bachelor's
Average percentage of first-time, full-time undergraduates receiving financial aid:							
Aid from any source	68.5	71.3	71.5	56.8	72.0	86.5	85.7
Federal grants	28.3	38.0	44.1	40.9	24.7	32.9	35.5
State grants	26.9	31.6	29.2	25.9	23.8	36.8	38.8
Institutional grants	30.9	25.8	28.3	14.0	64.7	79.4	76.9
Loan aid	45.4	47.1	49.5	16.6	55.4	66.8	65.9
Average amounts of aid received ($):							
Federal grants	$2,262	$2,098	$2,064	$1,846	$3,276	$2,528	$2,502
State grants	1,742	1,414	1,259	758	3,259	2,734	2,521
Institutional grants	2,576	1,696	1,613	683	9,640	5,475	6,063
Loan aid	3,490	2,689	2,659	1,789	3,968	3,705	3,514

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Surveys (IPSFA).

Keeping these provisions in mind, the models used the most recent available data on financial aid patterns and did not find evidence of a relationship between financial aid and tuition in any of the seven groups of institutions (table 53). The single exception was institutional aid, which was associated with changes in tuition at two groups of institutions: public and private not-for-profit comprehensive institutions. Other independent variables found to be related to the change in tuition included the change in revenue from state appropriations—which was associated at public 4-year institutions—the level of tuition in the base year, and the number of first-time, full-time, degree/certificate-seeking undergraduates.

At the same time, the low R-squared values found for these models suggest that more remains unexplained than explained by the models. This may be due to the limitations of available data, or to misspecification of the model. For example, some highly relevant variables may not have been included in the model, or the independent variables may not have been measured appropriately (for example, the change in financial aid, if available, may be a better variable to include than financial aid in a given year). The decisions regarding choice of model might be informed by the development of theories that account for differences by type of aid and institution, and for simultaneous relationships among variables. Given the limitations of this study, the results presented in this chapter can only suggest aspects of how a more complex model might be structured.

Table 53.—Significant relationships with the change in undergraduate tuition at public and private not-for-profit institutions: 1997–98 to 1999–2000

	Public research/ doctoral	Public compre-hensive	Public bachelor's	Public 2-year	Private not-for-profit research/ doctoral	Private not-for-profit compre-hensive	Private not-for-profit bachelor's: Highest tuition quartile	Private not-for-profit bachelor's: Middle tuition quartiles	Private not-for-profit bachelor's: Lowest tuition quartile
Federal grant aid									
State grant aid									
Institutional grant aid		*				*			
Loan aid									
Tuition in base year	*	*		*					*
Change in state appropriations revenue	*	*	*						
Number of FT, FT undergraduates	*	*			*	*	*		
Percent minority students	*			*					
Percent full-time students	*								
Change in instruction expenditures		*							
Percent certificates awarded				*					
Change in state grants and contracts				*					
Change in per capita state income						*			
Change in research expenditures									*

*Relatively strong relationship.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA); U.S. Department ofEducation, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1994 to 1998.

Chapter VI: Summary of Findings and Conclusions

This report, the final product of Phase I of the NCES Study of College Costs and Prices, has examined trends in prices, expenditures, revenues, and enrollment over the past decade and has explored the relationships among these variables at public and private not-for-profit colleges and universities. The goals of Phase I of the study were twofold:

1) To revisit the question left unanswered by the Cost Commission about the relations between prices and costs, and the relation of federal financial aid and institutional aid to price increases; and

2) To examine the usefulness of existing statistical models for testing the relationships between revenues and costs, and prices in higher education.

The approach taken to meet these goals reflects the constraints of resources and the limitations of available data. NCES initially proposed to respond to Congress' mandate with a national study collecting new institutional data and investigating the reciprocal relationships among variables over time. However, funds were not appropriated by Congress to allow such a collection of new data or the development of new statistical models to analyze them. As a result, existing models and data were used to investigate the relationship among prices, expenditures, and revenues. Due to the diversity of higher education institutions and the differences in influences and decisionmaking structures, the analysis separated public and private not-for-profit institutions and then divided these sectors into broad sub-groups to better address differences. Recognizing the limits of such analysis, NCES decided to extend the empirical research by requesting expert opinions from national researchers in the field.

The analysis in the report has been presented in four separate sections: Chapter II summarized the discussion of the commissioned papers, Chapter III presented the results of research about the public sector; Chapter IV focused on the private not-for-profit sector; and Chapter V explored the relation between financial aid packaging and tuition increases. This section briefly reiterates the major conclusions that can be drawn from across these sections, followed by a summary of trends in prices, revenues, and expenditures. The report ends with conclusions about the efficacy of the research models for future work on the topic.

Major Conclusions from the Data Analyses

The conclusions that have been reached from the trend analyses and models in this report are consistent with earlier research, extended to a longer period of time and expanded to include work on public 2-year institutions and financial aid packaging.

General Findings

The detailed analyses found variations in the nature and strength of the relationships between costs and prices across types of institutions, and within types of institutions over time. This is consistent with previous research, as well as with the opinions of the expert authors.

- In both the public and private not-for-profit sectors, average tuition charges increased at a faster rate than inflation over the period of the analyses, and tuition charges also increased faster than most expenditure categories within the institutions. The share of overall revenue coming from tuition has increased on average for all institutional types in both sectors.
- For the public 4-year institutions, the single most important factor associated with tuition increases was decreasing revenue from government appropriations, with state appropriations making up the majority of such revenue. Although increases in instruction expenditures were associated with increases in tuition at public 4-year institutions, the proportion of total expenditures for instruction declined slightly over the time period examined.
- Within the public sector, the regression models found that changes in revenue and expenditure categories explained a very low percentage of the variation in tuition for 2-year institutions. Whether this is attributable to the differences in funding between 2-year and other public institutions, or differences in students and programs, cannot be determined with these data.
- The research shows that prices at private not-for-profit institutions were related to both "internal" institutional budget constraints and "external" market conditions. In the private not-for-profit sector, there is no single overriding factor consistently related to tuition.
- For all three groups of private not-for-profit institutions, "internal" institutional constraints—higher costs (institutional aid and average faculty compensation levels) and lower levels of revenue from nontuition sources (endowment income and private gifts, grants, and contracts)—were associated with higher levels of undergraduate tuition. At the same time, "external" factors such as the availability of aid for students, the price of attending public institutions in the same state, and in-state consumer purchasing power were also associated with tuition levels. Some differences were found regarding the other independent variables that were related to tuition—for example, instruction expenditures were associated with tuition at comprehensive and bachelor's institutions, but not at research/doctoral institutions. These differences suggest that the three groups

of institutions face different competitive environments, although the findings were difficult to interpret.

- Regarding the relation between financial aid and tuition, the regression models found no associations between most of the aid packaging variables (federal grants, state grants, and loans) and changes in tuition in either the public or private not-for-profit sectors. The single exception is institutional aid, which was found to have a positive association with tuition increases for public comprehensive and private not-for-profit comprehensive institutions.

Summary of Trends

On average, inflation-adjusted, in-state undergraduate tuition levels rose through the 1990s for all institutional types, as evidenced by the institutions examined in detail in Chapters III and IV of this report:

- In the public sector, between 1988–89 and 1997–98, on average in-state undergraduate tuition and fees increased annually by 4.1 percent at research/doctoral institutions, 4.2 percent at comprehensive institutions, 4.3 percent at bachelor's institutions, and 3.4 percent at 2-year institutions, in inflation-adjusted terms.
- In the private not-for-profit sector, between 1988–89 and 1995–96, on average undergraduate tuition and fees increased annually by 3.6 percent at research/doctoral institutions, 4.1 percent at comprehensive institutions, and 3.7 percent at bachelor's institutions.

Gross tuition revenue accounted for increasing proportions of total E&G revenue for all institutional types, although, on average, public institutions continued to rely more on state appropriations than on tuition revenue. Public institutions in particular faced substantial changes in the composition of their revenue sources in the 1990s.

- Over the period 1988–89 to 1997–98, the proportion of total E&G revenue from tuition in public research/doctoral institutions increased by 5.4 percentage points, 8.4 percentage points at public comprehensive institutions, 8.0 percentage points at bachelor's institutions, and 5.6 percentage points at public 2-year institutions. The proportion of total E&G revenue from state appropriations decreased over the period; on average, the proportion decreased by 9.8 percentage points at research/doctoral institutions, 11.3 percentage points at comprehensive institutions, 6.9 percentage points at bachelor's institutions, and 3.2 percentage points at 2-year institutions.
- Despite the changes in composition of E&G revenue, on average state appropriations continued to make up a larger proportion than tuition revenue at public institutions. In 1997–98, tuition revenue at public research/doctoral institutions averaged 23.8 percent of total E&G revenue in contrast to 38.9 percent from state appropriations. At public comprehensive institutions, tuition revenues comprised 31.1 percent of total revenues compared to 47.0 percent from state appropriations; 31.5 percent compared to 44.6

percent at public bachelor's institutions; and 20.7 percent compared to 41.1 percent at public 2-year institutions.

- Tuition revenue tended to make up the largest single component of total E&G revenue at private not-for-profit institutions on average in 1995–96, comprising 49.3 percent at research/doctoral institutions, 73.5 percent at comprehensive institutions, and 64.8 percent at bachelor's institutions.
- The proportion of E&G revenue accounted for by tuition revenue at private not-for-profit institutions also increased: from 1988–89 to 1995–96, by 1.3 percentage points at research/doctoral institutions, by 5.1 percentage points at comprehensive institutions, and by 4.2 percentage points at bachelor's institutions. The proportion of revenue from other, nontuition sources, such as endowment income, decreased slightly over this period.

On average, instruction expenditures continued to constitute the largest proportion of total E&G expenditures for all institutional types, while expenditures for scholarships and fellowships—specifically, institutional scholarships and fellowships—was one of the fastest growing expenditure categories.

- At public institutions, instruction expenditures made up the largest proportion of total E&G expenditures in 1997–98—34.7 percent at research/doctoral institutions, 40.5 percent at comprehensive institutions, 37.6 percent at bachelor's institutions, and 42.8 percent at 2-year institutions. However, from 1988–89 to 1997–98, instruction decreased slightly as a proportion of total E&G expenditures—on average, by 1.9 percentage points at research/doctoral institutions, by 2.5 percentage points at comprehensive institutions, by 1.6 percentage points at bachelor's institutions, and by 4.0 percentage points at 2-year institutions. The second largest expenditure categories in 1997–98 were research (18.9 percent) at research/doctoral institutions, scholarships and fellowships at comprehensive and bachelor's institutions (12.1 percent and 14.5 percent, respectively), and institutional support (14.4 percent) at 2-year institutions.
- Expenditures for scholarships and fellowships—specifically institutional aid—at public institutions were one of the fastest growing expenditure categories. Over the period of 1988–89 to 1997–98, institutional aid increased annually by 8.1 percent on average at research/doctoral institutions in inflation-adjusted terms, 7.7 percent at comprehensive institutions, 8.0 percent at bachelor's institutions, and 6.8 percent at 2-year institutions. As a result, scholarships and fellowships made up an increasing proportion of total E&G expenditures at public institutions over this period—increasing by 1.8 percentage points at research/doctoral institutions, by 2.2 percentage points at comprehensive institutions, by 1.1 percentage points at bachelor's institutions, and by 3.9 percentage points at 2-year institutions.
- At private not-for-profit institutions, instruction expenditures made up the largest proportion of total E&G expenditures in 1995–96—35.4 percent at research/doctoral institutions, 31.7 percent at comprehensive institutions, and 28.3 percent at bachelor's institutions. From 1988–89 to 1995–96, instruction expenditures increased slightly (0.3

percentage points) as a proportion of total E&G expenditures at research/doctoral institutions, but decreased by 1.9 percentage points at comprehensive institutions and by 0.8 percentage points at bachelor's institutions. Scholarships and fellowships were the second largest category, accounting for 14.3 percent of total E&G expenditures at research/doctoral institutions, 22.6 percent at comprehensive institutions, and 25.1 percent at bachelor's institutions.

- Institutional scholarships and fellowships at private not-for-profit institutions were one of the fastest growing expenditure categories. Over the period of 1988–89 to 1995–96, institutional aid increased annually by 8.7 percent on average at research/doctoral institutions in inflation-adjusted terms, by 10.2 percent at comprehensive institutions, and by 8.5 percent at bachelor's institutions. As a result, scholarships and fellowships made up an increasing proportion of total E&G expenditures at private not-for-profit institutions over this period—increasing by 3.0 percentage points at research/doctoral institutions, by 5.0 percentage points at comprehensive institutions, and by 4.5 percentage points at bachelor's institutions.

In Chapter V, analysis of the recently collected IPSFA data revealed patterns of financial aid that differed among the groups of institutions, but which appeared to show some common tendencies within each institutional sector.

- Among all groups of institutions, over half of first-time, full-time, degree/certificate-seeking undergraduates received aid from any source, ranging from 56.8 percent at public 2-year institutions to 85.7 percent at private not-for-profit bachelor's institutions.
- At public 4-year institutions, the average percent receiving aid and average amount received varied by type of aid, but in general the highest figures were for student loan aid. Public 2-year institutions presented a distinctly different situation, in which the highest percentages and average amounts were for federal grant aid while relatively low percentages of students received student loans or institutional aid.
- At private not-for-profit 4-year institutions, the highest average percentages of students receiving aid were for institutional aid, while student loan aid tended to be the second highest.

Limitations of the Research

Although this research improves and expands upon previous studies of costs and prices, it remains limited with regard to answering some of Congress' specific questions. Some, but not all, of the limitations were caused by the reliance on existing institutional typologies and previously collected national data. Several changes to national data collection systems (and the underlying financial reporting standards at postsecondary education institutions) would be needed to more fully answer Congress' questions, including: more detailed institutional classification systems; comparable financial accounting standards between the public and private not-for-profit

sectors; detailed net price data; information on sources of revenue for institutional aid; standard definitions for items such as merit aid and technology costs; isolation of revenue and expenditure data by level of student; and information on marketing bands/peer groups, especially for sectors in which competition heavily influences institutional decisionmaking.

Some of these limitations could conceivably be overcome through the collection of new data over an appropriate period of time. In fact, recent changes were made to the accounting standards used by private not-for-profit institutions and have been incorporated into national data collection mechanisms; similar changes are expected for public institutions in the future. Nonetheless, new or revised data collection will not overcome all of the relevant research issues. For instance, the continuing differences in accounting standards are likely to complicate the collection of comparable data on capital and depreciation costs for some time to come. The nature of technology means that much of the costs of technology will always be hidden, as these expenditures are embedded within other functions. Perhaps most importantly, the production function of higher education—the essential fact that the nature of the inputs also influences the costs of production and the value of the outputs—and the existence of multiple sources of revenue at postsecondary education institutions means that cost analysis (or any other purely quantitative analysis) will always be somewhat limited in what it can reveal.

Conclusions about Research Models

As evidenced in this report, available national datasets can be used to describe and analyze aggregate trends in costs, prices, and subsidies, for broad groups of institutions. These data also allow regression models that can determine the associations between revenue and expenditure variables and tuition—i.e., as one decreases, the other tends to increase. It is important to keep in mind that the statistical models presented in this report are correlational in nature and cannot lead to definitive conclusions regarding the interrelationships among changes in variables over time. This research may be helpful in developing theories about the effects of expenditures, revenues, financial aid, and other variables on prices. It is less useful in testing such theories, however. Ideally, simultaneous equation models should be constructed to explore the direct and indirect effects of costs, revenues, financial aid, market conditions and other external influences, family resources, and college prices.[90]

In the process of performing the analyses in this report and in summarizing the opinions of the expert authors, several conclusions emerged regarding the appropriateness of research models

[90]For a discussion of a conceptual framework for a structural equation model, see Pearson and Baldi (1998).

designed to explore financial relationships in postsecondary education. The following considerations should be kept in mind:

- Public and private not-for-profit institutions operate in distinct circumstances, and should be modeled separately.
- Greater disaggregation of institutions below the level of the Carnegie classification should be done for institutions among both public and private not-for-profit institutions, as the current groups mask important differences in access to resources and market position. The classification of institutions by decile of subsidy, as suggested by Winston in his commissioned paper (see Volume 2), may be an appropriate mechanism. For public 2-year institutions, consideration must be given to the criteria that might be used to create sub-divisions to help distinguish among this large group of diverse institutions.[91]
- It is important to recognize, however, that the ability to carry out analyses on subgroups of institutions is limited by the number of cases needed to conduct accurate and useful statistical analyses.
- To analyze relationships, more needs to be known about the interaction of enrollments across sectors, and about the consequences of pricing decisions in the public sector on student demand in the private sector. It might also be helpful to look at higher education systems within a particular state and the interactions among different types of institutions.
- Examining the relationships both between student aid and prices, and between federal aid and institutional aid, requires distinguishing among different types of grant aid, need-based loan aid, and unsubsidized loan aid, as well as between the volume of aid and the terms and conditions of capital.
- The phenomenon of "tuition discounting" needs much more comprehensive analysis than is possible with existing data and accounting conventions. Greater precision is needed to understand the extent of merit aid in tuition discounting, and the relation of merit aid to other forms of aid. The studies of institutional discounting referred to in Lapovsky's paper (see Volume 2) have been limited to the private not-for-profit sector. It is widely believed that some form of tuition discounting, or differential pricing policies, is also an increasingly common pattern in public institutions.
- Given that existing models of change in prices tend to leave much of the variation unexplained, it might be useful to model government policy variables, such as changes in student loan terms and conditions.

In addition, as McPherson and Schapiro note in their commissioned paper (see Volume 2), more work is needed on theoretical explanations of observed trends and patterns in costs, revenues, prices, and other factors, including development of theories regarding the behavior of not-for-profit institutions in response to external changes, such as decreases in subsidies, and the im-

[91] An NCES report (Phipps, Shedd, and Merisotis 2001) may be helpful in this regard.

pact of state policies on the behavior of public institutions. Any statistical model exploring these issues will have to be based on sound theories of institutional and student behavior. At the same time, constructing and estimating a simultaneous equation model that explores the interrelationships among variables will depend upon the existence of well defined, relevant data collected over a reasonably long period of time (e.g., five or more years).

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Appendix A—Technical Notes and Methodology

Integrated Postsecondary Education Data System

The Integrated Postsecondary Education Data System (IPEDS) is a comprehensive database that encompasses all identified institutions whose primary purpose is to provide postsecondary education. IPEDS consists of institutional-level data that can be used to describe trends in higher education at the institutional, state, and/or national levels.

Postsecondary education is defined within IPEDS as the provision of formal instructional programs whose curriculum is designed primarily for students who have completed the requirements for a high school diploma or its equivalent. This includes academic, vocational, and continuing professional education programs, and excludes avocational and adult basic education programs.

IPEDS includes information about baccalaureate or higher degree-granting institutions, 2-year award institutions, and less-than-2-year institutions (i.e. institutions whose awards usually result in terminal occupational awards or are creditable toward a formal 2-year or higher award). Each of these three categories is further disaggregated by control (public; private not-for-profit; and private for-profit), resulting in nine institutional categories or sectors.

Specialized, but compatible, reporting formats have been developed for these nine sectors of postsecondary education providers. In general, the surveys/reports developed for postsecondary institutions granting baccalaureate and higher degrees are the most extensive; forms for the 2-year and less-than-2-year awards granting sectors request less data. This design feature accommodates the varied operating characteristics, program offerings, and reporting capabilities that differentiate postsecondary institutional sectors while yielding comparable statistics for all sectors.

Data are collected from approximately 11,000 postsecondary institutions. IPEDS has been designed to produce national-, state-, and institutional-level data for most postsecondary institutions. However, prior to 1993, only national-level estimates from a sample of institutions were available for the private, less-than-2-year institutions.

Until recently, data in IPEDS were organized into several survey areas.[92] For this report, the most important surveys include the following:

- *Institutional Characteristics*, including institutional names and addresses; congressional districts; counties; telephone numbers; tuition; control or affiliation; calendar systems; levels of degrees and awards offered; types of programs; and accreditation for all postsecondary education institutions in the United States and outlying territories.
- *Fall Enrollment*, including information about full- and part-time enrollment by racial/ethnic category and sex for undergraduates, first-professional, and graduate students. Age distributions by level of enrollment and sex were collected in odd-numbered years, and first-time degree-seeking student enrollments by residence status were collected in even-numbered years.
- *Financial Statistics*, including each institution's current fund revenues by source (e.g., tuition and fees, government, gifts); current fund expenditures by function (e.g., instruction, research); assets and indebtedness; and endowment investments.
- *Salaries, Tenure, and Fringe Benefits of Full-time Instructional Faculty*, including information about full-time instructional faculty by gender and tenure status, and outlays for salaries and fringe benefits.

Other components of IPEDS provided data on fall staff, degrees and certificates awarded, and library resources. Detailed information about IPEDS is available at the National Center for Education Statistics Web site (http://nces.ed.gov).

At the time this report was written, Finance survey data for 1996–97 and 1997–98 were available only for public institutions and did not include imputations. Finance data were available only until 1995–96 for private not-for-profit institutions. This was due to the changes in the IPEDS Finance survey incorporated in Fiscal Year 1997 as a result of the changes in Financial Accounting Standards Board (FASB) guidelines for private not-for-profit institutions.

Also, some of the data from the Salaries, Tenure, and Fringe Benefits of Full-time Instructional Faculty survey are suppressed in the public use data files for reasons of confidentiality. For this report, the restricted data files were used. Because a restricted file was unavailable for 1989–90, suppressed data fields were estimated through interpolation from data for subsequent years.

Institutional Prices and Student Financial Aid Survey

The Institutional Prices and Student Financial Aid Survey (IPSFA) was a Web-based survey administered by NCES in the 1999–2000 data collection cycle to collect institutional infor-

[92]In 1999-2000, the IPEDS collection framework was converted to a web-based system, and changes were made to the fields collected.

mation on price of attendance, student financial aid, and other characteristics. The original IPSFA survey was planned as a pilot study to test institutions' ability both to provide data on these issues and to submit data via the Web. In 2000–2001, various components of IPSFA were incorporated into the redesigned IPEDS surveys, which are now administered through a Web-based data collection process.

The IPSFA universe of institutions was based on the IPEDS universe. Data were collected from more than 6,000 institutions, including public, private not-for-profit, and private for-profit institutions at the 4-year, 2-year, and less-than-2-year levels.

Data in IPSFA were organized into several subcomponents, including the following:

- *Institutional Characteristics*, including institutional names, addresses; telephone numbers; web addresses; and control or affiliation.
- *Student Count*, including information about the number and percentage of first-time, full-time, degree/certificate-seeking undergraduates.
- *Academic Tuition*, including the in-state and out-of-state tuition levels charged to first-time, full-time degree/certificate-seeking undergraduates for three years (1997–98 to 1999–2000), as well as charges for books and supplies, room and board, and other expenses.
- *Financial Aid*, including information on the percentage of first-time, full-time degree/certificate-seeking undergraduates receiving federal grants, state grants, institutional grants, and loan aid for either 1997–98 or 1998–99, as well as the average amounts of aid received.

At the time this report was written, the IPSFA data for 1999–2000 had been edited but did not include imputations.

Bureau of Economic Analysis Regional Accounts Data

The Bureau of Economic Analysis (BEA) at the U.S. Department of Commerce collects state personal income data under its State Annual Series. The model presented in Chapter IV of this report uses the state per capita income data released in July 1999, the most recent estimates available at the time the analysis was performed. Estimates of state personal income, per capita personal income, population, disposable personal income, and per capita disposable personal income for 1969 to 1998 for all states, regions, and the United States were available for download from the BEA's Web site. The per capita personal income estimates were computed from administrative records and other sources, using the mid-year population estimates of the Bureau of

the Census. For more information, see the Bureau of Economic Analysis Web site (http://www.bea.doc.gov).

Accuracy of Estimates

Most of the statistics in this report are estimates derived from a population. In using a census of an entire population there is not a sampling error, but there is still the possibility of nonsampling error.

Nonsampling errors can be attributed to a number of sources: inability to obtain complete information about all institutions (i.e., some institutions refused to participate, or participated but answered only certain items); ambiguous definitions; differences in interpreting questions; inability or willingness to give correct information; mistakes in recording or coding data; and other errors of collecting, processing, and imputing missing data.

To compensate for nonresponse, adjustments are often made, referred to as imputations. Imputations are usually made separately within various groups of institutions that have similar characteristics. If a particular institution responded in previous and later years, simple interpolations may also be used to substitute for a missing response.

In addition to nonsampling errors, sampling errors may have occurred in the estimates of state per capita personal income, which were used in the simultaneous equation model presented in Chapter IV. Although BEA produced its estimates of state per capita income based on samples, the estimates were aggregated to the state level and the standard errors are likely to be very small. The standard error is a measure of the variability due to sampling when estimating a parameter; very small standard errors signify that a high level of precision would be expected from a particular sample.

Most of the estimates in this report were produced using the SPSS 10.0 software package. SPSS makes it possible for users to specify and generate a variety of univariate and multivariate analyses, including linear regression analysis. In addition, the STATA 6.0 software package was used to produce the estimates for the simultaneous equation models presented in Chapter IV, using the three-stage least squares procedure.

IPEDS Data Used in Chapters III and IV

Selection Criteria

The trend analyses and statistical models presented in Chapters III and IV used panels of institutions constructed from IPEDS data, over the period 1988–89 to 1997–98 for public institutions and 1988–89 to 1995–96 for private not-for-profit institutions. The difference in time periods is a result of the changes in FASB guidelines for private not-for-profit institutions, which were incorporated into the IPEDS finance survey beginning in Fiscal Year 1997.

As the dependent variable in these models was first-time, full-time undergraduate tuition and fees, the panel criteria targeted postsecondary institutions that primarily serve full-time, undergraduate students. To an extent, this attempted to mitigate the fact that IPEDS revenue and expenditure data cannot be broken down by level of student. It is also common practice in cost studies to select a group of institutions that are somewhat comparable, and the criteria used here are similar to those used in other contemporary studies.[93]

To create the panels, institutional characteristics data were used to define and measure selection criteria, using 1997–98 data for public institutions and 1995–96 data for private not-for-profit institutions. Institutions were drawn from all Title IV participating, degree-granting institutions located in the 50 states and the District of Columbia. Both 4-year and 2-year institutions were included for public institutions, while only 4-year institutions were included for private not-for-profit institutions. The 4-year institutions were further divided by Carnegie classification into research/doctoral, comprehensive, and bachelor's institutions (institutions classified as "other/specialized" or not classified were excluded). Institutions that enrolled less than 200 FTE students were excluded from the universe. Finally, for 4-year institutions only, institutions with less than 50 percent undergraduate fall headcount enrollment and institutions with less than 25 percent full-time fall headcount enrollment were excluded.

Parent/Child Institutions

The IPEDS surveys allow "parent" institutions to report data for campuses or branch institutions, or the "child" institutions may report information on their own. In many cases, schools reported data separately for campuses or branch institutions for some IPEDS surveys but not others, or reported data separately in certain years but in the aggregate in other years. To deal with these inconsistencies across surveys and/or years, financial data were disaggregated, using the

[93]See, for example, GAO (1998); Coopers and Lybrand (1997); Winston (1998).

distribution of FTE enrollment across branch campuses to allocate revenues and expenditures. When the discrepancies could not be resolved, institutions were eliminated from the universe.

Missing Data and Outliers

In cleaning the data for the remaining institutions, it was important to impute for missing data so that the panel institutions had data for all years.[94] As a first step, institutions that had missing data in key variables (tuition, fall enrollment, credit hour activity, total revenue, and scholarships and fellowships) for a certain number of years were eliminated from the universe. The cut-offs chosen were 3 or more years out of 10 years for public 4-year institutions, 6 or more years out of 10 years for public 2-year institutions, and 6 or more years out of 8 years for private not-for-profit institutions.[95] For institutions remaining in the universe after this cut-off, a simple interpolation procedure based on previous and subsequent years was used to impute for missing data.

After the imputation of missing data, the distributions of all of the variables were examined to spot any errors caused by imputations or estimations. Errors in imputation were corrected whenever possible. Data reported by the institutions were not altered, even in the case of outliers. However, for the public institutions only, in order to deal with remaining outliers that appeared to be extreme but could not be corrected, certain variables were Winsor trimmed from the top and bottom of the distribution by 1 or 2 percentiles, i.e., cases with extreme outliers in specific variables were removed from the analysis. The trimming process was done consistently within each institutional type; that is, for each group of public institutions, the variables that were trimmed for the ten-year time period also were trimmed in each of the sub-periods. Public 2-year institutions presented a particular obstacle, as the widespread existence of extreme outliers made trimming of virtually all the variables necessary; although this group had the largest number of cases (813), approximately 10 percent of the cases were eliminated due to the trimming process.

[94]Note that full imputations (defined as response status = 4) already in the dataset were treated as missing data so that imputations would be consistent across all data.

[95]The cut-offs were chosen for each type of institutions such that the fewest number of years could be used without eliminating more than a quarter of the institutions.

Variable Definition

After the panels were created and imputations were made, all financial data were adjusted for inflation using the Consumer Price Index (CPI-U, 1982–84 = 100).[96] Financial variables were adjusted to constant 1999 dollars.

Revenue and expenditure variables were calculated on a per FTE student basis, where FTE was generated from reported or estimated fall instructional activity (credit/contact hours). One component of the IPEDS Institutional Characteristics survey is instructional credit/contact hour activity for undergraduates, graduate students, and professional students. To generate total FTE for each institution, a formula was used.[97] Since instructional activity data were collected only for 1991–92 and later years, instructional activity values were estimated for the years in which they were not available. To estimate the values, ratios of total FTE generated from credit hour activity to total headcount fall enrollment were calculated separately for undergraduates, graduate students, and professional students (for the nearest year in which instructional activity data were available); these ratios were applied to total enrollment for years in which instructional activity data were missing. A similar procedure was used to estimate first-time freshman FTE for the model in Chapter IV.

For the panels of private not-for-profit institutions, the final dataset was rearranged such that the structure included seven records for each institution, one for each year. Dummy variables were then inserted to identify the years. Because of the need for lagged variables in the simultaneous equations model (see Chapter IV), the time period for the model extended from 1989–90 to 1995–96, while the data (for some variables) began in 1988–89. Also, natural logarithms were taken of the model variables.[98] In cases in which variables contained missing, zero, or negative values (for which logarithms return no value), zero values were inserted into the logged variables and separate dummy variables were created to identify these cases. Negative values occurred in some computed variables due to the imputation process.

[96]The Consumer Price Index for All Urban Consumers (CPI-U) measures changes in relation to a base period, in this case the average index level for a 36-month period covering 1982, 1983, and 1984, which is set equal to 100.

[97]For quarter calendar systems, one FTE is equivalent to 15 credit hours (300 contact hours) for undergraduates, 12 credit hours for graduate students, and 16 credit hours for professional students; for semester, trimester, and other calendar systems, one FTE is equivalent to 15 credit hours (450 contact hours) for undergraduates, 12 credit hours for graduate students, and 16 credit hours for professional students.

[98]Logs were not taken of the ratio of graduate to total enrollment due to the large number of zero values, especially for comprehensive and bachelor's institutions.

Final Universe for Chapters III and IV

The various procedures described above eliminated institutions from the original dataset (tables A1 and A2). The final datasets comprised four panels of public institutions with data for all years of the ten-year period, and three panels of private not-for-profit 4-year institutions with data for all years of the eight-year period. The total number of public institutions remaining in the panels was 1,235 (research/doctoral = 135; comprehensive = 221; bachelor's = 66; 2-year = 813). The total number of private not-for-profit institutions remaining in the panels was 690 (research/doctoral = 47; comprehensive = 192; bachelor's = 451).

Although the final universe includes 64 percent of the original number of public 4- and 2-year institutions with data, the institutions remaining in the panels comprised 84 percent of undergraduate enrollment at all public 4-year institutions and 81 percent of undergraduate enrollment at all 2-year institutions in 1997–98. The final universe of private not-for-profit 4-year institutions includes 34 percent of the original number, but captures 63 percent of the total undergraduate enrollment within these institutions.

In order to examine the differences between the final universe and the institutions that were excluded, a bias analysis was performed for each institutional type, using the original IPEDS data files.[99] In general, the institutions excluded from the analysis were fairly similar to those included in the final universe on a range of variables measuring tuition, revenues, expenditures, and enrollment (tables A3 to A9). Some exceptions were:

- Of public 4-year institutions, research/doctoral institutions excluded from the universe had higher proportions of graduate students and higher revenues and expenditures per FTE, on average, than included institutions (table A3).[100] Excluded comprehensive institutions tended to have fewer students, on average (table A4).
- Of public 2-year institutions, excluded institutions had fewer students and slightly higher revenues and expenditures per FTE student, on average, than 2-year institutions included in the final universe (table A6).
- Of private not-for-profit 4-year institutions, research/doctoral institutions excluded from the final universe had higher proportions of graduate students and higher revenues and expenditures per FTE, on average, than included institutions (table A7).[101]

[99]Note that many institutions had missing data for the variables examined; no attempts were made to impute for missing data, for either the included institutions or the eliminated institutions.

[100]Note that one institution in particular, a graduate/professional school in health sciences, appeared to be pulling up the financial averages.

[101]Again, a few institutions appeared to be highly influencing the financial averages.

Table A1.—Final universe of public 4-year and 2-year institutions for Chapter III

	Number	Percentage of original number
Original number of public 4-year and 2-year institutions in IPEDS in 1997–98	1,921	100.0
Less institutions removed through the parent/child procedure	94	4.9
Sub-total	1,827	95.1
Less institutions removed through selection criteria	333	17.3
Sub-total	1,494	77.8
Less institutions removed due to missing data	211	11.0
Sub-total	1,283	66.8
Less institutions excluded due to specialized, other, or missing Carnegie classification	48	2.5
Final universe	1,235	64.3

NOTE: Selection criteria were: Title IV participation, degree-granting status, location in the 50 states and the District of Columbia, enrollment (at least 200 full-time equivalent enrollment), and percentage of undergraduate and full-time enrollment (at least 50 percent undergraduate and 25 percent full-time enrollment, respectively; relevant only for 4-year institutions).

SOURCE: U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full 1998 Collection Year.

Table A2.—Final universe of private not-for-profit 4-year institutions for Chapter IV

	Number	Percentage of original number
Original number of private not-for-profit 4-year institutions in IPEDS in 1995–96	2004	100.0
Less institutions removed through the parent/child procedure	92	4.6
Sub-total	1912	95.4
Less institutions removed through selection criteria	1001	50.0
Sub-total	911	45.5
Less institutions removed due to missing data	101	5.0
Sub-total	810	40.4
Less institutions excluded due to specialized, other, or missing Carnegie classification	120	6.0
Final universe	690	34.4

NOTE: Selection criteria were: Title IV participation, degree-granting status, location in the 50 states and the District of Columbia, enrollment (at least 200 full-time equivalent enrollment), and percentage of undergraduate and full-time enrollment (at least 50 percent undergraduate and 25 percent full-time enrollment, respectively).

SOURCE: U.S. Education Department, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full 1996 Collection Year.

Table A3.—Final universe of public research/doctoral institutions in Chapter III compared to excluded institutions: 1997–98

	Final universe	N	Excluded institutions	N
Total		135		16
Average in-state undergraduate tuition	$3,420	135	$3,140	15
Average percent change in in-state undergraduate tuition since 1989–90	81.1	135	104.2	14
Average revenues per FTE:				
Tuition	$5,071	132	$5,186	15
State appropriations	$8,269	132	$10,699	15
Total current revenue	$26,950	132	$44,906	15
Tuition as a percentage of total revenue	21.8	132	24.6	15
State appropriations revenue as a percentage of total revenue	34.1	132	32.1	15
Average expenditures per FTE:				
Instruction	$7,330	132	$11,198	15
Research	$4,020	132	$8,835	15
Academic support	$2,000	132	$6,286	15
Student services	$904	132	$1,198	15
Institutional support	$1,625	132	$2,764	15
Scholarships and fellowships	$1,619	132	$2,070	15
Institutional scholarships and fellowships	$583	130	$944	12
E&G expenditures	$21,152	132	$37,976	15
Total current expenditures	$26,773	132	$45,995	15
Instruction as a percentage of total expenditures	30.1	132	42.0	15
Average enrollment:				
FTE undergraduates	13,703	135	14,837	14
Total headcount enrollment	20,754	135	19,470	16
Undergraduate headcount enrollment	15,691	135	14,809	16
First-time, full-time headcount enrollment	2,630	135	2,488	16
Percent undergraduate	76.1	135	68.2	16
Percent full-time	73.9	135	75.5	16

NOTE: Educational and general (E&G) expenditures include the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers. Full-time equivalent (FTE) enrollment was calculated from instructional (credit/contact hour) activity, as described in this appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1990 and 1998.

Table A4.—Final universe of public comprehensive institutions in Chapter III compared to excluded institutions: 1997–98

	Final universe	N	Excluded institutions	N
Total		221		54
Average in-state undergraduate tuition	$2,834	221	$2,463	54
Average percent change in in-state undergraduate tuition since 1989–90	87.4	213	81.1	52
Average revenues per FTE:				
Tuition	$3,534	220	$3,689	52
State appropriations	$5,378	218	$6,260	51
Total current revenue	$13,059	220	$15,305	52
Tuition as a percentage of total revenue	27.5	220	25.2	52
State appropriations revenue as a percentage of total revenue	41.5	218	43.3	51
Average expenditures per FTE:				
Instruction	$4,505	220	$5,089	52
Research	$330	200	$391	46
Academic support	$1,046	220	$1,236	52
Student services	$883	220	$979	52
Institutional support	$1,319	220	$1,804	52
Scholarships and fellowships	$1,347	220	$1,626	52
Institutional scholarships and fellowships	$316	215	$264	38
E&G expenditures	$11,106	220	$13,157	52
Total current expenditures	$12,854	220	$14,992	52
Instruction as a percentage of total expenditures	35.6	220	35.1	52
Average enrollment:				
FTE undergraduates	6,247	221	3,856	53
Total headcount enrollment	8,758	221	6,123	54
Undergraduate headcount enrollment	7,351	221	4,978	54
First-time, full-time headcount enrollment	1,148	221	717	54
Percent undergraduate	84.7	221	81.0	54
Percent full-time	70.1	221	59.5	54

NOTE: Educational and general (E&G) expenditures include the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers. Full-time equivalent (FTE) enrollment was calculated from instructional (credit/contact hour) activity, as described in this appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1990 and 1998.

Table A5.—Final universe of public bachelor's institutions in Chapter III compared to excluded institutions: 1997–98

	Final universe	N	Excluded institutions	N
Total		66		20
Average in-state undergraduate tuition	$2,943	66	$2,699	16
Average percent change in in-state undergraduate tuition since 1989–90	80.3	66	126.6	14
Average revenues per FTE:				
Tuition	$3,367	65	$3,164	17
State appropriations	$4,982	61	$4,787	15
Total current revenue	$12,291	65	$12,063	17
Tuition as a percentage of total revenue	29.0	65	30.9	17
State appropriations revenue as a percentage of total revenue	40.0	61	32.5	15
Average expenditures per FTE:				
Instruction	$3,968	65	$4,089	17
Research	$162	52	$400	16
Academic support	$907	65	$1,085	17
Student services	$967	65	$941	17
Institutional support	$1,292	65	$1,956	17
Scholarships and fellowships	$1,519	65	$2,004	17
Institutional scholarships and fellowships	$317	62	$204	14
E&G expenditures	$10,536	65	$9,887	17
Total current expenditures	$12,310	65	$10,892	17
Instruction as a percentage of total expenditures	33.9	65	68.7	17
Average enrollment:				
FTE undergraduates	2,416	66	2,716	18
Total headcount enrollment	3,059	66	4,150	18
Undergraduate headcount enrollment	3,005	66	4,031	18
First-time, full-time headcount enrollment	529	66	488	18
Percent undergraduate	98.0	66	96.8	18
Percent full-time	72.5	66	62.8	18

NOTE: Educational and general (E&G) expenditures include the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers. Full-time equivalent (FTE) enrollment was calculated from instructional (credit/contact hour) activity, as described in this appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1990 and 1998.

Table A6.—Final universe of public 2-year institutions in Chapter III compared to excluded institutions: 1997–98

	Final universe	N	Excluded institutions	N
Total		813		467
Average in-state undergraduate tuition	$1,431	787	$1,225	376
Average percent change in in-state undergraduate tuition since 1989–90	86.1	768	143.7	253
Average revenues per FTE:				
Tuition	$1,907	769	$1,963	157
State appropriations	$3,800	748	$6,513	129
Total current revenue	$9,714	769	$14,517	157
Tuition as a percentage of total revenue	20.3	769	15.3	157
State appropriations revenue as a percentage of total revenue	39.4	769	47.7	129
Average expenditures per FTE:				
Instruction	$3,836	769	$5,396	157
Academic support	$702	768	$1,227	124
Student services	$861	769	$1,261	138
Institutional support	$1,291	769	$2,078	145
Scholarships and fellowships	$1,104	769	$1,909	133
Institutional scholarships and fellowships	$123	633	$118	86
E&G expenditures	$8,967	769	$12,686	157
Total current expenditures	$9,575	769	$13,495	157
Instruction as a percentage of total expenditures	40.2	769	43.9	157
Average enrollment:				
FTE undergraduates	3,107	813	1,361	354
Total (undergraduate) headcount enrollment	5,442	813	2,829	368
First-time, full-time headcount enrollment	957	813	525	368
Percent full-time	41.3	813	52.1	368

NOTE: Educational and general (E&G) expenditures include the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers. Full-time equivalent (FTE) enrollment was calculated from instructional (credit/contact hour) activity, as described in this appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1990 and 1998.

Table A7.—Final universe of private not-for-profit research/doctoral institutions in Chapter IV compared to excluded institutions: 1995–96

	Final universe	N	Excluded institutions	N
Total		47		38
Average in-state undergraduate tuition	$16,266	46	$15,194	34
Average percent change in in-state undergraduate tuition since 1989–90	50.5	46	46.9	31
Average revenues per FTE:				
Tuition	$16,362	47	$16,646	37
Federal grants and contracts	$5,314	47	$18,449	37
Private gifts	$3,096	47	$13,703	37
Endowment income	$2,799	47	$8,706	37
Total current revenue	$44,688	47	$97,365	37
Tuition as a percentage of total revenue	48.2	47	43.0	37
Philanthropic revenue as a percentage of total revenue	12.7	47	15.4	37
Average expenditures per FTE:				
Instruction	$11,682	47	$15,323	37
Research	$4,652	47	$22,934	37
Academic support	$2,699	47	$3,954	37
Student services	$1,558	47	$1,601	37
Institutional support	$3,389	47	$7,070	37
Scholarships and fellowships	$4,701	47	$4,232	37
Institutional scholarships and fellowships	$3,744	47	$3,096	36
E&G expenditures	$32,941	47	$65,934	37
Total current expenditures	$44,135	47	$95,852	37
Instruction as a percentage of total expenditures	28.7	47	28.2	37
Average enrollment:				
FTE undergraduates	5,944	47	4,185	38
Total headcount enrollment	10,260	47	10,191	38
Undergraduate headcount enrollment	6,595	47	4,806	38
First-time, full-time headcount enrollment	1,346	47	911	38
Percent undergraduate	65.2	47	42.1	38
Percent full-time	78.6	47	70.1	38

NOTE: Educational and general (E&G) expenditures include the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers. Full-time equivalent (FTE) enrollment was calculated from instructional (credit/contact hour) activity, as described in this appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1990 and 1996.

Table A8.—Final universe of private not-for-profit comprehensive institutions in Chapter IV compared to excluded institutions: 1995–96

	Final universe	N	Excluded institutions	N
Total		192		62
Average in-state undergraduate tuition	$11,267	191	$9,483	61
Average percent change in in-state undergraduate tuition since 1989–90	54.6	187	46.0	58
Average revenues per FTE:				
Tuition	$11,241	192	$10,301	60
Federal grants and contracts	$1,008	192	$927	60
Private gifts	$1,190	192	$1,190	60
Endowment income	$474	192	$417	60
Total current revenue	$17,712	192	$15,583	60
Tuition as a percentage of total revenue	65.0	192	68.4	60
Philanthropic revenue as a percentage of total revenue	9.3	192	8.4	60
Average expenditures per FTE:				
Instruction	$4,863	192	$4,426	60
Research	$222	192	$112	60
Academic support	$1,030	192	$1,150	60
Student services	$1,499	192	$1,325	60
Institutional support	$2,248	192	$2,500	60
Scholarships and fellowships	$3,465	192	$2,625	60
Institutional scholarships and fellowships	$2,435	192	$1,609	60
E&G expenditures	$15,337	192	$13,894	60
Total current expenditures	$17,342	192	$15,322	60
Instruction as a percentage of total expenditures	28.3	192	30.1	60
Average enrollment:				
FTE undergraduates	2,005	192	2,196	62
Total headcount enrollment	3,181	192	4,446	62
Undergraduate headcount enrollment	2,392	192	2,812	62
First-time, full-time headcount enrollment	448	192	394	62
Percent undergraduate	76.5	192	65.4	62
Percent full-time	64.7	192	56.8	62

NOTE: Educational and general (E&G) expenditures include the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers. Full-time equivalent (FTE) enrollment was calculated from instructional (credit/contact hour) activity, as described in this appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1990 and 1996.

Table A9.—Final universe of private not-for-profit bachelor's institutions in Chapter IV compared to excluded institutions: 1995–96

	Final universe	N	Excluded institutions	N
Total		451		88
Average in-state undergraduate tuition	$11,628	449	$8,208	83
Average percent change in in-state undergraduate tuition since 1989–90	52.8	440	54.2	67
Average revenues per FTE:				
Tuition	$11,939	451	$9,162	86
Federal grants and contracts	$1,125	451	$1,779	87
Private gifts	$2,394	451	$3,667	86
Endowment income	$1,625	451	$1,020	86
Total current revenue	$21,956	451	$19,481	86
Tuition as a percentage of total revenue	55.8	451	49.8	86
Philanthropic revenue as a percentage of total revenue	16.2	451	19.3	86
Average expenditures per FTE:				
Instruction	$5,278	451	$4,280	86
Research	$138	451	$74	87
Academic support	$1,214	451	$1,358	86
Student services	$1,927	451	$1,524	86
Institutional support	$3,036	451	$3,666	86
Scholarships and fellowships	$4,683	451	$3,599	86
Institutional scholarships and fellowships	$3,355	450	$2,036	84
E&G expenditures	$18,655	451	$16,967	86
Total current expenditures	$21,506	451	$19,109	86
Instruction as a percentage of total expenditures	24.5	451	23.1	86
Average enrollment:				
FTE undergraduates	1,173	451	1,191	87
Total headcount enrollment	1,422	451	1,740	88
Undergraduate headcount enrollment	1,355	451	1,643	88
First-time, full-time headcount enrollment	297	451	277	88
Percent undergraduate	95.9	451	94.5	88
Percent full-time	81.7	451	75.2	88

NOTE: Educational and general (E&G) expenditures include the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers. Full-time equivalent (FTE) enrollment was calculated from instructional (credit/contact hour) activity, as described in this appendix.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1990 and 1996.

IPSFA and IPEDS Data Used for Chapter V

Selection Criteria

For the trend analysis and statistical modeling presented in Chapter V, the universe of institutions was drawn from public 2-year and 4-year and private not-for-profit 4-year institutions that are Title IV participating, degree-granting, and located in the 50 states and the District of Columbia. Public and private not-for-profit 4-year institutions were further divided by Carnegie classification into research/doctoral, comprehensive, and bachelor's institutions[102] (institutions classified as "other/specialized" or not classified were excluded). As the financial aid variables in the IPSFA dataset are based on first-time, full-time, degree/certificate-seeking undergraduate students, institutions that enrolled less than 50 first-time, full-time, degree/certificate-seeking undergraduate students were excluded from the analysis. IPSFA data for 1999–2000 were used to define and measure all of these selection criteria.

Missing Data

In cases in which tuition was missing or zero, cases in which there were missing data for all of the financial aid variables (federal grants, state grants, institutional grants, and loans), and cases in which the financial aid year indicator was missing, the institutions were excluded from the universe. In some cases, missing data were actually implied zeros—for example, where the percent of students receiving a specific form of aid was reported to be zero, then the average amount for that type of aid is also zero. The exclusion of cases occurred only after recoding of these cases.

For the remaining institutions, missing data was addressed by inserting the mean amounts for each variable (calculated by institutional type). Separate dummy variables were then created to identify the cases with missing data.

Variable Definition

The final universe of institutions was matched to IPEDS data[103] from 1993–94 to 1997–98, depending on the variable and the type of institution. Academic tuition, financial aid, finance,

[102]Private not-for-profit bachelor's institutions were further divided into tuition quartiles during the regression modeling, due to an interaction effect.

[103]Because the IPSFA data was not coded for parent/child status, the matched IPEDS data included the adjustments made to the financial variables that distributed the amounts based on FTE, as described in the above section on the creation of the panels of institutions using IPEDS data.

and salary variables were adjusted for inflation using the Consumer Price Index (CPI-U, 1982–84 = 100). All variables were adjusted to 1999 dollars.

Final Universe for Chapter V

The various procedures described above eliminated institutions from the original dataset (table A10). The total number of public institutions remaining in the universe was 1,407 (research/doctoral = 145; comprehensive = 254; bachelor's = 74; 2-year = 934), and the total number of private not-for-profit institutions was 770 (research/doctoral = 77; comprehensive = 222; bachelor's = 471).

Table A10.—Final universe of institutions for Chapter V

	Public 4- and 2-year institutions		Private not-for-profit 4-year institutions	
	Number of institutions	Percentage of original number	Number of institutions	Percentage of original number
Original number of institutions in IPSFA	1,794	100.0	1,571	100.0
Less institutions removed through selection criteria	262	14.6	601	38.3
Sub-total	1,532	85.4	970	61.7
Less institutions removed due to missing data	71	4.0	24	1.5
Sub-total	1,461	81.4	946	60.2
Less institutions excluded due to specialized, other, or missing Carnegie classification	54	3.0	176	11.2
Final universe	1,407	78.4	770	49.0

NOTE: Selection criteria were: Title IV participation, degree-granting status, location in the 50 states and the District of Columbia, and enrollment (at least 50 first-time, full-time, degree/certificate-seeking undergraduates).

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Although almost 22 percent of public institutions and 51 percent of private not-for-profit institutions were eliminated from the original dataset through the selection and missing data processes, the final group of institutions enrolled 93 percent of first-time, full-time, degree/certificate-seeking undergraduates at private not-for-profit 4-year institutions and 94 percent of the total number at public 4-year and 2-year institutions in 1999. In order to examine the differences between the final universe and the institutions that were excluded, a bias analysis for

each type of institution was performed using the original IPSFA data files.[104] In general, the institutions excluded from the analysis were fairly similar to those included in the final universe on a range of variables measuring tuition, enrollment, and financial aid patterns (tables A11 to A17). Some exceptions occurred, but in most cases the number of excluded institutions was very small, allowing each institution to be highly influential.

- Of public 4-year institutions, those institutions excluded from the final universe tended to have lower percentages of students receiving certain forms of aid (tables A11, A12, and A13). In addition, excluded comprehensive institutions had fewer first-time, full-time students, on average, and excluded bachelor's institutions had lower levels of tuition, on average.
- Of private not-for-profit 4-year institutions, the two research/doctoral institutions that were excluded from the final universe had different characteristics from those included in the analysis (table A15). Excluded comprehensive and bachelor's institutions had lower tuitions, higher proportions of students receiving federal grants, and lower proportions of students receiving institutional grants and loan aid, on average (table A16).

Table A11.—Final universe of public research/doctoral institutions in Chapter V compared to excluded institutions

	Final universe	N	Excluded institutions	N
Total		145		6
Average in-state undergraduate tuition, 1999–2000	$3,619	145	$3,138	4
Average percent change in in-state undergraduate tuition, 1997–98 to 1999–2000	7.8	128	4.5	3
Average enrollment:				
Number of first-time, full-time, degree/certificate-seeking undergraduates	2,646	145	2,873	4
Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates	16.6	145	16.3	4
Average percentage of first-time, full-time undergraduates receiving financial aid:				
Aid from any source	68.5	140	63.0	4
Federal grants	28.3	145	33.8	4
State grants	26.9	145	22.0	4
Institutional grants	31.6	142	6.0	4
Loan aid	45.4	145	28.0	4
Average amounts of aid received:				
Federal grants	$2,262	145	$2,467	4
State grants	$1,742	145	$1,628	4
Institutional grants	$2,631	142	$1,335	4
Loan aid	$3,490	145	$2,731	3

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

[104]Again, many institutions had missing data for the variables examined; no attempts were made to impute for missing data, for either the included institutions or the eliminated institutions. However, in some cases implied zeros were substituted for missing fields in order to calculate means.

Table A12.—Final universe of public comprehensive institutions in Chapter V compared to excluded institutions

	Final universe	N	Excluded institutions	N
Total		254		17
Average in-state undergraduate tuition, 1999–2000	$2,963	254	$2,671	7
Average percent change in in-state undergraduate tuition, 1997–98 to 1999–2000	8.2	254	15.0	7
Average enrollment:				
Number of first-time, full-time, degree/certificate-seeking undergraduates	1,107	254	429	13
Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates	17.4	254	7.2	13
Average percentage of first-time, full-time undergraduates receiving financial aid:				
Aid from any source	71.3	242	25.0	9
Federal grants	38.0	254	46.8	4
State grants	31.9	252	10.0	2
Institutional grants	26.6	247	10.7	3
Loan aid	47.1	254	29.8	4
Average amounts of aid received:				
Federal grants	$2,098	254	$3,027	4
State grants	$1,425	252	$1,285	2
Institutional grants	$1,744	247	$1,833	3
Loan aid	$2,689	254	$3,479	4

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Table A13.—Final universe of public bachelor's institutions in Chapter V compared to excluded institutions

	Final universe	N	Excluded institutions	N
Total		74		11
Average in-state undergraduate tuition, 1999–2000	$3,177	74	$1,520	4
Average percent change in in-state undergraduate tuition, 1997–98 to 1999–2000	8.3	69	4.9	4
Average enrollment:				
Number of first-time, full-time, degree/certificate-seeking undergraduates	480	74	636	7
Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates	17.8	74	25.0	7
Average percentage of first-time, full-time undergraduates receiving financial aid:				
Aid from any source	71.5	74	57.2	6
Federal grants	44.1	74	74.2	5
State grants	29.6	73	22.8	5
Institutional grants	28.7	73	10.3	3
Loan aid	50.2	73	10.8	5
Average amounts of aid received:				
Federal grants	$2,064	74	$2,465	4
State grants	$1,276	73	$688	4
Institutional grants	$1,635	73	$529	3
Loan aid	$2,695	73	$1,920	4

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Table A14.—Final universe of public 2-year institutions in Chapter V compared to excluded institutions

	Final universe	N	Excluded institutions	N
Total		934		239
Average in-state undergraduate tuition, 1999–2000	$1,616	934	$1,486	159
Average percent change in in-state undergraduate tuition, 1997–98 to 1999–2000	9.8	774	18.6	153
Average enrollment:				
Number of first-time, full-time, degree/certificate-seeking undergraduates	528	934	280	207
Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates	15.9	934	35.0	204
Average percentage of first-time, full-time undergraduates receiving financial aid:				
Aid from any source	56.8	923	60.4	179
Federal grants	40.9	933	47.8	175
State grants	26.7	907	29.8	155
Institutional grants	15.4	851	14.2	116
Loan aid	19.3	806	22.6	93
Average amounts of aid received:				
Federal grants	$1,848	933	$1,905	180
State grants	$780	907	$857	157
Institutional grants	$750	851	$588	124
Loan aid	$2,073	806	$1,882	94

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Table A15.—Final universe of private not-for-profit research/doctoral institutions in Chapter V compared to excluded institutions

	Final universe	N	Excluded institutions	N
Total		77		5
Average in-state undergraduate tuition, 1999–2000	$19,599	77	$10,225	1
Average percent change in in-state undergraduate tuition, 1997–98 to 1999–2000	10.0	77	5.9	1
Average enrollment:				
Number of first-time, full-time, degree/certificate-seeking undergraduates	1,375	77	21	2
Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates	23.6	77	2.0	2
Average percentage of first-time, full-time undergraduates receiving financial aid:				
Aid from any source	72.0	77	86.0	2
Federal grants	24.7	77	65.5	2
State grants	24.2	76	30.0	1
Institutional grants	64.7	77	—	0
Loan aid	55.4	77	81.0	2
Average amounts of aid received:				
Federal grants	$3,276	77	$3,286	2
State grants	$3,302	76	$3,479	1
Institutional grants	$9,640	77	—	0
Loan aid	$3,968	77	$4,158	2

—Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Table A16.—Final universe of private not-for-profit comprehensive institutions in Chapter V compared to excluded institutions

	Final universe	N	Excluded institutions	N
Total		222		20
Average in-state undergraduate tuition, 1999–2000	$13,806	222	$8,524	18
Average percent change in in-state undergraduate tuition, 1997–98 to 1999–2000	10.1	222	8.1	17
Average enrollment:				
Number of first-time, full-time, degree/certificate-seeking undergraduates	461	222	600	20
Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates	21.0	221	20.4	20
Average percentage of first-time, full-time undergraduates receiving financial aid:				
Aid from any source	86.5	220	78.0	19
Federal grants	32.9	222	61.4	16
State grants	37.1	220	26.5	16
Institutional grants	79.7	221	52.7	15
Loan aid	67.1	221	58.1	15
Average amounts of aid received:				
Federal grants	$2,528	222	$2,882	16
State grants	$2,759	220	$2,682	16
Institutional grants	$5,499	221	$3,669	15
Loan aid	$3,722	221	$3,437	15

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Table A17.—Final universe of private not-for-profit bachelor's institutions in Chapter V compared to excluded institutions

	Final universe	N	Excluded institutions	N
Total		471		42
Average in-state undergraduate tuition, 1999–2000	$14,024	471	$7,904	36
Average percent change in in-state undergraduate tuition, 1997–98 to 1999–2000	9.6	471	10.2	35
Average enrollment:				
Number of first-time, full-time, degree/certificate-seeking undergraduates	320	471	336	40
Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates	27.7	471	26.8	40
Average percentage of first-time, full-time undergraduates receiving financial aid:				
Aid from any source	85.7	469	82.4	40
Federal grants	35.6	470	57.8	32
State grants	39.0	469	26.2	27
Institutional grants	76.9	471	44.7	31
Loan aid	66.3	468	46.6	33
Average amounts of aid received:				
Federal grants	$2,507	470	$2,470	32
State grants	$2,531	469	$1,876	28
Institutional grants	$6,063	471	$2,833	31
Loan aid	$3,536	468	$3,073	33

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999, Institutional Prices and Student Financial Aid Survey (IPSFA).

Statistical Procedures

Descriptive Statistics

For the panels of institutions presented in Chapters III and IV, trend data—averages at the institutional level—were compiled for each institutional type. Average dollar changes over the period 1988–89 to 1997–98 (to 1995–96 for private not-for-profit institutions) were calculated as the difference between the average end year figure and the average base year figure within each institutional type, in constant dollar terms. Average annual changes, in real percentage terms, were calculated as the sum of average annual change increments within each institutional type divided by the number of years; they are therefore averages of institutional averages.

For the private not-for-profit institutions, descriptive statistics regarding the variables included in the simultaneous equation model are provided in tables A18, A19, and A20, including the following:

- The mean (average), minimum, and maximum values of each variable;
- The standard deviation of each variable, which measures data variability or the spread of data about the mean (the standard deviation is zero with no spread, and increases as the spread of the data increases);
- Skewness, which measures lack of symmetry or the extent to which the distribution is displaced toward one side of the scale (where zero is symmetrical, negative values indicate a skew to the left, and positive values signify a skew to the right); and
- Kurtosis, which measures the size of the tails of a distribution, or the tallness or flatness of the distribution (where smaller values indicate a flatter distribution with relatively small tails, and the normal distribution has a kurtosis of three).

For the analysis presented in Chapter V using IPSFA data, averages were compiled for each institutional type, including such variables as the change in tuition, the number of first-time, full-time, degree/certificate-seeking undergraduates, the percentage of students receiving various forms of financial aid, and the average amounts of aid received.

Magnitude of correlations

For the bivariate correlations reported in the findings section of the Executive Summary, the strength of the relationships between pairs of variables was provided using a scale of

Table A18.—Descriptive statistics of model variables for private not-for-profit research/doctoral institutions: 1989–90 to 1995–96

	N = 329					
Variable	Mean	Standard deviation	Skewness	Kurtosis	Minimum	Maximum
Log of undergraduate tuition	9.636	0.268	-0.596	2.544	8.810	10.062
Log of first-time freshmen FTE students	6.945	0.643	-0.735	3.887	4.728	8.449
Log of previous year's instruction expenditures	9.196	0.530	0.618	2.720	8.304	10.771
Log of average tuition at public 4-year institutions in the state	7.965	0.412	-0.616	2.609	6.716	8.548
Log of previous year's expenditures on plant maintenance and transfers	8.013	0.932	-4.575	38.929	0.000	9.653
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	-1.519	0.662	-0.355	1.984	-2.857	-0.296
Log of previous year's research expenditures	7.249	2.191	-1.534	5.735	0.000	9.894
Log of previous year's student service expenditures	7.190	0.473	1.101	6.118	6.122	9.140
Log of expenditures on institutional aid	7.940	0.595	-0.354	2.543	6.240	9.107
Log of previous year's student/faculty ratio	2.890	0.291	-0.044	4.486	2.024	3.987
Log of philanthropic revenue	8.200	1.015	-0.178	2.550	5.676	10.343
Log of per capita income in the state	10.180	0.127	-0.091	2.248	9.843	10.500
Log of instruction expenditures	9.224	0.533	0.641	2.771	8.354	10.804
Log of average faculty compensation	11.274	0.161	-1.080	4.652	10.698	11.626
Log of institutional support expenditures	8.038	0.404	0.060	3.414	7.021	9.310
Log of academic support expenditures	7.718	0.606	0.208	3.387	6.080	9.686
Log of student services expenditures	7.228	0.464	0.982	5.780	6.122	9.140
Log of federal grants and contracts	7.508	1.694	-0.489	2.241	2.156	9.962
Log of revenue from state and local sources	5.168	2.273	-1.098	3.438	-0.297	8.947
Ratio of graduate FTE enrollment to total FTE enrollment	0.277	0.098	0.146	2.740	0.072	0.626
Dummy variable for 1991	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1992	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1993	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1994	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1995	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1996	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for zero values in log of previous year's research expenditures	0.043	0.202	4.533	21.544	0.000	1.000
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	0.006	0.078	12.709	162.506	0.000	1.000
Dummy variable for zero values in log of revenue from state and local sources	0.106	0.309	2.553	7.519	0.000	1.000

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958-98, released July 1999.

Table A19.—Descriptive statistics of model variables for private not-for-profit comprehensive institutions: 1989–90 to 1995–96

	N = 1344					
Variable	Mean	Standard deviation	Skewness	Kurtosis	Minimum	Maximum
Log of undergraduate tuition	9.258	0.280	-0.840	4.041	8.071	9.871
Log of first-time freshmen FTE students	5.618	0.818	-0.375	3.252	2.544	7.918
Log of previous year's instruction expenditures	8.407	0.333	0.490	6.329	7.126	10.376
Log of average tuition at public 4-year institutions in the state	7.922	0.374	-0.320	2.558	6.716	8.762
Log of previous year's expenditures on plant maintenance and transfers	7.353	0.850	-5.536	47.642	0.000	9.859
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	-1.759	0.578	0.081	2.113	-2.857	-0.296
Log of previous year's research expenditures	1.643	2.489	1.093	2.734	-2.745	10.172
Log of previous year's student service expenditures	7.164	0.391	-0.420	4.626	5.003	9.175
Log of expenditures on institutional aid	7.409	0.653	-1.011	5.190	4.116	9.386
Log of previous year's student/faculty ratio	2.979	0.322	0.383	9.883	0.663	4.781
Log of philanthropic revenue	7.111	0.848	-1.496	12.292	0.000	9.701
Log of per capita income in the state	10.122	0.141	0.216	2.947	9.693	10.500
Log of instruction expenditures	8.429	0.328	0.332	5.913	7.126	10.376
Log of average faculty compensation	10.892	0.187	0.193	3.069	10.274	11.758
Log of institutional support expenditures	7.686	0.341	-0.058	4.367	6.456	9.761
Log of academic support expenditures	6.747	0.593	-0.425	3.451	4.583	8.916
Log of student services expenditures	7.202	0.378	-0.390	4.070	5.421	9.175
Log of federal grants and contracts	3.751	5.466	-5.093	31.607	-30.498	10.728
Log of revenue from state and local sources	2.774	2.695	0.127	1.413	-4.540	7.567
Ratio of graduate FTE enrollment to total FTE enrollment	0.152	0.097	0.780	3.154	0.000	0.536
Dummy variable for 1991	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1992	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1993	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1994	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1995	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1996	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for zero values in log of previous year's research expenditures	0.653	0.476	-0.644	1.415	0.000	1.000
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	0.008	0.090	10.917	120.190	0.000	1.000
Dummy variable for zero values in log of revenue from state and local sources	0.116	0.320	2.397	6.747	0.000	1.000
Dummy variable for zero values in log of federal grants and contracts	0.402	0.490	0.401	1.161	0.000	1.000
Dummy variable for zero values in log of philanthropic revenue	0.001	0.039	25.865	670.002	0.000	1.000

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958-98, released July 1999.

Table A20.—Descriptive statistics of model variables for private not-for-profit bachelor's institutions: 1989–90 to 1995–96

	N = 3157					
Variable	Mean	Standard deviation	Skewness	Kurtosis	Minimum	Maximum
Log of undergraduate tuition	9.235	0.531	-4.325	50.158	0.000	10.280
Log of first-time freshmen FTE students	5.316	0.760	-0.981	6.321	0.000	7.075
Log of previous year's instruction expenditures	8.432	0.475	0.679	7.078	5.147	10.807
Log of average tuition at public 4-year institutions in the state	7.934	0.350	-0.055	2.323	7.098	8.762
Log of previous year's expenditures on plant maintenance and transfers	7.489	1.061	-4.387	32.363	0.000	10.488
Log of the proportion of undergraduates enrolled in the state attending private not-for-profit 4-year institutions	-1.743	0.569	-0.910	6.682	-5.412	-0.720
Log of previous year's research expenditures	1.512	2.457	1.208	2.854	-2.293	9.340
Log of previous year's student service expenditures	7.392	0.544	-1.100	15.673	0.000	9.558
Log of expenditures on institutional aid	7.653	0.998	-2.662	19.807	0.000	10.580
Log of previous year's student/faculty ratio	2.779	0.357	-0.626	8.264	0.726	4.709
Log of philanthropic revenue	7.846	0.921	-0.302	4.340	3.971	10.897
Log of per capita income in the state	10.082	0.134	0.202	2.898	9.693	10.493
Log of instruction expenditures	8.452	0.471	0.822	6.225	5.147	10.835
Log of average faculty compensation	10.821	0.234	0.102	2.679	9.758	11.452
Log of institutional support expenditures	7.905	0.476	0.400	5.488	5.427	10.275
Log of academic support expenditures	6.867	0.683	0.268	3.339	4.336	9.555
Log of student services expenditures	7.417	0.543	-1.142	15.941	0.000	9.628
Log of federal grants and contracts	3.431	6.332	-4.340	22.953	-30.598	8.947
Log of revenue from state and local sources	2.309	2.716	-0.258	10.141	-32.578	8.634
Ratio of graduate FTE enrollment to total FTE enrollment	0.026	0.069	5.069	35.904	0.000	0.745
Dummy variable for 1991	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1992	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1993	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1994	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1995	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for 1996	0.143	0.350	2.041	5.167	0.000	1.000
Dummy variable for zero values in log of previous year's research expenditures	0.687	0.464	-0.808	1.653	0.000	1.000
Dummy variable for zero values in log of previous year's expenditures on plant maintenance and operation	0.013	0.112	8.714	76.938	0.000	1.000
Dummy variable for zero values in log of revenue from state and local sources	0.158	0.365	1.871	4.502	0.000	1.000
Dummy variable for zero values in log of federal grants and contracts	0.500	0.500	-0.001	1.000	0.000	1.000
Dummy variable for zero values in log of FTE enrollment	0.001	0.036	28.040	787.251	0.000	1.000
Dummy variable for zero values in log of expenditures on institutional aid	0.005	0.071	13.940	195.318	0.000	1.000
Dummy variable for zero values in log of undergraduate tuition	0.000	0.018	56.160	3155.000	0.000	1.000
Dummy variable for zero values in log of student service expenditures	0.000	0.018	56.160	3155.000	0.000	1.000
Dummy variable for zero values in log of previous year's student service expenditures	0.000	0.018	56.160	3155.000	0.000	1.000

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Full Collection Years 1989 to 1996; Bureau of Economic Analysis, Regional Accounts Data, Personal Income for States: 1958-98, released July 1999.

magnitudes. Following Cohen (1988), reported magnitudes adopted the notion of a scale of small, medium, and large sized relationships, qualitative terms that allow interpretation of the strength of a relationship through the concept of effect size. Cohen suggested that for a scale of the proportion of variance accounted for (the square of the correlation coefficient, r^2), one might use a value of 0.01 to signify a small effect size, 0.09 for moderate, and 0.25 for large. Some latitude is appropriate in determining the scale of effect sizes within the context of the analysis. The magnitudes reported in the Executive Summary of this report were based on a scale in which the effect is small if r^2 is less than 0.05, medium if r^2 is at least 0.05 but less than 0.25, and large if r^2 is 0.25 or greater.

Multiple Regression Analysis

For the analysis of public institutions presented in Chapter III, multiple linear regression procedures were used to explore the associations among various tuition, revenue, and expenditure categories, based upon the framework set forth by GAO (1998). Prior to running the regression analyses, bivariate relationships between variables were examined through scatterplots and correlation matrices.

Multiple linear regression is a statistical procedure used to relate two or more independent variables to a dependent variable. According to the general form of the least squares linear regression model, the dependent variable (Y) is assumed to be a function of a set of k independent variables (X) in a population:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + \varepsilon$$

Through such a model, partial slope coefficients (β) are estimated for each independent variable, showing the relationship between an independent variable and the dependent variable holding all other independent variables constant. The intercept (α) represents the expected value of the dependent variable when all the independent variables equal zero. The error term (ε) is the deviation of an observed value of the dependent variable from the mean value of the distribution obtained by repeated observation of values for the dependent variable, and represents both the effects of variables not explicitly included in the equation, as well as a residual random element in the dependent variable.

Certain assumptions must be met in order to appropriately estimate population parameters and conduct tests of statistical significance, including the following:

- The dependent variable can be calculated as a linear function of a specific set of independent variables, plus an error term. The coefficients of this linear function are constant. This assumption can be violated if the relationship between the dependent variable and one of the independent variables is not linear, if the parameters do not remain constant during the period in which the data were collected, or if relevant independent variables were omitted from the model (or irrelevant independent variables were included). These are errors in the specification of the model.
- For each set of values for the independent variables, the mean value of the error term must be zero. A violation of this assumption affects the value of the intercept.
- For each set of values for the independent variables, the error terms must have the same variance and must not be correlated with each other. The problem of heteroskedasticity occurs when the error terms do not have the same variance; autocorrelation occurs when the error terms are correlated with each other. Both may have implications for estimation of the parameters and inference, especially in conjunction with other violations of assumptions.
- The observations on the independent variables must be considered fixed in repeated samples. Several problems are associated with violations of this assumption, including errors in measuring independent variables and situations in which the dependent variable is determined by the simultaneous interaction of several relationships.
- For each set of values for the independent variables, the error term must be normally distributed. A violation of this assumption has no effect on the estimated parameters, but rather is important for tests of statistical significance (and even then, only with small samples).
- No independent variable can be perfectly linearly related to one or more of the other independent variables in the model. The problem of multicollinearity is associated with this assumption, where approximate linear relationships occur among independent variables, leading to large variances in the parameter estimates of the collinear variables.

One or more of these assumptions may be violated when using empirical data, resulting in misleading or problematic coefficient estimates.[105] It is important to keep in mind that the analyses in this report use census data of a population, making the interpretation of the results (especially tests of statistical significance) slightly different than if the data were from a sample. Specifically, tests of statistical significance on census data do not measure the probability of whether sample results can be generalized to a population, but rather can be used to judge the strength of relationships in the population. Nevertheless, one must be concerned with interpreta-

[105]For a more detailed discussion of the assumptions of multiple linear regression, see Berry and Feldman (1985); and Kennedy (1998).

tion of the results, particularly in a single equation model. Correlation or any statistical relationship between variables does not necessarily mean causation.[106]

For the multiple linear regression model presented in Chapter III, the equation used takes the functional form of:

$$\Delta Y_i = \alpha + \beta_0 Y_{(0)i} + \sum_{k=1}^{r} \beta_k (\Delta X_{(k)i}) + \varepsilon$$

where ΔY_i = change in in-state undergraduate tuition (price) at institution i
$Y_{(0)i}$ = tuition in the base year at institution i
$\Delta X_{(k)i}$ = change in each expenditure/revenue variable (k) at institution i

Following the framework set forward by GAO, the results of the regression models were presented for each institutional type and each time period, including the following statistics:

- Multiple R-squared, the percent of the variance in the dependent variable accounted for by the independent variables;
- The adjusted R-squared, which attempts to compensate for the fact that simply adding more independent variables tends to increase the value of multiple R-squared;
- The model probability, which in the case of census data is displayed to gauge the explanatory power of the model as a whole;
- The number of valid cases;
- The Pearson's correlation coefficient of each independent variable with the dependent variable (change in tuition), where a correlation coefficient approaching zero suggests no statistical relationship between the two variables (without controlling for other factors);
- The regression coefficient, which indicates the estimate of the average amount the dependent variable changes with a unit change in each independent variable, after controlling for all the other variables;
- The incremental change in multiple R-squared for each independent variable, or the extent to which the portion of variation accounted for declines with the deletion of each variable one at a time (in percentage points); and

[106]As noted by Kennedy (1998), "It is usually assumed that movements in the dependent variable are caused by movements in the independent variable(s), but the existence of a relationship between these variables proves neither the existence of causality nor its direction" (p. 66).

- The probability of the t statistic for each independent variable, which were displayed as standard output of statistical software and may be used in this analysis to gauge the strength of the relationship between the independent variable and the variation in the dependent variable not accounted for by all the other variables.

Independent variables were identified as "important" if the decline in the portion of variation accounted for (R-squared) by omitting the variable from the model was 10 percentage points or greater. When independent variables are highly correlated with each other, the usefulness of assessing the importance of a variable by deleting it from the model is limited because it is difficult to distinguish their independent contribution to the portion of variation accounted for; therefore, in cases in which bivariate correlations are 0.7 or greater, the correlation was noted and the R-squared change when both variables are deleted from the model was provided.

Reduction Procedures

For the analysis presented in Chapter V, multiple linear regression procedures also were used to explore the associations among variables. These models were reduced in order to eliminate variables that do not add to the model's ability to explain the variability in the response and avoid spurious findings. On the other hand, the models in Chapters III and IV were not reduced because the analysis updated previously existing models, without altering the models or testing their significance.

When dealing with a large number of explanatory variables, it is useful to eliminate unnecessary variables both for the sake of simplicity and because unnecessary terms in the model lead to less precise inference. Variables that are redundant should not both (all) be included in the final model. Multicollinearity exists when variables are nearly redundant; it decreases the precision of estimated coefficients, and the problem gets worse as more explanatory variables are included in the model. Automated variable selection procedures, available in standard statistical packages, allow the reduction of regression models without having to run all of the possible regressions.

One such method of reduction is the backward elimination procedure. In backward elimination, all of the independent variables are entered in one block, then at each step the variable that changes R-squared the least is removed. The procedure continues until the removal of any variable in the model results in a meaningful change in R-squared. The partial regression coefficients for all of the variables remaining in the model point to meaningful relationships with the dependent variable.

The assumptions required for standard linear regression procedures also hold for reduced regression models, as do the stipulations regarding the use of census data. It is important to note that different eliminations can result from the order in which variables are tested (i.e., forward,

backward, or stepwise). In addition, prediction bias can arise because the final, reduced model is uniquely related or fitted to the specific data set.

In the case of the models presented in Chapter V, the frequency distributions of each variable were examined and bivariate relationships between variables were explored through scatterplots and correlation matrices prior to the regression modeling. When potential independent variables had bivariate correlations of 0.7 or higher, only one was included in a particular model; the exception was the case of dummy variables for missing data.

For the reduced regression models presented in Chapter V, the equations take the functional form of:

$$\Delta Y_i = \alpha + \beta_0 Y_{(0)i} + \sum_{k-1}^{r} \beta_k (X_{(k)it}) + \sum_{j=1}^{s} \beta_j (\Delta Z_{(j)i}) + \varepsilon$$

where ΔY_i = change in in-state undergraduate tuition (price) at institution i
$Y_{(0)i}$ = tuition in the base year at institution i
$X_{(k)it}$ = aid and other explanatory variables (k) at institution i in year t
$\Delta Z_{(j)i}$ = change in each expenditure/revenue variable (j) at institution i

Each regression model was reduced (and the coefficients were estimated) using the backward elimination method. The results presented for each institutional type include the same statistics as those presented in Chapter III. In addition, the results include the standardized (Beta) coefficient, which is the average amount the dependent variable increases when the independent variable increases one standard deviation and other independent variables are held constant. The Beta weights express in standardized terms the relative sizes of the partial regression coefficients.

Three-Stage Least Squares

For the analysis of private not-for-profit institutions presented in Chapter IV, a three-stage least squares procedure was used to estimate the model of simultaneous equations. In a system of simultaneous equations, a change in any error term changes all of the endogenous (jointly dependent) variables, since they are determined simultaneously. Because any endogenous variables used as independent variables will be correlated with the error terms, the standard least squares multiple regression procedure will produce biased estimates.

The three-stage least squares procedure, however, allows unbiased estimation of systems of structural equations where some equations contain endogenous variables among the explanatory variables. It uses an instrumental variable approach (two-stage least squares) to produce consistent estimates, and generalized least squares to account for the correlation in the error terms across equations.[107]

Three-stage least squares is based on several assumptions, including that the error terms in each structural equation have uniform variance and are not correlated with one another; that errors in different time periods in different equations are independent; and that the variance-covariance matrix is the same in each time period. It is a systems estimating procedure, which estimates all the identified structural equations together as a set rather than separately. The main advantage of such a procedure is that it incorporates all available information into its estimates. If the system is misspecified, however, estimates of all the structural parameters are affected.

In the case of the model presented in Chapter IV, bivariate relationships between variables were examined through scatterplots and correlation matrices prior to the modeling. Both equations took the functional form of:

$$\ln(Y_{it}) = \alpha_t + \beta_0 \ln(E_{it}) + \sum_{k=1}^{r} \beta_k \ln(X_{(k)it}) + \varepsilon$$

where Y_{it} = in-state undergraduate tuition (price) at institution i in year t
α_t = year-specific constant term
E_{it} = number of new enrollments at institution i in year t
$X_{(k)it}$ = other factors influencing tuition (k) at institution i in year t

The three-stage least squares procedure was used to estimate the model coefficients simultaneously. As in other analyses, it is important to keep in mind that the data are derived from a census rather than a sample. Following the framework of the Westat/Pelavin (1994) study, the results of the updated models included the following statistics:

- "R-squared" for each equation, which measures the correlation between the actual values and the predicted values (the model's "goodness of fit");

[107]Specifically, the procedure is as follows: 1) regress each endogenous variable acting as an independent variable in the equation being estimated on all the exogenous variables in the system and calculate the estimated values; 2) use these estimated values as instrumental variables for these endogenous variables and calculate the two-stage least squares estimates of the identified equations; 3) use the two-stage least squares estimates to estimate the structural equations' errors, and then use these to estimate the variance-covariance matrix of the structural equations' errors; 4) apply generalized least squares to the large equation representing all the identified equations of the system. See Kennedy (1998).

- The root mean square error (RMSE), which also evaluates the performance of the model and gives a measure of lack of fit;
- The model probability, which in the case of census data is displayed to gauge the explanatory power of the model as a whole;
- The number of valid observations (given that each institution has one observation for each of the seven years);
- The estimated coefficients, which (because the variables are logs) indicate the "elasticity," or the percentage change in the dependent variable associated with a one percent change in each independent variable, after controlling for all the other variables;
- The standard error of the estimate, as provided by the standard output of statistical software; and
- The Z statistic for each independent variable, which were displayed as standard output of statistical software and may be used in this analysis to gauge the strength of the relationship between the independent variable and the variation in the dependent variable not accounted for by all the other variables.

In addition, reduced form regressions were performed within each institutional type. In reduced form regressions, the simultaneous system is solved such that every endogenous variable is expressed as a linear function of all of the exogenous variables. The reduced form equations therefore incorporate all exogenous variables from both equations into one model, with the same dependent variable, which then can be estimated using the standard linear regression procedure.[108] Whereas structural equations explore the direct relationships among variables (and are based on a stronger set of assumptions), reduced form equations capture the aggregate effect of the exogenous factors on the endogenous variables, including the indirect effects of the exogenous variables as well as direct effects. Such regressions are useful to support the findings of the structural model.

[108]According to economic theory, the reduced-form parameters are the long-run multipliers associated with the model; see Kennedy (1998).

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Appendix B—Glossary

This glossary describes the variables used in this report. The items were taken from several sources, including the NCES Integrated Postsecondary Education Data System (IPEDS) and the Institutional Prices and Student Financial Aid Survey (IPSFA), and the Bureau of Economic Analysis' Regional Accounts Data. The variables were imported, manipulated, and relabeled using SPSS (or Stata) statistical software. The glossary is in alphabetical order by the variable label in SPSS (or Stata), shown in bold, capital letters and displayed along the right-hand column. Underscores in variable names signify the variable is duplicated for each relevant year of data. The glossary is also divided by source of data.

The variables listed in the index below are approximately in the order they appear in the tables in the report.

Glossary Index

E&G expenditures per FTE ..... EG3__F
Institutional aid expenditures per FTE..... IAID3__F

MODEL VARIABLES:

Change in in-state undergraduate tuition.....TFUG2__C
Change in in-district undergraduate tuition.....TFUG1__C
Change in government appropriations ..... APPR1__C
Change in government grants and contracts..... GRNT2__C
Change in philanthropic revenue ..... PHIL1__C
Change in instruction expenditures..... INST3__C
Change in student services expenditures...STUD3__C
Change in institutional scholarships and fellowships.....IAID3__C
Change in other student-related expenditures.....STUX__C
Change in research expenditures.....RES3__C
Change in non-student-related Expenditures .....NONX__C
Level of in-state undergraduate tuition in specific year. .....TFGU2__R
Level of in-district undergraduate tuition in specific year. .....TFUG1__R
Change in amount by which E&G revenues exceed/fall short of E&G expenditures. ..... BAL1__C
Change in ratio of graduate to total FTE enrollment. ..... PERGD__C

CHAPTER IV

TREND VARIABLES:

In-state undergraduate tuition in specific year .....TFUG2__R
In-district undergraduate tuition in specific year.....TFUG1__R
In-state graduate tuition in specific year ...TFGR2__R
Out-of-state undergraduate tuition in specific year.....TFUG3__R
Total fall enrollment ..... TOTEF__
FTE fall enrollment.....FTE__
FTE first-time enrollment ..... FTEFF__
Tuition revenue per FTE..... TUIT3__F
Federal appropriations revenue per FTE... FDAP3__F
State appropriations revenue per FTE.....STAP3__F
Local appropriations revenue per FTE ..... LOAP3__F
Federal grants and contracts per FTE ..... FDGR3__F
State grants and contracts per FTE ..... STGR3__F
Local grants and contracts per FTE .....LOGR3__F
Private gifts revenue per FTE ..... PRIV3__F
Endowment income per FTE .....ENDW3__F
Sales and services revenue per FTE.....SALE3__F
Other revenue per FTE .....OTHR3__F
Auxiliary enterprise revenue per FTE.....AUXL3__F
Hospital revenue per FTE..... HOSP3__F
Independent operations revenue per FTE .. INDP3__F
Total revenue per FTE.....CREV3__F
E&G revenue per FTE..... EGREV__F
Instruction expenditures per FTE.....INST3__F
Research expenditures per FTE ..... RES3__F
Public service expenditures per FTE .....PUB3__F
Academic support expenditures per FTE..... ACAD3__F
Student services expenditures per FTE..... STUD3__F
Institutional support expenditures per FTE.....INSP3__F
Plant operations expenditures per FTE.....PLNT3__F
Scholarships and fellowships expenditures per FTE..... SCHO3__F
Mandatory transfers per FTE..... MAND3__F
Non-mandatory transfers per FTE ..... NONM3__F
Auxiliary enterprise expenditures per FTE.....AUXE3__F
Hospital expenditures per FTE .....HSPE3__F
Independent operations expenditures per FTE..... INDE3__F
Total expenditures per FTE ..... CEXP3__F
E&G expenditures per FTE ..... EG3__F
Institutional aid expenditures per FTE..... IAID3__F
Average faculty compensation.....

MODEL VARIABLES:

Log of undergraduate tuition..... TFUGLG
Log of first-time freshmen FTE students .... FTEFFLG
Log of average undergraduate tuition at public 4-year institutions in the state..... AVTFLG
Log of proportion of undergraduates enrolled at private not-for-profit 4-year institutions..... PERPRLG
Log of previous year's instruction expenditures per student .....INSTLN
Log of previous year's plant operations expenditures and transfers per student .....PLTRLN
Log of previous year's research expenditures per student. ..... RESLN
Log of previous year's student/faculty ratio per student ..... STUFCLN
Log of philanthropic revenue per student .....PHILLG
Log of institutional aid expenditures per student..... IAIDLG
Log of previous year's student services expenditures per student. ..... STUDLN
Log of per capita income in state ..... STINCLG
Dummy variable for 1991 ..... DUMMY91
Dummy variable for 1992 ..... DUMMY92
Dummy variable for 1993 ..... DUMMY93
Dummy variable for 1994 ..... DUMMY94
Dummy variable for 1995 ..... DUMMY95

Dummy variable for 1996 ..... DUMMY96
Zero values in RESLN ..... RESLND
Zero values in PLTRLN..... PLTRLND
Zero values in PHILLG ..... PHILLGD
Zero values in FTELG ..... FTELGD
Zero values in IAIDLG..... IAIDLGD
Zero values in TFUGLG..... TFUGLGD
Zero values in STUDLN..... STUDLND
Log of instruction expenditures per student.....INSTLG
Log of average faculty compensation ..... AVCMPLG
Log of institutional support expenditures per student.....INSPLG
Log of academic support expenditures per Student..... ACADLG
Log of student services expenditures per student..... STUDLG
Ratio of graduate to total FTE enrollment .....PERGD
Log of federal grants and contracts per student.....FDGRLG
Log of state and local revenue per student....STLOLG
Zero values in STLOLG .....STLOLGD
Zero values in FDGRLG..... FDGRLGD
Zero values in STUDLG..... STUDLGD

CHAPTER V

AVERAGE VARIABLES*:*

Dollar change in undergraduate tuition.... INSTATCH
Percentage change in undergraduate tuition..... INSTAD
Number of first-time, full-time undergraduates..... FTUG99
Percentage of students who are first-time, full-time undergraduates FTUGP99
Percentage of first-time, full-time undergraduates who receive any aid FTUGAP99
Percentage receiving federal grants ..... FEDGRNTP
Average amount of federal grants received.....FEDGRNTA
Percentage receiving state grants ..... STGRNTP
Average amount of state grants received .. STGRNTA
Percentage receiving institutional grants.... INGRNTP
Average amount of institutional grants received.....INGRNTA
Percentage receiving student loans ..... LOANPCT
Average amount of student loans received..... LOANAVG

MODEL VARIABLES:

Dollar change in undergraduate tuition.... INSTATCH
Base level of tuition INSTAC98
Number of first-time, full-time undergraduate FTUG99
Percentage of undergraduates receiving any aid times the percentage of first-time, full-time undergraduates..... FTUGAP2
Percentage receiving federal grants times the average amount received.....FEDGPAC
Percentage receiving state grants times the average amount received..... STGPAC
Percentage receiving institutional grants times the average amount received .....INGPAC
Percentage receiving student loans times the average amount received..... LOANPAC
Change in academic support expenditures..... ACADDIFF
Change in average faculty compensation AVC2DIFF
Change in average tuition at public 4-year institutions in the state .....AVTFDIFF
Change in federal grants and contracts .....FDGRDIFF
Change in institutional support expenditures..... INSPDIFF
Change in instruction expenditures..... INSTDIFF
Degree of urbanicity ..... LOCALE
Percentage of awards that were certificates..... PCTCERT
Percentage of enrollment that was full time..... PERFT98R
Percentage of enrollment that was minority.....PERMIN98
Change in philanthropic revenue ..... PHILDIFF
Change in plant maintenance expenditures..... PLNTDIFF
Change in plant maintenance expenditures plus transfers..... PLTRDIFF
Change in research expenditures.....RESDIFF
Change in state appropriations revenue .... STAPDIFF
Change in state grants and contracts ..... STGRDIFF
Change in per capita income by state.....STINCDIF
Change in state and local revenue..... STLODIFF
Change in student services expenditures...STUDDIFF
Tribal college indicator..... TRIBAL98
Indicator for cases using 1997-98 financial aid data..... YRINDFAD
Missing value indicator for ACADDIFF ..... ACADUMD
Missing value indicator for AVC2DIFF AVC2DUMD
Missing value indicator for FDGRDIFF..... FDGRDUMD
Missing value indicator for INSPDIFF.....INSPUMD
Missing value indicator for INSTDIFF.....INSTDUMD
Missing value indicator for LOCALE..... LOCALDUM
Missing value indicator for PCTCERT..... CERTDUM

Missing value indicator for PERFT98RF ..... PERFTDUM
Missing value indicator for PERMIN98 ..... PERMIND
Missing value indicator for PHILDIFF ..... PHILDUMD
Missing value indicator for PLNTDIFF ..... PLNTDUMD
Missing value indicator for PLTRDIFF ..... PLTRDUMD
Missing value indicator for RESDIFF ..... RESDUMD
Missing value indicator for STAPDIFF ..... STAPDUMD
Missing value indicator for STGRDIFF ..... STGRDUMD
Missing value indicator for STLODIFF ..... STLODUMD
Missing value indicator for STUDDIFF ..... STUDDUMD

IPEDS VARIABLES

Academic support expenditures per FTE **ACAD3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for support services that are an integral part of the institution's mission, including expenditures for libraries, academic administration, academic computing support, and curriculum development.

Dollar change in academic support expenditures **ACADDIFF**

Dollar change in current fund expenditures of the reporting institution for academic support activities, in constant 1999 dollars, over the period 1993-94 to 1995-96 for private not-for-profit institutions and 1995-96 to 1997-98 for public institutions.

Missing values for ACADDIFF **ACADDUMD**

This dummy variable indicates missing values for real dollar change in academic support expenditures.

Log of inflation-adjusted academic support expenditures per FTE **ACADLG**

Natural logarithm of current fund expenditures of the reporting institution for academic support activities per FTE student, in constant 1999 dollars, for a given year.

Dollar change in revenue from government appropriations per FTE **APPR1__C**

Dollar change in current fund revenue of the reporting institution from acts of federal, state, and local legislative bodies for meeting current operating expenses per FTE student, in constant 1999 dollars, for a given time period.

Expenditures for auxiliary enterprises per FTE **AUXE3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for auxiliary enterprises such as residence halls and college bookstores.

Revenue from auxiliary enterprises per FTE **AUXL3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, from auxiliary enterprises such as residence halls and college bookstores.

Dollar change in average faculty compensation **AVC2DIFF**

Dollar change in the inflation-adjusted average salary and fringe benefits for full-time instructional faculty on 9/10-month or 11/12-month contracts reported by private not-for-profit institutions, 1995-96 to 1997-98.

Missing values for AVC2DIFF **AVC2DUMD**

This dummy variable indicates missing values for the dollar change in average faculty compensation.

Average faculty compensation **AVCMP__R**

Average salary and fringe benefits for full-time instructional faculty on 9/10-month or 11/12-month contracts reported by private not-for-profit institutions, in constant 1999 dollars.

Log of average faculty compensation **AVCMPLG**

Natural logarithm of the average salary and fringe benefits for full-time instructional faculty on 9/10-month or 11/12-month contracts reported by private not-for-profit institutions.

Dollar change in average in-state undergraduate tuition at public 4-year institutions in the state **AVTFDIFF**

Change in the average of inflation-adjusted undergraduate tuition amounts reported by public 4-year institutions located in the same state as the institution, over the period 1995-96 to 1997-98 for private not-for-profit institutions. Undergraduate tuition refers to tuition and required fees for full-time, full-year undergraduate students who are legal residents of the state in which the reporting institution is located.

Log of average in-state undergraduate tuition at public 4-year institutions in the state **AVTFLG**

Natural logarithm of the average of inflation-adjusted undergraduate tuition amounts reported by public 4-year institutions located in the same state as the institution, for a given year. Undergraduate tuition refers to tuition and required fees for full-time, full-year undergraduate students who are legal residents of the state in which the reporting institution is located.

Dollar change in the amount by which E&G revenues exceed/fall short of E&G expenditures **BAL1__C**

Difference, in constant 1999 dollars, between total educational and general expenditures and total educational and general revenues.

Carnegie classification code **CARNEGIE**

Indicates the 1994 Carnegie classification of the reporting institution.

- *Research Universities I*: These institutions offer a full range of bachelor's programs, are committed to graduate education through the doctorate, and give high priority to research. They award 50 or more doctoral degrees each year. In addition, they receive annually $40 million or more in federal support.
- *Research Universities II*: These institutions offer a full range of bachelor's programs, are committed to graduate education through the doctorate, and give high priority to research. They award 50 or more doctoral degrees each year. In addition, they receive annually between $15.5 million and $40 million in federal support.
- *Doctoral Universities I*: These institutions offer a full range of bachelor's programs and are committed to graduate education through the doctorate. They award at least 40 doctoral degrees annually in five or more disciplines.
- *Doctoral Universities II*: These institutions offer a full range of bachelor's programs and are committed to graduate education through the doctorate. They award annually at least 10 doctoral degrees (in three or more disciplines), or 20 or more doctoral degrees in one or more disciplines.
- *Master's (Comprehensive) Universities and Colleges I*: These institutions offer a full range of bachelor's programs and are committed to graduate education through the master's degree. They award 40 or more master's degrees annually in three or more disciplines.
- *Master's (Comprehensive) Universities and Colleges II*: These institutions offer a full range of bachelor's programs and are committed to education through the master's degree. They award 20 or more master's degrees annually in one or more disciplines.

- *Bachelor's (Liberal Arts) Colleges I*: These institutions are primarily undergraduate colleges with major emphasis on bachelor's degree programs. They award 40 percent or more of their bachelor's degrees in liberal arts fields or are less restrictive in admissions.
- *Bachelor's Colleges II*: These institutions are primarily undergraduate colleges with major emphasis on bachelor's degree programs. They award less than 40 percent of their bachelor's degrees in liberal arts fields or are less restrictive in admissions.
- *Associate of Arts Colleges*: These institutions offer associate of arts certificate or degree programs and, with few exceptions, offer no bachelor's degrees.
- *Specialized Institutions*: These institutions offer degrees ranging from the bachelor's to the doctorate. At least 50 percent of the degrees awarded by these institutions are in a single discipline. Examples of specialized institutions include theological seminaries, medical schools, schools of engineering, law schools, and teachers colleges. This group of institutions also includes tribal colleges.

Revised Carnegie classification code **CARNEGER**

For 4-year institutions, the Carnegie classification codes of the reporting institutions were regrouped into the following categories for use in this report.

- *Research/Doctoral Institutions*: Includes Research I, Research II, Doctoral I, and Doctoral II institutions.
- *Comprehensive Institutions*: Includes Master's (Comprehensive) I and II institutions.
- *Bachelor's Institutions*: Includes Bachelor's I and II colleges.
- *Other/Specialized Institutions*: Includes institutions with other Carnegie classification codes as well as institutions that had not been classified in the 1994 system.

PCTCERT missing **CERTDUM**

This dummy variable was created to indicate missing values for percentage of 1996-97 awards that were certificates.

Total expenditures per FTE **CEXP3__F**

Total current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars. In IPEDS, these expenditures are divided into the following functional areas: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, mandatory transfers, non-mandatory transfers, auxiliary enterprises, hospitals, and independent operations.

Total revenue per FTE **CREV3__F**

Total current fund revenue of the reporting institution per FTE student in a given year, in constant 1999 dollars. Current funds revenues include all unrestricted gifts, grants, and other resources earned during the reporting period, and restricted resources to the extent that such funds were expended for current operating purposes. In IPEDS, these revenues are divided according to the following sources of funds: tuition and fees; federal, state, and local appropriations; federal, state, and local grants and contracts; private gifts, grants, and contracts; endowment income; sales and services of educational activities; auxiliary enterprises; hospitals; other sources; and independent operations.

1991 **DUMMY91**

This dummy variable indicates data for 1990-91.

1 = 1991
0 = Otherwise

1992 **DUMMY92**

This dummy variable indicates data for 1991-92.

1 = 1992
0 = Otherwise

1993 **DUMMY93**

This dummy variable indicates data for 1992-93.

1 = 1993
0 = Otherwise

1994 **DUMMY94**

This dummy variable indicates data for 1993-94.

1 = 1994
0 = Otherwise

1995 **DUMMY95**

This dummy variable indicates data for 1994-95.

1 = 1995
0 = Otherwise

1996 **DUMMY96**

This dummy variable indicates data for 1995-96.

1 = 1996
0 = Otherwise

Total E&G expenditures per FTE **EG3__F**

Total current fund expenditures of the reporting institution per FTE student in a given year, in constant 1999 dollars, for activities that fall in the following functional categories: instruction, research, public service, academic support, student services, institutional support, plant operation and maintenance, scholarships and fellowships, and mandatory and non-mandatory transfers.

Total E&G revenue per FTE **EGREV__F**

Total current fund revenue of the reporting institution per FTE student in a given year, in constant 1999 dollars, from the following sources: tuition; federal, state, and local appropriations; federal, state, and local grants and contracts; private gifts, grants, and contracts; endowment income; and sales and services of educational activities.

Revenue from endowment income per FTE **ENDW3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, from endowment and similar funds.

Revenue from federal appropriations per FTE **FDAP3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, received through acts of Congress that are for meeting current operating expenses, not for specific projects or programs.

Revenue from federal grants and contracts per FTE **FDGR3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, received from federal agencies that are for specific research projects or other types of programs.

Dollar change in revenue from federal grants and contracts **FDGRDIFF**

Dollar change in current fund revenue from federal grants and contracts, in constant 1999 dollars, over the period 1993-94 to 1995-96 for private not-for-profit institutions and 1995-96 to 1997-98 for public institutions.

Missing values for FDGRDIFF **FDGRDUMD**

This dummy variable indicates missing values for the dollar change in revenue from federal grants and contracts.

Log of federal grants and contracts less federal aid funds per FTE **FDGRLG**

Natural logarithm of revenue from federal grants and contracts less revenue from federal student financial aid per FTE student, in constant 1999 dollars, for a given year.

Zero values in FDGRLG **FDGRLGD**

This dummy variable indicates zero values in log of federal grants and contracts less federal aid funds per FTE.

Total FTE enrollment **FTE__**

Total full-time equivalent (FTE) fall enrollment of the reporting institution in a given year. FTE was calculated through the following formula:

> For institutions with quarter calendar systems, total undergraduate student credit hour activity of the reporting institution divided by 15; plus total undergraduate student contact hours of the reporting institution divided by 300; plus total graduate student credit hour activity of the reporting institution divided by 12; plus total professional student credit hour activity of the reporting institution divided by 16.
>
> For institutions with semester, trimester, and other calendar systems, total undergraduate student credit hour activity of the reporting institution was divided by 15; plus total undergraduate student contact hours of the reporting institution divided by 450; plus total graduate student credit hour activity of the reporting institution divided by 12; plus total professional student credit hour activity of the reporting institution divided by 16.

For years in which credit/contact hour activity was not available, the ratios of total FTE generated from credit hour activity to total headcount fall enrollment for the nearest year in which instructional activity data were available (calculated separately for undergraduates, graduate students, and professional students) were applied to total fall enrollment to estimate FTE values.

First-time freshmen FTE enrollment **FTEFF__**

Total full-time equivalent (FTE) enrollment of first-time freshmen of the reporting institution in a given year. FTE estimates were generated by applying the ratio of undergraduate FTE generated from credit hour activity to total undergraduate fall enrollment (for the nearest year in which instructional activity data were available) to the level of first-time enrollment.

Log of first-time freshmen FTE enrollment **FTEFFLG**

Natural logarithm of first-time, first-year FTE enrollment of the reporting institution.

Zero values in FTEFFLG **FTELGD**

This dummy variable indicates zero values in the log of first-time freshmen FTE students.

Dollar change in revenue from government grants and contracts per FTE **GRNT2__C**

Dollar change in current fund revenue per FTE student of the reporting institution received from federal, state, and local agencies that is for specific research projects or other types of programs, in constant 1999 dollars, for a given time period.

Highest degree offered **HDEGOFFR**

The highest degree offered at the reporting institution. This variable was used to eliminate institutions that were not degree granting.

Revenue from hospitals per FTE **HOSP3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, generated by hospitals operated by the institution.

Expenditures for hospitals per FTE **HSPE3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for hospitals operated by the institution.

Dollar change in institutional aid expenditures per FTE **IAID3__C**

Dollar change in current fund expenditures per FTE student of the reporting institution for institutional scholarships and fellowships, in constant 1999 dollars, for a given time period.

Expenditures on institutional scholarships and fellowships per FTE **IAID3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for institutional aid awarded as outright grants and trainee stipends to individuals enrolled in formal coursework, including aid to students in the form of tuition or fee remission, but not including aid that is exchanged for student work.

Log of expenditures per FTE on institutional aid **IAIDLG**

Natural logarithm of current fund expenditures of the reporting institution for institutional aid per FTE student, in constant 1999 dollars, for a given year.

Zero values in IAIDLG **IAIDLGD**

This dummy variable indicates zero values for log of expenditures per FTE on institutional aid.

Expenditures for independent operations per FTE **INDE3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, associated with independent operations.

Revenue from independent operations per FTE **INDP3__F**

Current fund revenues of the reporting institution per FTE student in a given year, in constant 1999 dollars, associated with independent operations.

Institutional support expenditures per FTE **INSP3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for day-to-day operational support of the institution, including expenditures for physical plant operations, general administrative services, legal and fiscal operations, and public relations.

Dollar change in institutional support expenditures **INSPDIFF**

Dollar change in current fund expenditures of the reporting institution for institutional support activities, in constant 1999 dollars, over the period 1993-94 to 1995-96 for private not-for-profit institutions and 1995-96 to 1997-98 for public institutions.

Missing values for INSPDIFF **INSPDUMD**

This dummy variable indicates missing values for the dollar change in institutional support expenditures.

Log of institutional support expenditures per FTE **INSPLG**

Natural logarithm of current fund expenditures per FTE student of the reporting institution for institutional support activities, in constant 1999 dollars, for a given year.

Dollar change in instruction expenditures per FTE **INST3__C**

Dollar change in current fund expenditures per FTE student of the reporting institution for activities directly related to instruction, in constant 1999 dollars, for a given time period.

Instruction expenditures per FTE **INST3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for activities related directly to instruction, including expenditures for faculty compensation, office supplies, and administration of academic departments, as well as expenditures for departmental research and public service that are not budgeted separately.

Dollar change in instruction expenditures **INSTDIFF**

Dollar change in current fund expenditures of the reporting institution for instructional activities over the period 1993-94 to 1995-96 for private not-for-profit institutions and 1995-96 to 1997-98 for public institutions, in constant 1999 dollars.

Missing values for INSTDIFF **INSTDUMD**

This dummy variable indicates missing values for the dollar change in instruction expenditures.

Log of instruction expenditures per FTE **INSTLG**

Natural logarithm of current fund expenditures per FTE student of the reporting institution for instructional activities, in constant 1999 dollars, for a given year.

Log of previous year's instruction expenditures per FTE **INSTLN**

Natural logarithm of current fund expenditures per FTE student of the reporting institution for instructional activities in the previous year, in constant 1999 dollars.

Revenue from local appropriations per FTE **LOAP3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, received through acts of the local legislative body that is for meeting current operating expenses, not for specific projects or programs.

Missing values for LOCALE **LOCALDUM**

This dummy variable indicates missing values for the degree of urbanization of the reporting institution's location.

Degree of urbanization of location of the institution **LOCALE**

The degree of urbanization of the reporting institution's location, based on U.S. Census Bureau designations.

Large city = 1
A central city of a CMSA or MSA having a population greater than or equal to 250,000.

Mid-size city = 2
A central city of a CMSA or MSA, having a population less than 250,000.

Urban fringe of a large city = 3
Any incorporated place, CDP, or non-place territory within a CMSA or MSA of a large city and defined as urban by the Census Bureau.

Urban fringe of a mid-size city = 4
Any incorporated place, CDP, or non-place territory within a CMSA or MSA of a mid-size city and defined as urban by the Census Bureau.

Large town = 5
Any incorporated place or CDP with a population greater than or equal to 25,000 and located outside a CMSA or MSA.

Small town = 6
Any incorporated place or CDP with a population less than 25,000 and greater than or equal to 2,500 and located outside a CMSA or MSA.

Rural = 7
Any incorporated place, CDP, or non-place territory designated as rural by the Census Bureau.

Revenue from local grants and contracts per FTE **LOGR3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, received from local agencies that are for specific research projects or other types of programs.

Expenditures on mandatory transfers per FTE **MAND3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for mandatory transfers from current funds. Mandatory transfers are those that must be made in order to fulfill a binding legal obligation of the institution.

Expenditures on non-mandatory transfers **NONM3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for non-mandatory transfers from current funds. Non-mandatory transfers are those made at the discretion of the governing board to serve a variety of objectives.

Dollar change in non-student-related expenditures per FTE **NONX__C**

Dollar change in current fund expenditures of the reporting institution for non-student-related activities per FTE student, in constant 1999 dollars, for a given time period. Non-student-related expenditures include public service expenditures, plus pro-rated portions of expenditures for academic support, institutional support, plant operations and maintenance, and transfers. The pro rata variable was taken from the final report of the National Commission on the Cost of Higher Education, in which student-related costs were estimated using the proportion of clearly instructional costs (instruction and student services) divided by total current fund expenditures less transfers, scholarship expenditures, and the partially instructional categories (academic support, institutional support, and plant operations).

OPE eligibility indicator **OPEIND**

Indicates Office of Postsecondary Education (OPE) eligibility status of reporting institution, i.e., whether institutions have participation agreements with the U.S. Education Department for Title IV student aid programs.

Institution is eligible = 1
Institution is not listed separately as an eligible institution, but is a branch campus or system office of a main campus that is eligible = 2
Institution is not eligible = 9

Institutions coded 1 or 2 are considered to be eligible by NCES.

Revenue from other sources per FTE **OTHR3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, that are not covered in other categories.

Percentage of 1996-97 awards that were certificates **PCTCERT**

Percentage of degrees and certificates awarded in 1996-97 by the reporting institution (public 2-year institutions only) that were certificates.

Percentage of 1998 fall enrollment that was full-time **PERFT98R**

Percentage of total 1998 fall enrollment made up of students classified as full-time at the reporting institution.

Missing values in PERFT98R **PERFTDUM**

This dummy variable indicates missing values in the percentage of 1998 fall enrollment that was full-time.

Ratio of graduate FTE enrollment to total FTE enrollment **PERGD__**

Percentage of total FTE enrollment that is graduate FTE enrollment at the reporting institution in a specific year.

Change in ratio of graduate FTE enrollment to total FTE enrollment **PERGD__C**

Change in the percentage of total FTE enrollment that is graduate FTE enrollment, over a given time period.

Percentage of 1998 fall enrollment that was minority **PERMIN98**

Percentage of total 1998 fall enrollment that was made up of students classified as minority students, including Black, non-Hispanic, American Indian or Alaskan Native, Asian or Pacific Islander, and Hispanic students.

Missing values for PERMIN98 **PERMIND**

This dummy variable indicates missing values for the percentage of 1998 fall enrollment that was minority.

Log of the proportion of undergraduates enrolled in the state who were attending private, not-for-profit 4-year institutions **PERPRLG**

Natural logarithm of the percentage of total undergraduate fall headcount enrollment in the state that was made up of students enrolled at private not-for-profit 4-year institutions.

Dollar change in philanthropic revenue per FTE **PHIL1__C**

Dollar change in current fund revenues of the reporting institution from endowment income and private gifts per FTE student, in constant 1999 dollars, for a given time period.

Dollar change in philanthropic revenue **PHILDIFF**

Dollar change in current fund revenue, in constant 1999 dollars, from private gifts, grants, and contracts and from endowment and similar funds, over the period 1993-94 to 1995-96 for private not-for-profit institutions.

Missing values for PHILDIFF **PHILDUMD**

This dummy variable indicates missing values for the dollar change in philanthropic revenue.

Log of philanthropic revenue per FTE **PHILLG**

Natural logarithm of current fund revenue per FTE student, in constant 1999 dollars, from private gifts, grants, and contracts and from endowment and similar funds, for a given year.

Zero values in PHILLG **PHILLGD**

This dummy variable indicates zero values for log of philanthropic revenue per FTE.

Expenditures on plant operation and maintenance per FTE **PLNT3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for service and maintenance related to grounds and facilities used for education and general purposes, including expenditures for utilities, property insurance, and similar items.

Dollar change in expenditures on plant maintenance and operations **PLNTDIFF**

Dollar change in current fund expenditures of the reporting institution for plant operations and maintenance, in constant 1999 dollars, over the period 1995-96 to 1997-98 for public institutions.

Dummy variable for PLNTDIFF missing **PLNTDUMD**

This dummy variable indicates missing values for the dollar change in expenditures on plant maintenance.

Dollar change in expenditures on plant maintenance, plus transfer payments **PLTRDIFF**

Dollar change in current fund expenditures of the reporting institution for plant operations and maintenance, plus transfer payments, in constant 1999 dollars, over the period 1993-94 to 1995-96 for private not-for-profit institutions.

Missing values for PLTRDIFF **PLTRDUMD**

This dummy variable indicates missing values for the dollar change in expenditures on plant operations and maintenance, plus transfer payments.

Log of previous year's expenditures per FTE on plant maintenance, plus transfer payments **PLTRLN**

Natural logarithm of current fund expenditures per FTE student of the reporting institution for plant operations and maintenance, plus transfer payments, in the previous year, in constant 1999 dollars.

Zero values in PLTRLN **PLTRLND**

This dummy variable indicates zero values for the log of the previous year's expenditures per FTE on plant operation and maintenance, plus transfer payments.

Revenue from private gifts, grants, and contracts per FTE **PRIV3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, received from private donors for which no legal consideration is involved, and private contracts for specific goods and services provided to the funder in exchange for the funds.

Public service expenditures per FTE **PUB3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for activities established primarily to provide non-instructional services that benefit external groups and budgeted specifically for such public service.

Dollar change in research expenditures per FTE **RES3__C**

Dollar change in current fund expenditures per FTE student of the reporting institution for separately funded research activities, in constant 1999 dollars, for a given time period.

Research expenditures per FTE **RES3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for activities specifically organized to produce research outcomes, commissioned by an external agency, or budgeted separately to an internal organizational unit.

Dollar change in research expenditures **RESDIFF**

Dollar change in current fund expenditures of the reporting institution for research activities, in constant 1999 dollars, over the period 1993-94 to 1995-96 for private not-for-profit institutions.

Missing values for RESDIFF **RESDUMD**

This dummy variable indicates missing values from the dollar change in research expenditures.

Log of previous year's research expenditures per FTE **RESLN**

Natural logarithm of current fund expenditures per FTE student of the reporting institution for research activities in the previous year, in constant 1999 dollars, for a given year.

Zero values in RESLN **RESLND**

This dummy variable indicates zero values for the log of the previous year's research expenditures per FTE.

Revenue from sales and services of educational activities per FTE **SALE3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, that are incidental to the conduct of instruction, research, or public service.

Expenditures on scholarships and fellowships per FTE **SCHO3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for outright grants and trainee stipends to individuals enrolled in formal coursework, including aid to students in the form of tuition or fee remission, but not including aid that is exchanged for student work. Primarily institutional aid is represented in this category, but some federal aid (such as Pell Grants) and other grants that are distributed through the institutions are also included.

Sector of institution **SECTOR**

Indicates the sector—level and control—of the reporting institution. In this report, the following codes were used:

Public, 4-year
Private not-for-profit, 4-year
Public, 2-year

Revenue from state appropriations per FTE **STAP3__F**

Current fund revenues per FTE student of the reporting institution in a given year, received through acts of the state legislative body that are for meeting current operating expenses, not for specific projects or programs.

Dollar change in revenue from state appropriations **STAPDIFF**

Dollar change in current fund revenue from state appropriations of the reporting institution, in constant 1999 dollars, over the period 1995-96 to 1997-98 for public institutions.

Missing values for STAPDIFF **STAPDUMD**

This dummy variable indicates missing values for the dollar change in revenue from state appropriations.

Revenue from state grants and contracts per FTE **STGR3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, received from state agencies that are for specific research projects or other types of programs.

Dollar change in revenue from state grants and contracts **STGRDIFF**

Dollar change in current fund revenue from state grants and contracts, in constant 1999 dollars, over the period 1995-96 to 1997-98 for public institutions.

Missing values for STGRDIFF **STGRDUMD**

This dummy variable indicates missing values for the dollar change in revenue from state grants and contracts.

Dollar change in appropriations and grants and contracts from state and local sources, less state/local aid funds **STLODIFF**

Dollar change in current fund revenue of the reporting institution received from acts of state and local legislative bodies for meeting current operating expenses, and from state and local agencies for specific research projects or other types of programs, less state and local student financial aid funds, in constant 1999 dollars, over the period 1993-94 to 1995-96 for private not-for-profit institutions.

Missing values for STLODIFF **STLODUMD**

This dummy variable indicates missing values for the dollar change in appropriations and grants and contracts from state and local sources, less state/local aid funds.

Log of appropriations and grants and contracts from state and local sources, less state/local aid funds, per FTE **STLOLG**

Natural logarithm of current fund revenue per FTE student of the reporting institution received from acts of state and local legislative bodies for meeting current operating expenses, and from state and local agencies for specific re-

search projects or other types of programs, less state and local student financial aid funds, in constant 1999 dollars, for a given year.

Zero values in STLOLG **STLOLGD**

This dummy variable indicates zero values in the log of appropriations and grants and contracts from state and local sources, less state/local aid funds per FTE.

Dollar change in student services expenditures per FTE **STUD3__C**

Dollar change in current fund expenditures of the reporting institution for student services activities per FTE student, in constant 1999 dollars, for a given time period.

Student services expenditures per FTE **STUD3__F**

Current fund expenditures per FTE student of the reporting institution in a given year, in constant 1999 dollars, for admissions, registrar activities, and activities whose primary purpose is to contribute to students' well-being and development, including expenditures for career guidance, financial aid administration, and student health services.

Dollar change in student services expenditures **STUDDIFF**

Dollar change in current fund expenditures of the reporting institution for student services activities, in constant 1999 dollars, over the period 1993-94 to 1995-96 for private not-for-profit institutions.

Missing values for STUDDIFF **STUDDUMD**

This dummy variable indicates missing values for the dollar change in student services expenditures.

Log of student services expenditures per FTE **STUDLG**

Natural logarithm of current fund expenditures of the reporting institution for student services activities per FTE student, in constant 1999 dollars, for a given year.

Zero values in STUDLG **STUDLGD**

This dummy variable indicates zero values for log of student services expenditures per FTE.

Log of previous year's student services expenditures per FTE **STUDLN**

Natural logarithm of current fund expenditures per FTE student of the reporting institution for student services activities in the previous year, in constant 1999 dollars.

Zero values in STUDLN **STUDLND**

This dummy variable indicates zero values for log of previous year's student services expenditures per FTE.

Log of previous year's student/faculty ratio **STUFCLN**

Natural logarithm of the ratio of total FTE students to the total number of full-time instructional faculty on 9/10-month or 11/12-month contracts reported by the institution for the previous year.

Dollar change in other student-related expenditures per FTE **STUX__C**

Dollar change in current fund expenditures of the reporting institution for other student-related activities per FTE student, in constant 1999 dollars, for a given time period. Other student-related expenditures include pro-rated portions of expenditures for academic support, institutional support, plant operations and maintenance, and transfers. The pro rata variable was taken from the final report of the National Commission on the Cost of Higher Education, in which student-related costs were estimated using the proportion of clearly instructional costs (instruction and student services) divided by total current fund expenditures less transfers, scholarship expenditures, and the partially instructional categories (academic support, institutional support, and plant operations).

Level of in-state graduate tuition **TFGR2__R**

Graduate tuition and required fees for full-time, full-year students who are legal residents of the state in which the reporting institution is located, for a specific year, in constant 1999 dollars.

Dollar change in in-district undergraduate tuition **TFUG1__C**

The change in undergraduate tuition and required fees for full-time, full-year students who are legal residents of the locality in which the reporting institution is located, in constant 1999 dollars, for a given time period (only used for public 2-year institutions).

Level of in-district undergraduate tuition **TFUG1__R**

Undergraduate tuition and required fees for full-time, full-year students who are legal residents of the locality in which the reporting institution is located, for a specific year, in constant 1999 dollars (only used for public 2-year institutions).

Dollar change in in-state undergraduate tuition **TFUG2__C**

The dollar change in undergraduate tuition and required fees for full-time, full-year students who are legal residents of the state in which the reporting institution is located, in constant 1999 dollars, for a given time period.

Level of in-state undergraduate tuition **TFUG2__R**

Undergraduate tuition and required fees for full-time, full-year students who are legal residents of the state in which the reporting institution is located, for a specific year, in constant 1999 dollars.

Level of out-of-state undergraduate tuition **TFUG3__R**

Undergraduate tuition and required fees for full-time, full-year students who are not legal residents of the state in which the reporting institution is located, for a specific year, in constant 1999 dollars.

Log of in-state undergraduate tuition **TFUGLG**

Natural logarithm of in-state undergraduate tuition and required fees for full-time, full-year students who are legal residents of the state in which the reporting institution is located, for a specific year, in constant 1999 dollars.

Zero values in TFUGLG **TFUGLGD**

This dummy variable was created to indicate zero values for the log of in-state undergraduate tuition.

Undergraduate fall headcount enrollment **TOTEF__**

Total number of undergraduate students enrolled in the fall semester in courses creditable toward a diploma, certificate, degree, or other formal award, for a given year.

Tribal College indicator **TRIBAL98**

This dummy variable indicates whether the reporting public 2-year institution was classified as a Tribal College in 1998.

Tuition revenue per FTE **TUIT3__F**

Current fund revenues per FTE student of the reporting institution in a given year, in constant 1999 dollars, from charges assessed against students for education purposes, including tuition and fee remissions or exemptions as well as tuition and fee revenue that is remitted to the state.

BEA REGIONAL ACCOUNTS DATA VARIABLES

Change in average per capita income in the state **STINCDIF**

Dollar change in the average per capita income of the state in which the reporting institution is located, in constant 1999 dollars, over the period 1995-96 to 1997-98 for private not-for-profit institutions.

Log of average per capita income in the state **STINCLG**

Natural logarithm of the average per capita income of the state in which the reporting institution is located, in constant 1999 dollars, for a given year.

IPSFA VARIABLES

Percentage of undergraduates receiving federal grants times average inflation-adjusted amount received **FEDGPAC**

Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving federal grants times average amount received for the reporting institution, in constant 1999 dollars (for 1998-99, unless otherwise indicated).

Percentage of first-time undergraduates receiving federal grants **FEDGRNTP**

Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving federal grants for the reporting institution (for 1998-99, unless otherwise indicated).

Average amount of federal grants received **FEDGRNTA**

Average amount of federal grants received by first-time, full-time, degree/certificate-seeking undergraduates for the reporting institution, in constant 1999 dollars (for 1998-99, unless otherwise indicated).

Number of first-time undergraduates in 1999 **FTUG99**

Number of first-time, full-time, degree/certificate-seeking undergraduates at the reporting institution in 1999.

Percentage of students who are first-time undergraduates **FTUGP99**

Percentage of all students who are first-time, full-time, degree/certificate-seeking undergraduates in 1999 at the reporting institution.

Percentage of first-time undergraduates who receive aid from any source **FTUGAP99**

Percentage of all first-time, full-time, degree/certificate-seeking undergraduates who receive financial aid from any source, including federal grants, state grants, institutional grants, and student loans (for 1998-99, unless otherwise indicated) for the reporting institution.

Percentage of first-time undergraduates receiving aid from any source times the number of first-time undergraduates **FTUGAP2**

Percentage of first-time, full-time, degree/certificate-seeking undergraduates who receive financial aid from any source, including federal grants, state grants, institutional grants, and student loans (for 1998-99, unless otherwise indicated), times the percentage of first-time, full-time, degree/certificate-seeking undergraduates in 1999, for the reporting institution.

Missing values in FTUGAP **FTUGAPDM**

This dummy variable indicates missing values in the percentage of first-time undergraduates receiving aid from any source times the number of first-time undergraduates.

Percentage of first-time undergraduates receiving institutional grants times the average amount received **INGPAC**

Percentage of first-time, full-time degree/certificate-seeking undergraduates receiving institutional grants times the average amount received, in constant 1999 dollars (for 1998-99, unless otherwise indicated) for the reporting institution.

Percentage of first-time undergraduates receiving institutional grants **INGRNTP**

Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving institutional grants at the reporting institution (for 1998-99, unless otherwise indicated).

Average amount of institutional grants received **INGRNTA**

Average amount of institutional grants received by first-time, full-time, degree/certificate-seeking undergraduates for the reporting institution, in constant 1999 dollars (for 1998-99, unless otherwise indicated).

1997-98 in-state undergraduate tuition **INSTAC98**

1997-98 in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates who are legal residents of the state in which the reporting institution is located, in constant 1999 dollars.

Percentage change in in-state undergraduate tuition **INSTAD**

Percentage change in in-state tuition for first-time, full-time, degree-certificate-seeking undergraduates who are legal residents of the state in which the reporting institution is located, 1997-98 to 1999-2000, in constant 1999 dollars.

Dollar change in in-state undergraduate tuition **INSTATCH**

Dollar change in in-state tuition for first-time, full-time, degree/certificate-seeking undergraduates who are legal residents of the state in which the reporting institution is located, 1997-98 to 1999-2000, in constant 1999 dollars.

Average amount of student loans received **LOANAVG**

Average amount of student loans received by first-time, full-time, degree/certificate-seeking undergraduates for the reporting institution, in constant 1999 dollars (for 1998-99, unless otherwise indicated).

Percentage of first-time undergraduates receiving student loans times the average amount received **LOANPAC**

Percentage of first-time, full-time degree/certificate-seeking undergraduates receiving student loans times the average amount received for the reporting institution, in constant 1999 dollars (for 1998-99, unless otherwise indicated).

Percentage of first-time undergraduates receiving student loans **LOANPCT**

Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving student loans at the reporting institution (for 1998-99, unless otherwise indicated).

Percentage of first-time undergraduates receiving state grants times the average amount received **STGPAC**

Percentage of first-time, full-time degree/certificate-seeking undergraduates receiving state grants times the average amount received for the reporting institution, in constant 1999 dollars (for 1998-99, unless otherwise indicated).

Percentage of first-time undergraduates receiving state grants **STGRNTP**

Percentage of first-time, full-time, degree/certificate-seeking undergraduates receiving state grants at the reporting institution (for 1998-99, unless otherwise indicated).

Average amount of state grants received **STGRNTA**

Average amount of state grants received by first-time, full-time, degree/certificate-seeking undergraduates for the reporting institution, in constant 1999 dollars (for 1998-99, unless otherwise indicated).

1997-98 financial aid data indicator **YRINDFAD**

This dummy variable indicates institutions that reported financial aid data for 1997-98 instead of 1998-99.