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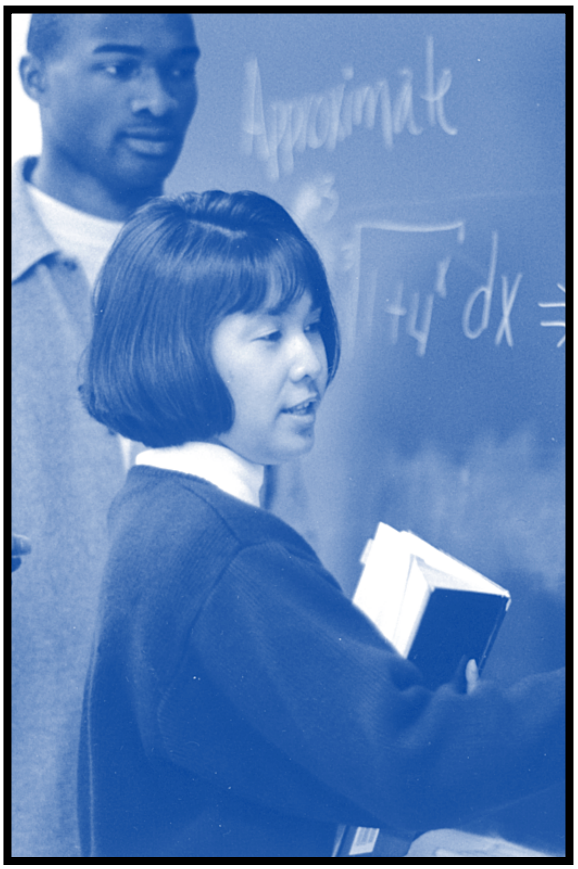

Cost, Price and Public Policy

Peering into the Higher Education Black Box

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The Institute for Higher Education Policy

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Executive Summary

Escalating tuitions and public accountability demands have brought considerable attention to the cost and price structures of American colleges and universities. This report is intended to serve as a primer on costs (the overall expenditure patterns, or what institutions spend in support of their missions) and prices (the charges to students and other consumers).

The report includes a conceptual framework for analyzing costs and prices by evaluating the higher education production function, and the determinants of both prices and costs. This framework can be used to strengthen understanding of costs and prices within individual institutions, as well as informing macro level investments at the state and national levels.

Insight into differential cost structures flows from the recognition that the higher education production process varies from institution to institution. Colleges and universities have broad latitude in choosing the quantity and quality of faculty, support staff, physical capital, and other inputs in order to produce educated students (instruction), knowledge (research), and public service. The nature of these products depends fundamentally upon the mission and goals of an individual institution. The ability to meet the mission and goals depends upon the production process employed by the institution. Factors such as the use of distance learning, the choice of course sizes, and the employment of adjunct faculty are part of the higher education production process. Despite the breadth of choices, average costs differ in somewhat predictable ways:

- *By level of instruction (lower division, upper division, and graduate)*: Each level has successively higher costs.
- *By discipline or field*: Such disciplines as engineering, health professions, and multi/interdisciplinary studies have

relatively higher costs; English and literature, psychology, and protective services have relatively lower costs.

- *By institutional type and control*: Research universities have relatively higher costs than comprehensive universities; private institutions have relatively higher costs than public institutions.

Because higher education institutions have sources of revenue in addition to tuition and fees, an understanding of price structures must incorporate subsidies and strategies for differential pricing. For either incentive or revenue-maximizing purposes, some groups of students are charged tuition and fees that diverge from the institution's average level. Although these choices are complicated by the overlapping patterns of tuition discounts, national aggregate data indicate some specific trends in average sticker price differentials:

- *By residency status*: Out-of-state students generally pay higher rates of tuition than do in-state students at public institutions.

- *By level of instruction*: Graduate and first-professional students pay slightly higher tuition per credit hour than do undergraduates.

- *By institutional type and control*: Private, non-profit institutions charge higher prices than do public institutions, and research universities charge higher prices than do community colleges.

These price differentials do not reflect cost differences exactly, even when costs and prices vary in the same direction. Decisions to differentiate tuition rates rest to some extent on conscious choices by states and institutions regarding which groups of students should (and would be willing to) pay more of their educational costs. Because tuition levels do not vary exactly with instructional costs even within the same institution, different students pay different proportions of those costs.

What proportion of the costs of higher education is met by stated levels of tuition, on average, for various subgroups of students? At an aggregate level, price-to-cost ratios presented in this report point to broad trends across institutions:

- Students at research universities and community colleges tend to pay a lower proportion of their instructional costs than do their counterparts at other types of institutions.

- At public institutions, out-of-state students pay a higher proportion of their instructional costs than do in-state students, at both undergraduate and graduate levels.

- Students in low-cost disciplines generally pay a higher proportion of their instructional costs than do students in higher-cost disciplines.

- Students at private institutions tend to pay a higher proportion of their educational costs, on average, than do students at public institutions.

From the opposite perspective, levels of subsidy (the proportion of costs paid by non-tuition revenue, including taxpayer money) also differ among groups of students. The available data reveal the importance of subsidy at every type of institution and support the previous findings:

- Subsidy makes up a higher proportion of educational spending for students at public institutions (77 percent, on average) than at private institutions

For either incentive or revenue-maximizing purposes, some groups of students are charged tuition and fees that diverge from the institution's average level.

Students at community colleges have the greatest subsidies as a proportion of educational costs, despite comparatively lower subsidies in absolute terms.

(31 percent). This should not be surprising, given that private institutions tend to rely more on tuition and fee revenue and less on non-tuition revenue (such as government appropriations) than do public institutions.

- Subsidy also differs by institutional mission. In particular, private research universities appear to have a larger subsidy as a proportion of educational costs (47 percent) than do other private institutions, such as comprehensive colleges (19 percent). At the same time, subsidy proportions at public institutions are relatively greater, regardless of mission; students at community colleges have the greatest subsidies as a proportion of educational costs, despite comparatively lower subsidies in absolute terms.

Both the level of subsidy and the pattern of differential pricing reflect to some extent the mission and goals of an individual institution, as well as policy decisions made at the state or the institutional level. After examining costs and prices, we offer several observations relevant to such policy decisions:

- Despite differences in missions and resources across institutions, categories of institutions exhibit somewhat consistent pricing and cost patterns.
- Within individual institutions, differential tuitions among different types of students can be used to alter the composition of the student body.
- Alternative sources of revenue subsidize virtually all students to some extent.
- Because institutions have enormous flexibility in selecting their production inputs, each institution has a unique set of costs and highly differentiated outputs.
- Differences in program costs within any single institution mean that some students are subsidized more than others.
- Measurement of costs and related pricing data can be adapted by an institution and used to compare itself with other institutions in order to provide insight into performance and cost effectiveness, while simultaneously recognizing differences in missions, resources, and other relevant conditions.

The observations above raise some fundamental questions about the fit between institutional purposes and funding decisions. For an institution or group of institutions, are the mission and goals that are incorporated into cost structures the same as those incorporated into pricing patterns, or are they, in fact, operating at cross purposes? Is the relationship between costs and prices reflected in price-to-cost ratios and subsidy patterns that are consistent with an institution's mission or a state's spending priorities? The answers to such questions have implications for institutional decisions on pricing, the evaluation of cost efficiency, and public policy.

Traditionally, however, the higher education community has asserted that detailed data on costs and prices cannot be collected due to methodological problems, and resistance to cost accounting within institutions continues to exist. Many believe that such data should not be collected because of the difficulty of comparing data among institutions with vastly different missions and resources. Nonetheless, if institutional and other leaders do not critically examine patterns of costs and prices, actual cost/price

relationships may drift out of alignment with the stated missions and goals of institutions and states.

The analysis in this primer suggests that greater use of available data will enhance understanding of cost and price structures within higher education. The analysis can help individual institutions ensure that their financing decisions are compatible with institutional goals. In addition, it can inform decisions about public finance strategies, such as aligning subsidies with other resources to achieve the greatest good.

Introduction

American colleges and universities expend a considerable amount of political and analytical energy devising and modifying their cost and price structures.

One reason for this focus on cost and price structures is that the interaction among the cost of educating students, the revenue received by the institutions, and the pattern of prices charged to students has a broad impact upon educational opportunities. This impact can be seen through the pattern of financial aid that can be offered to students, the pattern of enrollment among income groups, the persistence of any given set of students, and the availability and choice of courses of study by various students.[1] Studying the effects of this interaction is complicated, however, because such an analysis requires an understanding of the factors that determine each component and their interrelationship at the institutional level.

Over the years, the need to understand the relationship between college costs, revenue, and prices has driven institutions to develop measurement tools that capture the unique and complex characteristics of higher education. One essential tool is cost accounting (also called cost allocation, cost distribution, or cost apportionment), the technique employed to trace the flow of dollars from the source of income to the expenditure of that income within an institution. Movement of income between revenue centers and cost centers can, in turn, help reveal areas of profitability and loss. Whether areas of profitability are expanded (and areas of loss eliminated) depends in part upon the objectives of the institution.

The pressures within the educational community to provide financial accountability, promote private collaboration, and follow the new Financial Accounting Standards Board's accounting principles require some form of cost accounting. However, postsecondary institutions find that the existence of indirect costs, the interdependent nature of their products, and the subjective nature of choosing units of measurement make traditional cost accounting techniques difficult to adapt.

Because of these difficulties, cost accounting has not been fully implemented within higher education. Nevertheless, colleges and universities must strive for financial accountability and greater understanding of the relationship between the costs of higher education and the prices that students are charged. That goal becomes increasingly important as pressures mount to account for each dollar of revenue, as institutions rely more on tuition, and as public anxiety about college prices escalates.

Policymakers have been forced to examine both prices and costs in order to meet policy objectives. This accountability is especially true at the state level, where

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taxpayer funds appropriated directly to public institutions to keep tuition and fees low must be used in alignment with overarching state policy goals. On the national level, discussions from the 1973 Carnegie Commission on Higher Education to the 1998 National Commission on the Cost of Higher Education have recommended strengthening institutional cost control and management, with the goal of keeping college affordable to all who wish to obtain a postsecondary education.

This report presents a conceptual backdrop for understanding the factors influencing the costs of higher education and the prices students are charged, as well as the relationship between them—focusing primarily on instructional costs. The report examines empirical evidence from existing studies regarding price, revenue, and cost patterns at various types of institutions. Data are drawn from the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS), which collects comprehensive financial information from virtually all U.S. postsecondary institutions annually. In addition, data are derived from more specific studies such as the University of Delaware National Study of Instructional Costs and Productivity, a data-sharing consortium of almost 300 colleges and universities. Due to the nature of the available information, the data and analysis focus on four-year, degree-granting, public or private, non-profit institutions, although many of the concepts are applicable to institutions with other characteristics. Differences in average instructional costs by discipline, level of instruction, and institutional type are compared with the average prices charged. Finally, the report discusses the implications of the findings to institutions and public decision-making bodies regarding longer-term institutional financing, student composition, and pricing strategies.

Definitions

Several aspects of higher education financing are fundamental to understanding the approaches and data presented in this report:

- *Cost structures* are the patterns of expenditures incurred by postsecondary institutions; they depend upon institutional missions and choices made to achieve their missions. Costs ultimately depend upon the manner in which faculty, facilities, capital, administration, and other "inputs" are combined in order to produce certain products or "outputs." The transformation of inputs into outputs is called the "production function."

- *Revenue structures* are the level and patterns of financial resources received by institutions. Ultimately, inputs into the production of higher education outputs must be purchased with revenues obtained from specific sources, such as tuition and fees, gifts, and government appropriations. With the exception of certain income that is restricted (or "earmarked"), each dollar of revenue usually flows into a general fund from which it is dispersed.

- *Pricing patterns* are the schedule of tuition and fees charged to different students with varying characteristics.[2] Examples of pricing strategies include uniform tuition and fees to all students; tuitions reflecting program costs; tuition differentials by student residence (in-state versus out-of-state) or institutional mission (research university versus baccalaureate institution); and differentials in net tuition charged to exemplary or minority students.

To a large extent, revenue structures are the link between cost and pricing patterns. For example, as increases in state appropriations have failed to match rising costs, public institutions have increased their reliance on revenue from tuition and fees (see The Institute for Higher Education Policy, 1999). Thus, the following sections of this report primarily focus on costs and prices, but incorporate discussion of revenue structures as well.

Institutional Cost Considerations

The Determinants of Cost

Within broad limits defined by their mission and circumstances, colleges have discretion over how they expend their revenue and incur costs to "manufacture" their product.[3] The choices occur within broad categories representing the quantity and quality of students, faculty, facilities, and other inputs into the higher education production process.[4] The total annual cost of production for any particular institution reflects the cost of the inputs, appropriately amortized. At the same time, the price charged to the consumer must, in some manner, reflect (but not necessarily equal) the total costs of producing that product. Although the same could be said for the production of a can of beans, a computer, an automobile, or a condominium, there are some perplexing and challenging nuances in the case of higher education.

[Sum of the Costs of All Inputs] = Total Cost

An examination of the choices postsecondary institutions make regarding the quantity and quality of inputs is an essential part of the cost accounting process and important to the understanding of both costs and prices. These choices may be described through a production function analysis.

The Higher Education Production Function

The quantity and quality of inputs required for each different amount of output is usually called a production function, which, for any process, ultimately determines the total cost (but not necessarily price) of the product at every level of output.[7] Economists call the manner through which inputs are transformed into outputs the "technology." In principle, some technologies might produce exactly the same or higher quality and quantity of outputs with fewer or lower-cost inputs; in such a case, one could say that those technologies were more efficient than others. One goal of cost accounting is to describe a production function for each output within an organization and, within those functions, to assess changing technology, the ability to substitute inputs to achieve the same outputs, and the impact of changing revenue structures upon inputs and outputs.

The complexity and culture of higher education—coupled with a paucity of necessary data—make it impossible to gain even general agreement on the elements of the production function for higher education. However, this report does not attempt to "define" a single production function, but rather suggests that the nature of any one institution's production function is a primary determinant of its cost structure and pricing strategy. Despite the conceptual and technical difficulties, it is useful to examine the production function framework for the insight that it provides into higher education cost structures.[8] Frequently cited components of such a framework are listed in the following table.

Thus, at the institutional level, the higher education enterprise transforms a

As increases in state appropriations have failed to match rising costs, public institutions have increased their reliance on revenue from tuition and fees.

Each educated student—one output of a postsecondary institution—is subjected to a range of academic experiences that **vary widely in cost** from one student to another and from one institution to another.

variety of inputs into some combination of outputs through a process (technology) that involves a broad range of activities. The cost per unit of output results from decisions about the quantity and the quality of inputs. To a large extent, these decisions depend on the mission and goals of the institution. The production function framework includes only outputs and inputs directly used or produced in the education process—items that impact the supply of higher education products—and does not include factors that may be related to the demand for an institution's products, such as location, student income, or the condition of the employment market. Nevertheless, identification of the elements of the production function, and hence the elements of cost, remains complex.

Inputs into the process include the quantity and quality of:	The activities (technology) that transform the inputs into outputs include:	Outputs could be categorized as:
Faculty Support Staff Physical Capital Students	Instruction Institutional Support Activities Sponsored and Unsponsored Research Student Services Computer and Media Technology	Educated Students (Instruction) Knowledge (Research) Public Service

Different production functions undoubtedly exist by institutional type, or by sub-divisions—by degree program, by level of instruction, by department or discipline, or even by course.[9] For example, research universities probably have different production functions than community colleges, and within each type of institution, the production function for undergraduates probably differs from that of graduate students. Because of these differences, one would expect cost variations to be found in each academic division. Within a single university program, discipline, or class level (and certainly between institutions) some unit costs will exceed others. For instance, laboratory sciences typically require more resources than do the humanities; fine arts courses require theaters, which cost more than seminar rooms; and graduate education may require more specialized equipment, smaller class sizes, and more highly compensated professors than undergraduate education does. As a result, each educated student—one output of a postsecondary institution—is subjected to a range of academic experiences that vary widely in cost from one student to another and from one institution to another.

Marginal and Average Cost

The cost of a unit of input—faculty, staff, student, or new building—contributes directly to the total cost of production. If the cost of each input were known, the production function also could be used to determine both an "average cost" at each unit of output and a "marginal cost" of producing just one more unit of output. The distinction between average and marginal costs is important to an examination of the cost/price relationship because each concept is used for a different purpose:

- *Average costs* are used to measure accounting totals or subtotals, as total costs equal the average cost times the number of units produced. This is true irrespective of how many resources were expended to educate each incremental student (marginal cost). There is, of course, an infinite number of combinations of spending on each student that would give rise to the same average cost total. At the same time, average cost implies that a certain amount of average revenue is necessary to cover those costs.

[Average Cost per Unit of Output] x [Number of Units] = Total Cost

- *Marginal costs* are the incremental expenses that will be incurred by additional or curtailed production. Marginal costs are useful in predicting producer behavior. A college must decide whether to add one more student, one more faculty member, or one more computer terminal based on how much that addition contributes toward meeting the college's objectives. The additional unit may add more or less than the previous unit did.

[Sum of the Marginal Cost of Each Unit of Output] = Total Cost

Thus, there is a gap between the questions that are asked of cost accounting and the answers that can be provided from the data collected through cost accounting. Cost accounting data generally allow the calculation of average costs.

Special Characteristics of Higher Education

The higher education production process has at least four characteristics that defy the usual "production function" and cost accounting analyses.[5]

First, one of the outputs (an educated student) is also an input (an uneducated student). This situation is similar to the case of raw wheat being processed into refined flour, with one important distinction—the student gets to choose the production function (institution) to which he or she will submit. Coupled with other characteristics noted below, this situation often leads to competitive bidding for students with certain identifiable characteristics and selective pricing policies that encourage or discourage certain types of students.

Second, an inherent inequality is built into the dynamic of higher education. Other things being equal, greater subsidization of students attracts a greater number and/or higher quality of inputs (students). The result is a hierarchy of schools in which quality may depend on the extent of subsidy. By itself, this is similar to private industry where higher-priced inputs ensure better-quality outputs. What makes higher education different, however, is the self-perpetuating nature of the process.[6] The ultimate result is that a good student could pay less to attend a "good" school than a mediocre student pays to attend a "mediocre" school.

Third, although market niches are not unusual in business, what is atypical in the case of higher education is the extreme diversity in price and quality of educational institutions. This diversity is exacerbated by the hierarchy of institutional prestige that has developed, as well as allegiances of potential students to state, local, or legacy institutions. At the same time, the inputs into the academic process (particularly faculty) are much more varied than in most other production processes.

Finally, higher education involves interdependent products that may be produced in varying combinations. Joint products are not uncommon in industry: for example, the petroleum industry produces kerosene, napa, tar, and gasoline from the same crude oil input. These industry outputs are produced essentially in fixed and known proportions. In higher education, however, the processes used to produce each output are interrelated, and institutions can choose to produce a wide range of output combinations (depending on institutional missions). Higher education therefore involves a variable input/variable output production function that is difficult to both characterize and quantify. ■

Higher education involves a **variable input/variable output** production function that is difficult to both characterize and quantify.

Institutions' ratios between average cost and average tuition reveal an important element of their cost/price structures.

Because average cost suggests that a specific level of average revenue is required, knowledge of average costs provides the average tuition level that is required given the amount of non-tuition revenue, or vice versa.[12] Average cost information also enables insightful comparisons between institutions or similar groupings of institutions. Institutions' ratios between average cost and average tuition reveal an important element of their cost/price structures.

On the other hand, marginal cost information cannot be gathered easily from traditional cost accounting data.[13] This is most relevant for issues of changes in production, as well as predictions of the student response to institutional behavior. For example, the question of whether a price differential between in-state and out-of-state students will attract more or fewer in-state students requires marginal cost data (along with some additional information reflecting the nature of the two categories of students).

Average Cost Patterns

Despite measurement difficulties, average costs can be examined using the available data. Even within the instructional production function, unit costs (the amount higher education institutions spend per student or per credit hour) differ tremendously among institutions.

Defining Categories of Expenditure and Instructional Costs

In the conduct of their operations, institutions incur costs for goods and services in many different areas. Current expenditures (expenditures by institutions on their current operations, as opposed to capital expenditures) may be examined within the context of the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS).[14] The expenditure data collected through the IPEDS Finance survey (NCES, 1996) have traditionally been cost-based.[15] Looking at costs relative to the activity they support reveals that the bulk of current expenditures are called education and general (E&G) expenditures. E&G expenditures are devoted to instruction, research, public service, and administration; they exclude expenditures for self-supporting operations or operations that are independent of the primary missions of the institutions, such as auxiliary enterprises, hospitals, and independent research laboratories.[16]

Institutions distribute their total E&G expenditures among various functional categories (see Figure 1, page 12). In the case of public institutions, on average 38 percent of their combined E&G expenditures went toward instruction in 1995-96; the next highest categories were research (12 percent), institutional support (11 percent), and academic support (9 percent). Private, non-profit institutions on average spent 33 percent of their combined E&G expenditures on instruction, followed by scholarships and fellowships (16 percent), institutional support (13 percent), and research (9 percent).

Different types of institutions vary their distribution of expenditures among the functional categories. For example, research universities tend to spend a greater proportion of their total E&G resources on research than do other institutions—almost 22 percent overall, compared with doctoral universities, the next highest with 9 percent. Baccalaureate institutions spend the greatest proportion on scholarships and fellowships, 23 percent, compared with other types of institutions (NCES, 1996). In addition, large institutions tend to spend smaller proportions of their educational expenditures on support functions such as institutional support, student services, and operation and maintenance of plant; this is likely due to economies of scale (Bowen, 1980). The way in which these total

Cost Measurement and Allocation

If agreement were reached on the nature of the higher education production function, measurement of the elements themselves would still pose substantial obstacles. None of the obstacles argue that data are impossible to gather or are meaningless. Rather, they suggest that care should be taken in the collection, presentation, and interpretation of cost data.

There are two basic problems with measurement. First, in the face of multiple, somewhat overlapping products, higher education must choose a *unit of account*—for example, costs per unit of educated student, or per unit of knowledge, or per unit of public service. At the same time, the measure must capture both the *quantity* and the *quality* of inputs. Ratios and values designed to capture these elements are difficult to define, let alone measure. In his often cited 1980 work, Howard Bowen concludes that "there is simply no known way, except through the broad general judgment of experts, to measure the output of an institution's organized research or public service program. Cost studies, therefore, are usually confined to the educational function for which a tenable measuring unit is available" (p. 5).

Even when cost analysis is limited to the educational function, however, the basis for student units must be determined. For example, costs may be measured per full-time equivalent (FTE) student, or per student credit hour (SCH). The choice is significant, especially when comparing costs by level of instruction. Because the course load of the typical graduate student is lower than that of a typical undergraduate, cost ratios between graduate and lower division levels generally will be higher if they are reported on the basis of credit hours rather than per FTE students (Brinkman, 1989).[10]

In the absence of easily quantifiable input and output variables, proxies are often used. Morton Schapiro (1993) notes several measures as proxies for the output of "educated students," including years of education, test scores, size of graduating class, the percentage of entering freshmen who eventually graduate, and the percentage of seniors who go on for graduate education.[11] In addition, factors such as teacher experience and student-to-faculty ratios can be considered as proxies for the quantity and quality of various inputs (in this case, faculty). However, such proxies can only capture a portion of the production function concepts—that is, it is the quantity and quality of faculty that is relevant as an input, not the student-to-faculty ratio itself.

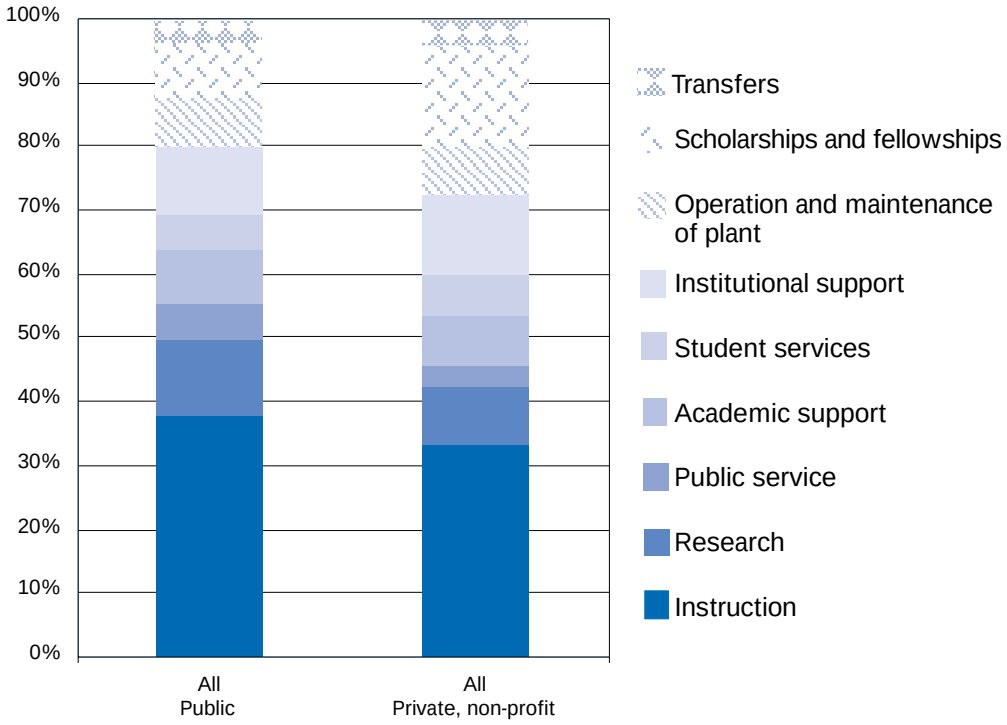
The second basic problem with cost measurement is that the total cost of providing the entire educational process includes not only costs that are directly budgeted and attributable to the primary missions of instruction, research, and public service, but also "unallocated" (indirect) costs that are accounted for separately. Indirect costs can include support costs—administrative expenses, security, library costs, and other costs—certain costs of debt financing, and depreciation of capital. It is clear that these indirect costs are used by some students more than others; however, it is virtually impossible to allocate these costs among various students on any meaningful basis. The most basic problem of implementing cost accounting in higher education has always been allocating portions of these costs to the various outputs and, further, to programs, disciplines, and courses. Decisions regarding the allocation of costs are always somewhat arbitrary and may bias the conclusion of a study in the direction of the ad hoc assignment of cost. In the case of the costs of educated students produced, for example, should the allocation be *pro rata* by number of students, by student credit hours produced, by number of faculty, or by already allocated expenses? The most common approach is to weight the costs by class level or program enrollment. ■

The most basic problem of implementing cost accounting in higher education has always been allocating portions of these costs to the various outputs and, further, to programs, disciplines, and courses.

Different types of institutions vary **their distribution** of expenditures among the functional categories.

Figure 1: Distribution of E&G Expenditures, by Institutional Control, 1995-96

(3,418 institutions)



Note: Includes only those institutions that responded to every data field. Public and private, non-profit categories include all Carnegie Classifications.

Source: NCES, 1996

expenditures are distributed impacts the calculation of unit costs.

Although the costs of research and public service are important because they are part of the institutional mission, it is difficult to include them in any measurement of unit costs due to the lack of appropriate measurement units. E&G expenditures therefore can be narrowed further to "educational costs," which comprise the portion of current expenditures that is directed toward the instruction and welfare of students. Educational costs were defined by Bowen (1980, 1981) as E&G expenditures minus the outlays for research and public service, and minus a prorated share of overhead costs attributable to research and public service. What remains is instruction, student services, institutional scholarships and fellowships, plus a prorated share of academic support, institutional support, and operation and maintenance of plant. Other studies have measured "instructional costs" even more narrowly than educational costs.

The functional categories of E&G expenditures also can be divided into direct costs and indirect costs. Three expenditure categories—instruction, research, and public service—represent direct costs, as they are directly attributable (and budgeted) to an institution's mission. Other expenditure categories (academic support, institutional support, student services, and operation and maintenance of plant) are indirect support costs, which are incurred through the production of more than one product and can only be estimated and allocated on a somewhat arbitrary basis. Finally, for the purposes of

unit cost measurement, scholarships and fellowships are frequently treated as a net reduction in price—rather than a cost of education—but otherwise they are usually considered as indirect costs.[20]

Previous cost studies have used data on full costs—direct plus indirect costs—employing a variety of procedures to distribute the indirect costs (see Bowen, 1980; Brinkman, 1993). On the other hand, many studies focus solely on direct costs in order to avoid issues regarding the basis of allocation. Thus, cost measurement analyses may examine any combination of the following, depending on the desired goals: full costs or direct costs alone; instructional costs, educational costs, or E&G expenditures as a whole; and costs inclusive or exclusive of scholarships and fellowships.[21]

Expected Differences in Direct Instructional Costs

One frequent focus of cost studies is direct instructional costs, which include both faculty compensation and operating expenses (Banziger et al., 1997). Typically, 80 to 90 percent of academic department direct expenditures are attributable to

Education and General (E&G) Expenditure Categories

E&G expenditures include the following functional categories:[17]

- ***Instruction***: 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.
- ***Research***: activities specifically organized to produce research outcomes, commissioned by an external agency, or budgeted separately to an internal organizational unit.
- ***Public service***: activities established primarily to provide non-instructional services that benefit external groups and budgeted specifically for such public service.
- ***Academic support***: support services that are an integral part of the institution's mission, including expenditures for libraries, academic administration, academic computing support, and curriculum development.
- ***Student services***: 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.
- ***Institutional support***: day-to-day operational support of the institution, including expenditures for physical plant operations, general administrative services, legal and fiscal operations, and public relations.
- ***Operation and maintenance of plant***: service and maintenance related to grounds and facilities used for education and general purposes, including expenditures for utilities, property insurance, and similar items.
- ***Scholarships and fellowships***: 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.[18] 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. (Scholarships and fellowships are frequently treated as a reduction in price rather than as a cost, or at the least are excluded from many cost studies.[19]) ■

Scholarships and fellowships are frequently treated as a reduction in price rather than as a cost, or at the least are excluded from many cost studies.

Typically, 80 to 90 percent of academic department direct expenditures are attributable to salaries and benefits.

salaries and benefits (Middaugh, 1999). Direct instructional costs differ both within and among institutions. These differences result from a combination of factors: student-to-faculty ratios; the type and salary level of faculty and staff; the use of supplies and equipment; and even economies of scale. Differences in costs occur on several levels:

By discipline or field. Some disciplines, such as natural sciences, tend to have higher direct instructional costs than others. The expected differences may derive from underlying production relationships—such as a reliance on laboratory courses, the costs of equipment, or the use of small seminars—or may result from the effects of scale, as in the case of disciplines that are underenrolled relative to faculty capacity (Brinkman, 1989). In addition, costs vary by discipline or field due to differences in the number, type, and price of faculty, equipment, supplies, and other inputs (Brinkman, 1993).

By level of instruction (lower division, upper division, and graduate). Higher levels of instruction generally have higher costs per student credit hour. There are several reasons: student-to-faculty ratios tend to be higher at the lower division level; more junior and part-time faculty or teaching assistants, who tend to have lower salaries, are used in lower division courses; and fewer supplies and equipment tend to be used on a per-credit-hour basis in lower instruction levels. In addition, scale effects may contribute to differences in costs—for example, smaller-scale graduate programs (with low enrollment) are likely to have higher costs per credit hour, and vice versa (Brinkman, 1989).

By institutional type/mission (Carnegie Classification). Larger, more complex institutions (in terms of degree levels, degrees awarded, and emphasis on research) tend to have greater differences in costs by level of instruction, especially comparing graduate with lower division (Brinkman, 1989). Institutional missions are relevant; some types of institutions are more heavily involved in graduate and professional study than are others, and institutions with more higher division students will generally have higher costs (Bowen, 1980, 1981). Economies of scale are also important in this respect. Finally, certain types of institutions may also emphasize higher-cost disciplines or fields, such as engineering or medicine.

By institutional control (public/private). Differences in scale and in the proportion of graduate students, both of which affect costs, tend to be large between public and private institutions with similar missions (Brinkman, 1993). Although differences in scale and proportion depend upon the nature of the production functions for graduate and undergraduate students, they most likely result in relatively lower unit costs for public institutions.

These differences are not clear cut, but overlap considerably. For example, certain types of institutions—those that focus on doctoral education—can use doctoral students, who are compensated at lower rates, to teach lower division courses.[23] At the same time, differences in costs are not static over time. Rather, trends in unit costs are greatly influenced by changing levels of faculty and staff compensation, as well as enrollment shifts among institutional types. Overall instructional costs per student remained steady or declined in the early part of the century, rose quickly during the 1950s and 1960s with the rapid expansion of the higher education system, and again remained steady or declined during the 1970s (Bowen, 1980).

Benchmark Data on Costs

One recent study of direct instructional costs is the University of Delaware National Study of Instructional Costs and Productivity, a data-sharing consortium that was established in 1992. Almost 300 colleges and universities have participated

in the study since its inception by volunteering cost data at the level of academic discipline. The study is intended to be longitudinal, and currently is in its sixth national data collection cycle. It focuses on direct instructional costs (personnel compensation, supplies and services, and departmental research and service that are not budgeted separately), collected on the basis of student credit hours; indirect costs are excluded (see University of Delaware, 1999; Middaugh, 1999).

Analysis by the University of Delaware of the 1996-97 data led to the development of national benchmarks organized by academic discipline and by Carnegie Classification within each discipline. The participating institutions are primarily

Institutional Type and Carnegie Classifications

The most widely used classification scheme for institutional type was developed by the Carnegie Foundation for the Advancement of Teaching in 1970. The most recent update was in 1994, and currently includes about 3,600 U.S. institutions that are degree-granting and accredited. The classification categories are based primarily on academic mission; institutions are classified according to their highest degree levels offered, the number of degrees conferred by discipline, and the amount of federal support for research received by the institution (Carnegie Foundation, 1994).

This report uses modified Carnegie Classifications, which combine similar categories. The categories used (along with their codes in IPEDS) are the following:

- ***Research universities (codes 11 and 12)***: These institutions offer a full range of baccalaureate programs, are committed to graduate education through the doctorate, and give high priority to research. They receive $15.5 million annually in federal support, and award 50 or more doctoral degrees each year.
- ***Doctoral universities (codes 13 and 14)***: These institutions offer a full range of baccalaureate programs and are committed to graduate education through the doctorate. They award at least 10 doctoral degrees annually in three or more disciplines, or 20 or more doctoral degrees in one or more disciplines.
- ***Master's (Comprehensive) universities and colleges (codes 21 and 22)***:[22] These institutions offer a full range of baccalaureate programs and are committed to graduate education through the master's and professional degrees. They award 20 or more master's degrees annually in one or more disciplines.
- ***Baccalaureate colleges (codes 31 and 32)***: These institutions are primarily undergraduate colleges with major emphasis on baccalaureate degree programs. This category includes Liberal Arts (Baccalaureate I) colleges, which award 40 percent or more of their baccalaureate degrees in liberal arts fields and are restrictive in admissions.
- ***Associate of Arts colleges (code 40)***: These institutions offer associate degree or certificate programs and, with few exceptions, offer no baccalaureate degrees. With the exception of public community colleges, this report generally excludes these institutions from the analysis.

Although this classification system is useful for cost comparisons among institutions, it should not be considered to represent true peer groups. The institutions within each Carnegie Classification share important similarities, but also differ in ways that can influence costs (Brinkman, 1993). The Carnegie Foundation also is reviewing its classification system for possible changes. ■

Trends in unit costs are **greatly influenced** by changing levels of faculty and staff compensation, as well as enrollment shifts among institutional types.

Average instructional costs for one discipline may be three times that of another discipline, or even greater in individual cases.

public colleges and universities, except those institutions in the baccalaureate classification, which are mostly private liberal arts colleges; community colleges are not included in the group.[24] Because the following analysis is derived from the benchmarks rather than individual institutional records, the data should be viewed only as indicators, not precise measures.[25]

Overall, the Delaware Study data support several general statements about differences in direct instructional costs:

- *By discipline or field.* Certain disciplines have higher average direct instructional costs than others (see Figure 2). In fact, average instructional costs for one discipline may be three times that of another discipline, or even greater in individual cases. For example, the average expenditures per student credit hour for protective services, English and literature, psychology, and philosophy and religion tend to be relatively low, whereas the averages for engineering, health professions and related sciences, and multi/interdisciplinary studies tend to be relatively high. This pattern generally holds within each Carnegie Classification; for example, engineering has the highest or second highest average expenditure per student credit hour for research universities, doctoral universities, and comprehensive institutions (it was not reported for baccalaureate institutions) (see Figure 3).

- *By institutional type/mission (Carnegie Classification).* Research universities spend more to deliver a student credit hour of instruction—$198 on average—than do doctoral universities and comprehensive institutions, which spend $170 and $129, respectively, on average (see Figure 4). Baccalaureate institutions spend about as much per student credit hour as doctoral universities, $163 on average. This pattern holds true within many disciplines as well; for example, research universities spend the most to deliver a student credit hour of instruction in biological science, followed by baccalaureate institutions, doctoral universities, and finally comprehensive institutions. However, baccalaureate institutions frequently have the highest direct instructional costs per student credit hour, in such disciplines as English

Figure 2: Rank of Direct Instructional Costs per Student Credit Hour (Highest and Lowest) by Discipline and Carnegie Classification

	Research	Doctoral	Comprehensive	Baccalaureate
Highest 1	Engineering	Multi/Interdisciplinary Studies	Engineering	Health Professions
2	Health Professions	Engineering	Health Professions	Visual & Performing Arts
3	Public Administration	Library Science	Engineering-Related Technologies	Physical Sciences
Lowest 1	Protective Services	Protective Services	Protective Services	Business Mangement
2	English Language & Literature	English Language & Literature	Psychology	English Language & Literature
3	Philosophy & Religion	Parks, Recreation, Leisure and Fitness Studies	Philosophy & Religion	Psychology

Source: Delaware Study benchmarks, 1996-97

and literature, philosophy and religion, and computer science.

Middaugh (1999) provides some explanations for these cost patterns. His analysis of individual records indicated that research universities have lower faculty workloads (student credit hours per FTE faculty) than do doctoral universities, which in turn have lower workloads on average than do comprehensive institutions. In addition, faculty at research and doctoral universities are less involved in undergraduate and lower-division instruction than are their counterparts at comprehensive institutions. Finally, Middaugh notes that baccalaureate institutions have fewer student credit hours per FTE faculty than any other Carnegie Classification, possibly because the participating institutions in this category are largely private, selective institutions with missions that embrace small class sizes and few graduate teaching assistants.

Unfortunately, the national benchmarks from the Delaware Study cannot illustrate differences in direct instructional costs by level of instruction. Examining a more specific study of instructional costs by the Arkansas Department of Higher Education can illuminate these differences. For the past three years, the department has collected cost data from all of the public four-year and two-year institutions in the state of Arkansas. Institutions reported expenditures directly attributable to instruction, research, and public service; these expenditures were allocated to courses associated with academic departments primarily on the basis of each course's student credit-hour production relative to total departmental student credit-hour production. In addition, support costs not allocated directly to departments and other indirect costs were distributed among all courses, as well as to research and public service. The Arkansas data therefore represent full costs rather than direct costs. The most recent data available are for 1996-97 (ADHE, 1998).

The Arkansas data also support the expected pattern of differences in instructional costs:

- *By level of instruction (lower division, upper division, and graduate).* Total expenditures per FTE student differed depending on the level of the degree program, with higher degree levels being more expensive than lower degree levels. (See Figure 5.) For example, annual expenditures per FTE student averaged $15,950 for doctorate degrees, $8,837 for bachelor's degrees, and $6,875 for associate's degrees. Average expenditures per FTE doctoral student were more than double the average for associate's degree students.

To supplement these findings, IPEDS expenditure data can be used to reveal differences in costs between public and private institutions. Data for 1994-95 were used by Winston (1997) to calculate average educational spending by control and Carnegie Classification. The data represent full educational costs for almost 3,000 degree-granting institutions.[26]

- *By institutional control (public/private)*: Average educational spending per FTE student is higher for private universities than for public institutions (see Figure 6). While annual educational spending per FTE student was $11,967 for all institutions, it was $9,919 for public institutions and $14,172 for private institutions. At research institutions, the difference was even greater: $13,448 for public institutions, compared to $32,014 for private institutions.

Faculty at research and doctoral universities are less involved in undergraduate and lower-division instruction than are their counterparts at comprehensive institutions.

Figure 3: Rank of Average Direct Instructional Costs per Student Credit Hour by Discipline and Carnegie Classification

On a scale of 0 to 10, with 0 being the most expensive

Classification of Institutional Program (CIP)		Research	Doctoral	Comprehensive	Baccalaureate
Code	Discipline				
14.00	Engineering	0	1	0	—
51.00	Health Professsions & Related Sciences	1	2	1	1
44.00	Public Administration & Services	1	4	3	—
22.00	Law & Legal Services	1	3	2	—
25.00	Library Science	2	1	—	—
40.00	Physical Sciences	2	3	4	2
26.00	Biological Sciences/Life Sciences	2	5	7	4
4.00	Architectural & Related Programs	3	1	—	—
3.00	Conservation & Renewable Natural Resources	3	2	—	—
2.00	Agricultural Sciences	3	8	—	—
1.00	Agricultural Business & Production	4	—	—	—
13.00	Education	4	4	5	4
5.00	Area, Ethnic & Cultural Studies	4	7	—	—
50.00	Visual & Performing Arts	4	4	3	1
11.00	Computer & Information Services	5	6	5	3
30.00	Multi/Interdiciplinary Studies	6	0	2	—
15.00	Engineering-Related Technologies	6	3	1	—
16.00	Foreign Languages & Literature	6	7	6	5
52.00	Business Management & Administrative Serv.	7	5	4	10
9.00	Communications	7	6	5	6
19.00	Home Economics	7	5	6	—
31.00	Parks, Recreation, Leisure & Fitness Studies	8	9	7	—
45.00	Social Sciences & History	8	9	8	7
27.00	Mathematics	8	9	8	7
42.00	Psychology	8	6	10	9
24.00	Liberal Arts & Sciences, General Studies & Humanities	9	8	—	—
38.00	Philosophy & Religion	9	8	9	6
23.00	English Language & Literature/Letters	10	10	8	9
43.00	Protective Services	10	10	10	—

— = not applicable/available

Note: Rankings were divided by number of disciplines reported by each Carnegie Classification in order to convert them all to the same scale. Only major CIP categories are reported.

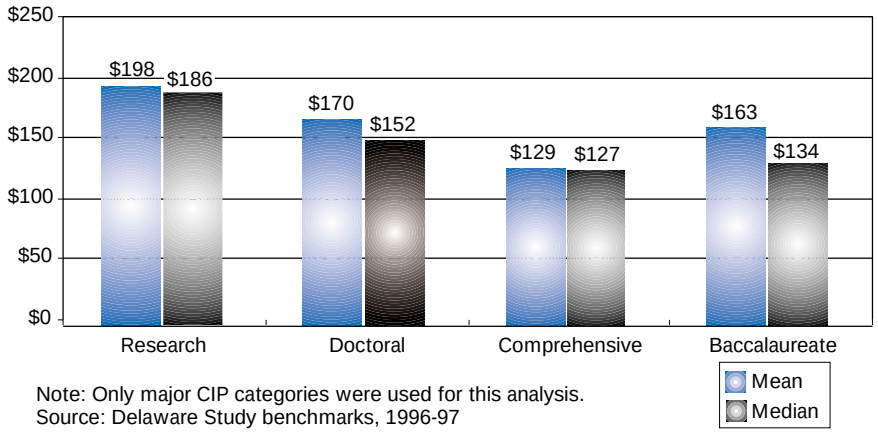
Source: Delaware Study benchmarks, 1996-97

Thus, the available data appear to support the expected differences in average instructional costs. These differences are likely due to a combination of factors that affect individual institutions' production functions, including the quantity and quality of faculty, class size, varying needs for equipment, and different institutional missions.

IPEDS expenditure data can be used to reveal differences in costs between public and private institutions.

Figure 4: Average Expenditures per Student Credit Hour, by Carnegie Classification

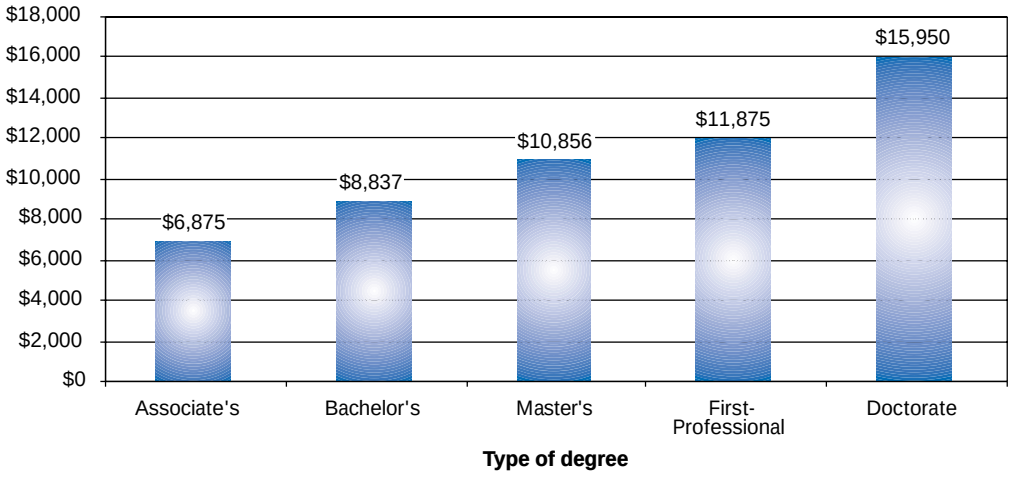
(weighted by number of observation at 153 institutions)



Note: Only major CIP categories were used for this analysis.
Source: Delaware Study benchmarks, 1996-97

Figure 5: Average Expenditures per FTE Student at Arkansas Public Institutions, 1996-97

(32 two-year and four-year institutions)

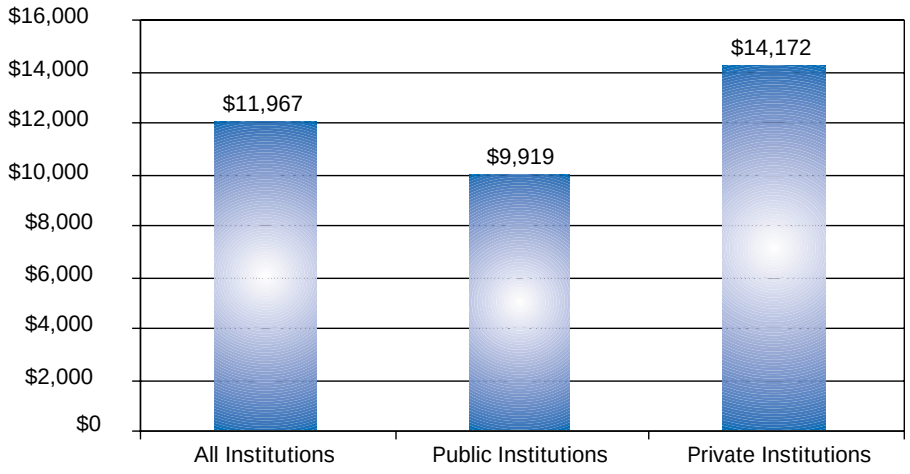


Note: Measures full costs, not just direct costs.
Source: ADHE, 1998

A college or university's income derives from a number of fungible sources, including tuition and fees, endowment earnings, and federal, state, or local appropriations.

Figure 6: Differences in Average Annual Educational Spending per FTE Students, 1996-97

(2,739 degree-granting institutions)



Note: Measures full costs, not just direct costs.
Source: Adapted from Winston, 1997

Alternative Pricing Structures

While many firms in private industry derive their income from a number of sources, each stream of income can be associated with a particular service or product.

A college or university's income also derives from a number of fungible sources, including tuition and fees, endowment earnings, and federal, state, or local appropriations Yet, these different income streams are not necessarily associated with a particular service or product of the institution.

As a result of the non-tuition sources of revenue, the price charged to the consumer (the student) can be lower than the cost of production. The pricing structure—the pattern of tuition and fees charged to any student or set of students—is merely one element of the overall revenue structure of the institution. The actual revenue structure and its pricing component depend on many factors, including the philosophy and mission of the individual institution, the philosophy of the state legislature (in the case of public institutions), the prestige and size of the institution, and the overall makeup of students and faculty.

There are four components of pricing structures:

- *Tuition,* which is charged to all students for instructional services, generally per term, per credit, or per course, and frequently by level of instruction.
- *Mandatory fees,* which are charged to all students or all students in certain groups (for example, fees for health services).

- *Optional or user fees,* which are charged only for use of facilities and therefore often differ by program or discipline (for example, fees for use of laboratories or studios).

- *Tuition discounts,* which reduce the price of tuition for some students and may come in the form of scholarships, fellowships, tuition remissions, or other price-based incentives provided by the institution.

All of these components of pricing may be differentiated, leading institutions to charge disparate prices to various students or groups of students. These are called "price differentials," which refer to the purposeful variation of tuition rates in relation to distinctions in costs, market forces such as demand, or other factors (Yanikoski and Wilson, 1984, p. 737).

Although the concept of pricing structures combines all four elements, available tuition data normally show only the patterns of "sticker prices" (tuition and mandatory fees alone) without taking discounts into account.[27] Net tuition patterns are extremely difficult to demonstrate, despite the growing prevalence of discounts. Institutions may discount their prices for certain categories of students (children of alumni, residents of certain areas, or valedictorians of their high school classes) or they may provide aid on a case-by-case basis. As a result, many colleges and universities charge almost as many distinct net prices as there are students receiving institutional aid (Jenny, 1997). Because the pattern of price discounting is so complex and most data sets do not account for such discounting, it is difficult to know how it affects any analysis of pricing structures and their relationship to costs.[28]

Recognizing the difficulties of gauging net tuition patterns, the evaluation of pricing structures has at least four dimensions:

- The overall level of tuition and fees, especially relative to those of peer institutions or to the constituency being served;

- The extent to which price covers average (unit) costs;

- The manner in which indirect costs for all activities are covered by tuition and fees; and

- The incentives that certain pricing structures have to encourage or discourage attendance by certain categories of students.

Data derived from cost accounting can be quite successful in constructing responses to the first three issues, but are less successful in responding to the fourth.

The Determinants of Price

Multiple philosophies and actors are usually involved in setting tuition levels,[29] especially for public institutions. On the state level, explicit policies may range from keeping tuitions as low as possible to encourage student access, to a "high tuition/high aid" policy in which tuition levels are allowed to rise while taxpayer funds are funneled into grants to needy students. In addition, tuition levels may be indexed to the levels at peer-group institutions or regional averages, or the decisions may be made in accordance with institution-level policies or budgetary needs. The authority to set tuition at public institutions usually involves multiple agencies, such as state legislatures, coordinating boards, governing boards, and/or the institutions themselves. Obviously, private, non-profit institutions have more autonomy in making tuition decisions than do public institutions, but the decisions still involve many participants at the administration and trustee levels.

Many colleges and universities charge almost as many distinct net prices as there are students receiving institutional aid.

A four-year college degree is analogous to an all-day ticket at Disney World: a student pays a price that entitles him or her to partake of the entire academic experience.

Many states and institutions use informal or formal guidelines in their determination of tuition rates. Tuition increases may be linked to external economic variables or internal cost factors, including consumer price indices, state personal income levels, and state higher education appropriation levels. Some linkage to the cost of providing instruction is also common: in 1997, 12 states linked the total cost of education to tuition levels in the four-year sector using a direct or indexed relationship, and 27 states took the cost of education into account more indirectly (Lenth, 1993; Christal, 1997). Average full-time tuition may be set as a specific ratio to average instructional costs, for example, or states and institutions may set tuition rates for certain subgroups of students in relation to instructional costs.

Several questions immediately arise regarding the nature of these decisions. First, there is a basic question of the unit of output for which the price is charged—for example, per credit hour, per credit hour in a particular program of study, per term, per year, or per degree. Proponents of cost accounting in higher education tend to believe that price should be in alignment with the smallest unit cost that is practical—a particular level of study or program of study. The argument could easily be made, however, that a four-year college degree is analogous to the all-day ticket at Disney World: a student pays a price that entitles him or her to partake of the entire academic experience. The rides he or she takes, and the curriculum he or she pursues, are up to the student, but what is being sold is the overall experience.

Second, the multiplicity of revenue resources gives rise to the question of which financial resource is calculated first—tuition and fees, or other sources of revenue—and which is the remainder. Undoubtedly, the actual process is a simultaneous movement of multiple revenue sources to cover total costs. The total costs are, themselves, a variable in the balancing process. But individual state legislatures and institutions may have some inclination—and in some cases a legislative mandate—to alter tuition to cover the costs that are not covered by other financial resources or, alternatively, to alter appropriations to cover a specific proportion of total costs.

Third, there is the question of an institution's willingness to "price discriminate." Pricing strategies in industry usually relate to attempts to segregate the consumer market into distinct segments and then charge different prices to each subgroup in order to maximize profitability. In this process, the subgroup that is least sensitive to price is generally charged the relatively higher price. Examples abound in shopping malls, where clothing manufacturers sell different lines of merchandise. Examples also are found within regulated industry, such as when commercial water rates are less than residential rates or bulk postage is less than regular postage. In higher education, the combination of many objectives, varied philosophies of pricing, and alternative sources of revenue leads to a variety of pricing structures that have little to do with profit maximization, however, and the practice of price discrimination has more to do with the mission of the institution.

Average and Differential Prices

In examining pricing structures, it is important to make a distinction between average prices and marginal prices. Similar to the distinction in cost analyses, average price represents the average amount charged per unit—to all students or to all students in a certain category—whereas marginal price represents the amount that is charged to each additional student. This report focuses on average prices in examining the relationship between pricing and cost patterns. The average price level

determines the total amount of revenue an institution can collect from tuition, given a certain level of enrollment.[30]

[Average Tuition per Student Unit] x [Number of Student Units] = Total Revenue from Tuition

Differential prices can be viewed essentially as charging varying average prices for the same educational product to distinct groups of students, based on specific characteristics—a form of price discrimination (see below). However, many differential price patterns can result in the same average price for students overall. For example, one institution may charge all students $2,000, while another may charge in-state students $1,000 and out-of-state students $3,000; if the second institution has an equal number of in-state and out-of-state students, then both institutions have an average price of $2,000. Therefore, the overall average price does not reflect the different levels of tuition charged to specific subcategories of students within the overall group.

The average tuition payment by a category of students is useful in assessing the extent to which the total costs of a particular program, discipline, or course are offset by tuition revenue—or, from the opposite perspective, what proportion of costs must be covered by revenue from other sources. Average tuition levels are also useful in describing the extent to which price differentials exist between institutions, categories of students, programs, or disciplines.

As previously mentioned, charging different prices for the identical product (which has the same average and marginal cost because it is the identical product) is termed "price discrimination." Because categories of students can be identified and student demand for any particular institution, program, discipline, or course has at least some sensitivity to the price charged, postsecondary institutions regularly practice price discrimination. Price discrimination in higher education leads to various tuition differentials. The most obvious example of price discrimination in higher education occurs in the case of in-state and out-of-state students, but other examples exist. Price discrimination policies are illustrated in Figure 7, where average program costs for two students (or two categories of students) are identical but the level of tuition charged to each differs.

Price Patterns and Institutional Goals

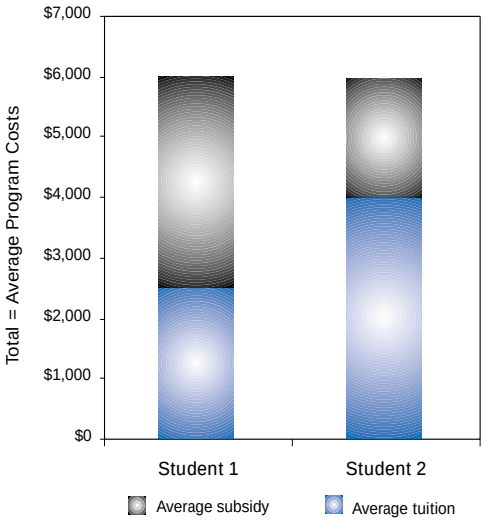
The impact of each component of pricing strategy operates within the context of each potential student's demand for education. Average price data can provide some insight into the effects that differentials will have on student responses, especially when the data are viewed over time. The most that can be said, however, is that—other things being equal—the group of students receiving the lower price is encouraged and the group receiving the higher price is discouraged. For example, a college might find a change in overall student demand when it increases or reduces tuition across the board.[31] A college might also find that students with specific characteristics—residents of the state, graduate students, minority students, students seeking to enroll in specific programs, academically outstanding students, and so on—are drawn to the university when they are charged different average prices. Still other students may be charged a higher price due to their greater "willingness to pay."

Nevertheless, more information is necessary to evaluate student responses fully. In addition, average data cannot predict the probable success in which various categories of institutions employ differential pricing patterns to achieve their objectives. These objectives range from enhancing tuition and fee revenue,

Differential prices can be viewed essentially as charging varying average prices for the same educational product to distinct groups of students, based on specific characteristics—a form of price discrimination.

A college might find that students with specific characteristics are drawn to the university when they are charged different average prices.

Figure 7: Illustration of Differing Tuitions with Identical Program Costs



to attracting more (or fewer) out-of-state students, to maximizing prestige by attracting top students, to achieving diversity goals by enrolling minority students. If there is a conscious policy on the part of an institution to encourage or discourage enrollment of certain categories of students, then evaluation of the effectiveness of the policy would require three additional pieces of information: (1) how much and in what manner each individual in the specified category is charged; (2) what the student's alternative choices are; and (3) how sensitive that potential student is to price differentials. Even though the pricing strategy of any institution may address each element of potential students' subjective demand, in the final analysis the matriculation decision is up to the student.

Data on Pricing Patterns

Tuition and fees play an increasingly important role in the overall revenue structure of most institutions. This relative importance has directed attention toward the way in which pricing strategies actually differ among institutions.

Sources of Revenue

Higher education institutions' sources of revenue include the following:[32]

- ***Tuition and fees***: 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.[33]
- ***Government appropriations (federal/state/local)***: all revenue received through acts of a legislative body that is for meeting current operating expenses, not for specific projects or programs.
- ***Government grants and contracts (federal/state/local)***: all revenue received from government agencies that is for specific research projects or other types of programs.
- ***Private gifts, grants, and contracts***: all revenue 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.[34]
- ***Endowment income***: total income from endowment and similar funds.[35]
- Other sources of revenue, including: ***sales and services of educational activities*** incidental to the conduct of instruction, research, or public service; revenues generated by ***auxiliary enterprises*** such as residence halls and college stores; income received or generated by ***hospitals*** operated by the institution; revenues associated with ***independent operations; and other sources*** of revenue not covered elsewhere. ■

Defining Categories of Revenue and Pricing Structures

Higher education institutions receive revenue from various sources for their current operations, and revenue structures differ considerably among institutions. (See Figure 8.) For example, private, non-profit institutions as a whole received a larger proportion of their total revenue from tuition and fees—41 percent, compared with 18 percent for public institutions. Public institutions, on the other hand, receive a substantial proportion of their total revenue from state appropriations—32 percent, compared with less than one percent for private, non-profit institutions (NCES, 1996).

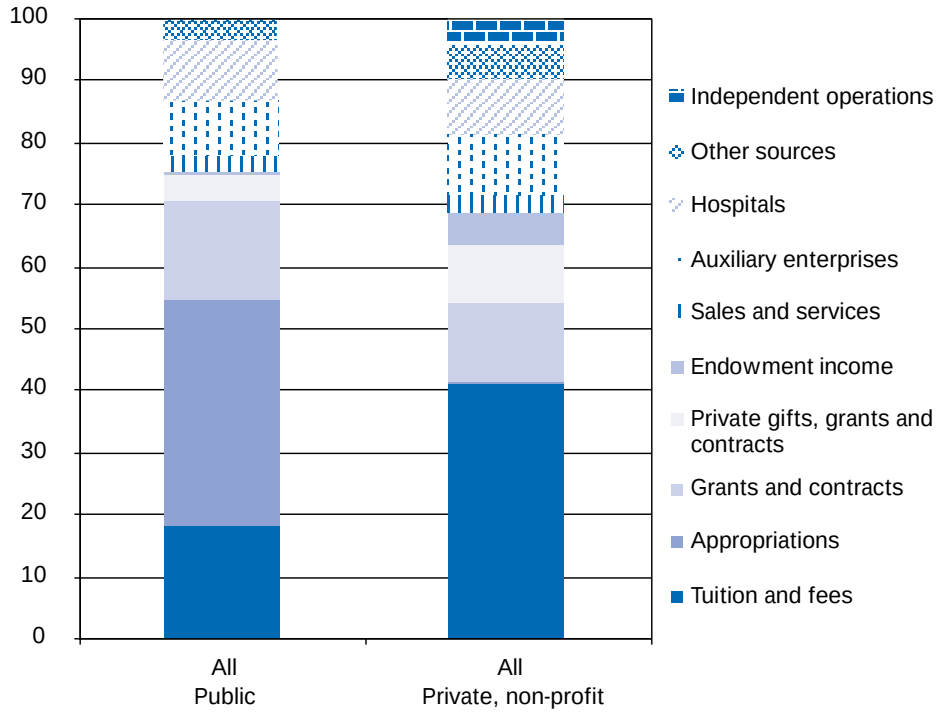
In addition, reliance on certain revenue sources has shifted over time. Both public and private institutions have seen a reduction in the relative importance of public revenue sources and an increase in the importance of tuition revenue. In 1980-81, for example, taxpayer revenue from all sources accounted for 63 percent of total revenue in public institutions, but fell to 51 percent by 1994-95; over the same period, tuition and fee revenue as a share of total revenue rose from 13 percent to 18 percent (The Institute for Higher Education Policy, 1999). This shift has been reflected in the rapid rise in average tuition levels in recent years.

As institutions' reliance on tuition revenue relative to other sources of revenue has increased, the methods and policies used to set tuition levels have received increasing attention. The differences in tuition and fees charged to various groups of students are essential to determining what proportion of instructional costs is being paid by students and their families, as opposed to public support.

Tuition and fees play an increasingly important role in the overall revenue structure of most institutions.

Figure 8: Distribution of Sources of Revenue, by Institutional Control, 1995-96

(3,418 institutions)



Note: Includes only those institutions that responded to every data field. Public and private, non-profit categories include all Carnegie Classifications.

Source: NCES, 1996

Both public and private institutions have seen a reduction in the relative importance of public revenue sources and an increase in the importance of tuition revenue.

Expected Differentials in Tuition and Fee Levels

Pricing structures vary among states and institutions and there are many explicit rationales used to justify differential prices. For example, some argue that a portion of the higher costs of certain programs should be passed on to students. Furthermore, in some fields—such as first-professional programs—future earnings are likely to be high enough to allow students to pay a higher proportion of their costs. Finally, when programs face high enrollment demand, higher tuition rates can signal quality and selectivity (Yanikoski and Wilson, 1984). Some of the possible types of tuition differentials follow:

By residency status. The most common differential, made in virtually all public institutions, is higher tuition levels for students who are not residents of the state. In fact, this differentiation is written into state guidelines in 34 states. Non-resident tuition rates may be two to three times higher than in-state rates. In many cases, non-resident tuition rates are set at a level equivalent to some calculated measure of full costs, or a higher proportion of those costs than is paid by resident students (Lenth, 1993).

By number of credit hours. In some institutions, tuition is charged on a per credit hour basis up to a maximum cutoff of credit hours. Other institutions, on the other hand, may have a flat charge per student regardless of hours enrolled. Tuition structures also could consist of a mixture of these options (Troutt, 1983).

By discipline or field. Some institutions charge higher tuition rates for specialized high-cost programs or programs that are in high demand. However, it appears that the technical complexity involved in setting differentiated tuition levels by discipline may limit the use of this strategy (Lenth, 1993).

By level of instruction (lower division, upper division, and graduate). Many institutions charge higher rates of tuition to postbaccalaureate students, and some charge slightly higher tuitions to upper division undergraduates compared with lower division students. These may be loosely based on the recognition that the costs of educating upper division and graduate students tend to be higher than the costs of educating lower division students; however, because many institutions do not separate out the costs of higher level programs, the tuition differential may just result from applying some incidental fees or an incremental amount to graduate programs. "Only in professional fields...do tuition rates approach the actual per student costs of the program" (Lenth, 1993, p. 19).

By institutional type/mission (Carnegie Classification). Tuition differentials also may exist across types of institutions. The differences may be part of an explicit policy in public systems—tuition levels at research universities are generally set higher than rates at comprehensive institutions, and rates at community colleges tend to be set at considerably lower levels, likely reflecting differences in the public provision of subsidies. However, the differentials also tend to exist across private, non-profit institutions. The reasons for these differences are not clear, but could range from lower costs due to the less expensive equipment and facilities (and, possibly, faculty) that are required at comprehensive or community college institutions, to reaching greater economies of scale or other factors.

By institutional control (public/private). Because most public institutions are heavily subsidized with state taxpayer resources, they generally are able and inclined to offer lower rates of tuition than can private, non-profit institutions. This type of tuition differential is due to differing revenue structures, rather than specific policies implemented by institutions or states.

National Averages on Pricing

Data from IPEDS can illustrate how tuition rates are differentiated on average for all U.S. institutions. The IPEDS Institutional Characteristics survey collects annual information from institutions regarding tuition and required fees for undergraduates, graduate students, and first-professional students (NCES, 1997). Institutions are asked to report average tuition and required fees for full-time students for the full academic year.[36] Tuition and fee levels also must be reported for in-state and out-of-state students at each level of instruction. Using the typical number of credit hours taken by full-time, full-year students by level of instruction, the average tuition and fees per credit hour can be calculated for each level of instruction, for residency status, for institutional control, and for Carnegie Classification.[37]

The tuition and fees per credit hour calculations for 1996-97 reveal tuition differentials, on average, for several different categories:

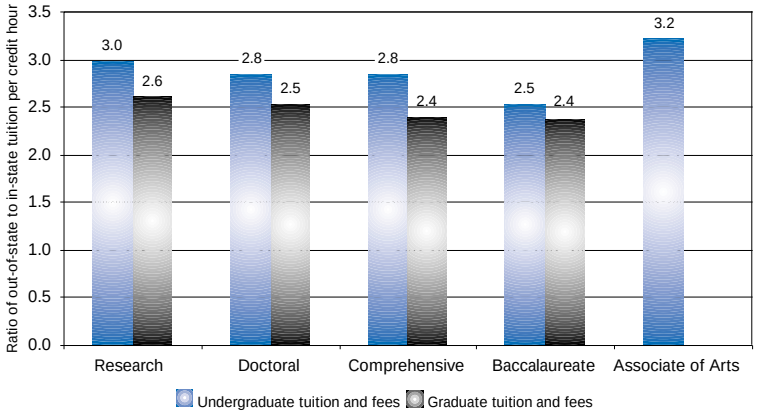
- *By residency status.* For public institutions, out-of-state students paid considerably higher tuitions on average—by two to three times—than did in-state students, at every level of instruction (see Figure 9).

- *By level of instruction (undergraduate and graduate).* For most types of institutions, graduate students paid higher levels of tuition on average than did undergraduates. However, the ratio of graduate to undergraduate tuition varied widely by institutional type and control: it tended to be highest at research universities and lowest at baccalaureate institutions, and higher at public institutions than at private, non-profit institutions (see Figure 10). In fact, at private, non-profit comprehensive and baccalaureate institutions, there was virtually no difference in the average tuition per credit hour paid by undergraduate and graduate students. Although tuition and fee rates vary widely for specific programs, on average first-professional students paid more per credit hour than did both graduate students and undergraduates.[38]

- *By institutional type/mission (Carnegie Classification).* On average, tuition per credit hour tended to be highest for research universities and

Figure 9: Ratio of Out-of-State to In-State Tuition per Credit Hour at Public Institutions, by Carnegie Classification and Level of Instruction, 1996-97

(1,433 institutions)



Note: Each bar represents the ratio of out-of-state to in-state tuition per credit hour by level of instruction at the given institution..
Source: NCES, 1997

Because most public institutions are heavily subsidized with state taxpayer resources, they generally are able and inclined to offer lower rates of tuition than can private, non-profit institutions.

Although tuition and fee rates vary widely for specific programs, on average first-professional students paid more **per credit hour** than did both graduate students and undergraduates.

lowest for associate of arts colleges (see Figure 11). This was true for both public and private, non-profit institutions, undergraduates and graduate students, and in-state and out-of-state students. (Baccalaureate institutions had the highest rate for in-state undergraduates when public and private were combined, largely because there are far more private, non-profits in this category than publics.)

- *By institutional control (public/private).* For most subsets of students, the average tuition per credit hour was higher at private, non-profit institutions than at public institutions (see Figure 12). In fact, tuition rates for students at private, non-profit institutions were up to four times the average rates paid by in-state students at public institutions. However, out-of-state graduate students paid similar levels of tuition on average at the two types of institutions.

Other tuition differentials are not reflected in national data, but may exist at some institutions (see following page).

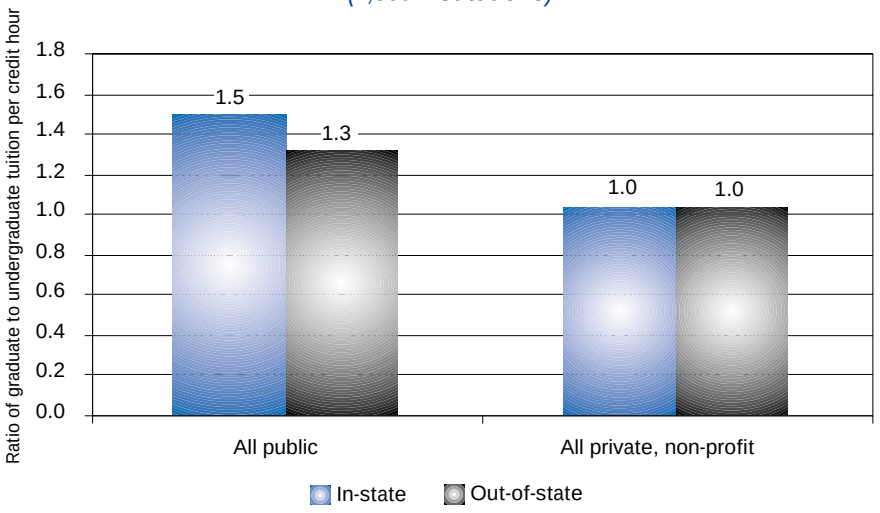
- *By level of instruction (lower division and upper division).* Some institutions charge higher tuition and fees for upper division undergraduates than for lower division students. For example, for the fall 1998 semester Michigan State University charged $144 per credit hour to in-state freshmen and sophomores, but $160 per credit hour to in-state juniors and seniors (MSU, 1999).

- *By number of credit hours.* Some institutions charge higher rates of tuition for students enrolled with more credit hours, or for students enrolled full-time instead of part-time. For example, in 1998-99 DePaul University charged undergraduates in its Liberal Arts and Sciences school $285 per credit hour if they were enrolled for 11 credit hours or less, but $294 per credit hour if they were enrolled with 12 or more credit hours[39] (DePaul University, 1999).

- *By discipline or field.* Some institutions charge different rates of tuition depending on the particular program

Figure 10: Ratio of Graduate to Undergraduate Tuition per Credit Hour, by Residency and Institutional Control, 1996-97

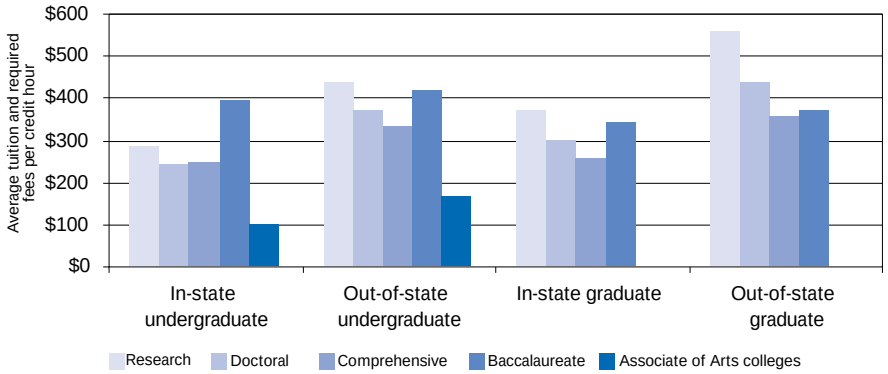
(4,560 institutions)



Note: Public and private, non-profit categories include all Carnegie Classifications. Each bar represents the ratio of graduate to undergraduate tuition per credit hour by residency.
Source: NCES, 1997

Figure 11: Tuition and Fees per Carnegie Classification, 1996-97

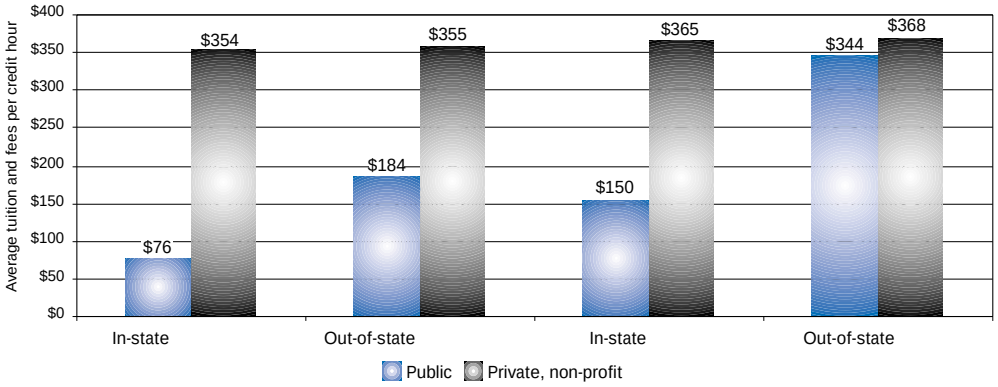
(2,654 institutions)



Note: Baccalaureate and Associate of Arts colleges categories include some private, for-profit institutions.
Source: NCES, 1997

Figure 12: Tuition and Fees by Institutional Control, 1996-97

(4,560 institutions)



Note: Public and private, non-profit categories include all Carnegie Classifications.
Source: NCES, 1997

or school in which the student is enrolled. For example, at the University of Illinois at Chicago, resident undergraduate engineering students were charged $2,379 in tuition and fees for the 1997-98 fall and spring semesters, compared with the $2,179 charged to other resident undergraduates (UIC, 1999).[40]

As the data demonstrate, tuition rates can differ by some of the same characteristics that reflect varying instructional costs. *Within* institutions, price differences by residency status—which are only applicable for public institutions—may be the widest. Although nationally representative data cannot support the assertion, pricing strategies appear to be relatively flat within a certain level of instruction, with little difference by discipline. There are clear differences in average prices *among* institutional types, on the other hand, supporting the assertion that the mission and control of an institution are important determinants of average prices.

Tuition **differentials** vary not only nationally but also by individual institutions.

Even in private enterprise the actual relationship between cost and price is an obscure one.

The Relationship Between Price and Cost

In 1973, the Carnegie Commission on Higher Education recommended a reevaluation of tuition policy to gear it more to the actual costs of education.

Specifically, the Commission favored allowing gross public tuition levels to rise to about one-third of educational costs. The stated reasoning was to bring public tuition more in line with private tuitions; to provide greater equity between students with financial means and those without (with increases in grants and scholarships to low-income students); and to anticipate rising rates of tuition in line with increases in real incomes. Since then, other policymakers on many levels have suggested proportional goals for the relationship between costs and prices.

Even in private enterprise, however, the actual relationship between cost and price is an obscure one. On the one hand, prices always "reflect" costs. Even the most flagrant monopolist charges a price that is cognizant of cost, but that usually exceeds average cost. But, on the other hand, the causal relationship depends upon the nature of the industry in which any particular producer operates and the unique conditions facing that producer. In the case of higher education, tuition is only one element of revenue, and colleges can use non-tuition resources such as endowments to "unlink expenditures and prices in the short run" (McPherson and Winston, 1993, p. 75). The availability of non-tuition revenue suggests there is even less reason to expect a consistent relationship between price and cost across all institutions or groups of institutions—even though any one institution could exhibit a consistent relationship.

The Expected Relationship

The relationship between the price of any product and the costs of producing it is not a simple one.[41] Given certain production functions and demands for a product or service, the producer decides how much to produce, and consumers decide how much they are willing to pay for that level of output. The price may be equal to average cost or some multiple of average cost, depending upon the characteristics of production and demand, the time period over which the examination of costs and revenues is conducted, and the legal environment in which the enterprise exists. In the case of higher education, even these relationships are obscured.

- As already noted, colleges and universities have multiple sources of revenue in addition to tuition and fees. This fact allows costs to exceed the tuition and fee component of revenue, and permits institutions to distribute non-tuition resources in a way that further erodes any relationship between prices and costs. The difference between average tuition and fees and the average educational cost is the "subsidy."[42] Public institutions are subsidized primarily through state taxpayer funds, while subsidies at private institutions are based on voluntary gifts as well as government funding.

- Higher education institutions are not usually seeking a profit, *per se*, but are seeking to optimize some alternative set of goals—for example, reputation,

the quality of the institution, the size of the institution, or political objectives.

These considerations suggest that costs do not impact prices to a predictable extent in cross-sectional data. In other words, the specific characteristics of higher education appear to preclude a cost/price relationship that can be applied to all institutions, or even to all institutions with a certain mission. If one institution sets tuition as a constant proportion of appropriations, and another indexes tuition according to the consumer price index, and still another feels compelled to keep tuitions low by increasing other sources of revenue, it is unlikely that an overall correlation between prices and costs could be found.

Bowen (1980) examined the relationship from the other direction, by observing that the amount of available revenue—and, by extension, prices—may affect costs per student, given a certain level of enrollment:

> Within wide limits, institutions can adjust to whatever amount of money they are able to raise. When resources are increased, they find uses for the new funds, and unit costs go up. When resources are decreased, they express keen regret and they protest, but in the end they accept the inevitable, and unit costs go down. This set of generalizations might be called the revenue theory of cost... (p. 15).

Yet Bowen recognizes this "revenue theory of cost" as a short-run possibility. In the longer run, colleges are forced to raise sufficient funds to meet fixed operating expenses, and are compelled to adjust variable costs so as to compete with other institutions. At the level of an individual institution, the relationship between costs and prices cannot be completely random, even though cross-sectional data may make it appear that way. With enough information about an institution—including the nature of demand, the multiple sources of revenue, the production function, and other factors—one could discover a relatively consistent relationship between costs and prices at that institution. Such a relationship would probably be somewhat fixed over time, barring a sudden shift in legislative policy.[43]

The Institution-Level Identity

With only average cost and price data, a causal relationship between cost and pricing structures across all or part of the higher education sector cannot be described. Nevertheless, a loose association between average costs and average prices can be expressed for an institution or group of institutions, given certain assumptions. Non-tuition sources of revenue are limited, even if different limits apply to different institutions.[44] Thus, the level of non-tuition revenue restricts the extent to which costs can exceed prices; institutions reaching the outer bound may need to raise tuition levels to accommodate increasing costs. At the same time, other objectives cannot be pursued without consciousness of the "bottom line"—even in non-profit organizations.

In other words, if an institution's total current revenues are equal to its total current expenditures[45] and current revenues are derived from both tuition and other sources, then average costs are equal to the sum of average tuition revenue and average non-tuition revenue. The average non-tuition revenue can be thought of as the average subsidy at that institution. This holds for an institution or a group of institutions in total, but not for one component of an institution, such as an undergraduate program alone.

The specific characteristics of higher education appear to preclude a cost/price relationship that can be applied to all institutions, or even to all institutions with a certain mission.

Effective analysis of financial data should reveal the amount of revenue needed to supplement tuition and fees at any one institution or type of institution.

Average Costs per Student Unit = [Average Tuition Revenue per Student Unit] + [Average Non-Tuition Revenue per Student Unit]

Examining average cost and tuition data can address an important question: What is the amount of revenue needed to supplement tuition and fees at any one institution or type of institution? In addition, the analysis can be taken further to look at the pattern of intra-institutional subsidization given a specific level of non-tuition revenue.

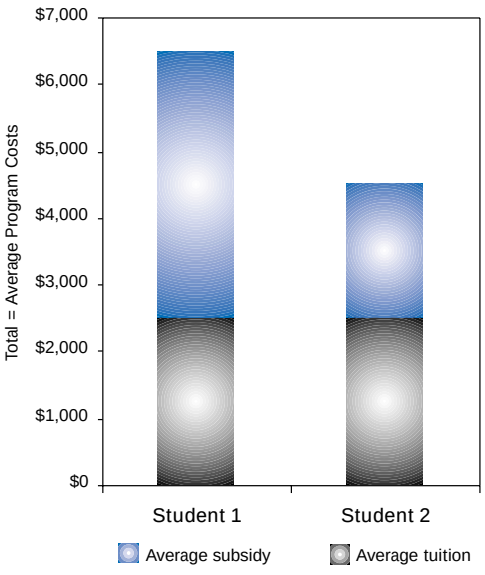
Non-Tuition Income and Intra-Institutional Subsidization

Within each program, course, or discipline, total costs do not necessarily equal total revenues, due to transfers of revenue within institutions. These transfers lead to "intra-institutional" subsidies that vary among programs, disciplines, and courses; such subsidies can be thought of as the amount of non-tuition revenue that has been allocated to a particular program, discipline, or course. From this perspective, the amount of subsidy per student is determined by the average cost per student of that program, discipline, or course compared with the average amount of tuition and mandatory fees paid per student.[46] In other words, if the average total cost of an undergraduate program is $5,000 and the average price paid by undergraduates is $2,000, then the subsidy for that program is $3,000. By definition, therefore, an intra-institutional subsidy is covered by some amount of non-tuition revenue.

If one student's total cost (for a program, discipline, or course) is matched by more non-tuition revenue than some other student's total cost, then the first student has been subsidized to a greater extent than has the other student. One instance of this pattern is illustrated in Figure 13, where average tuition is identical for two students (or two categories of students) but average program costs—and therefore average subsidies—differ.

Such a pattern is often referred to as a "cross-subsidy," although the term is generally inappropriate in the case of higher education. "Cross-subsidy" implies that the price charged to an identifiable subset of the student body exceeds the average costs of providing education to that subset, and that the "excess" revenue is used to pay a portion of the average costs of educating some other identifiable subset of students. At most postsecondary institutions, however, prices do not exceed average costs for *any* subset of students—*all* students are subsidized to some degree. Only in situations in which average tuition and fees make up a very high proportion of average total revenue is true "cross-subsidy" possible. Otherwise, patterns such as the one described are probably cases of differential "intra-institutional" subsidization, where a greater subsidy goes to one subset of students than to another.

Figure 13: Illustration of Program Costs with Identical Tuition Levels



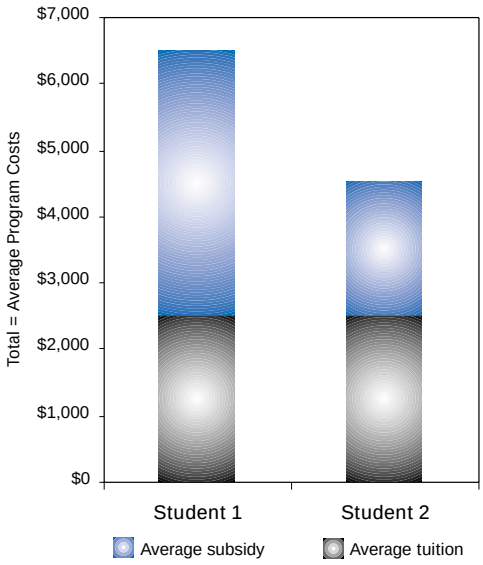
Average data (average cost of a program, discipline, or course compared with average tuition paid for a program, discipline, or course) can be used to examine the size of intra-institutional subsidies. Differential patterns between types of institutions can be examined—with caution—as well.

Comparisons between Price and Cost

Descriptive analyses of average price and cost data generally include the presentation of price-to-cost ratios, which reframe both types of subsidies in terms of the proportion of the costs of education that is met by tuition, on average, for various subgroups of students. For example, one might compare the proportion of educational costs paid by in-state students to the proportion paid by out-of-state students—especially if it is a policy goal for the latter group to pay a higher proportion of costs than the former group.

In fact, comparisons between average costs and prices for groups of institutions remain both common and relevant, largely because linkages between the two are made at the public policy level. As discussed above, many colleges and state legislatures have instituted policies that either directly or indirectly link price and cost (Lenth, 1993).[47] Average tuition overall may be mandated as a specific proportion of average costs,[48] or tuition rates for certain subgroups of students may be set in relation to instructional costs. This can mean that tuition differentials are based on specific percentages of average costs, or that differentials are loosely scaled according to cost differences. In this case, decisions are made as to which groups of students should pay higher proportions of the cost of educating them, and which groups should pay relatively lower proportions. From the opposite perspective, some students will receive relatively higher subsidies because they are paying a lower proportion of their costs.

Figure 14: Illustration of Differing Program Costs and Differing Tuition Levels



Price-to-cost ratios can be examined in at least three ways: as benchmark data (categorized by institutional characteristics, such as Carnegie Classification); as intra-institutional comparisons (within an institution, such as between programs or disciplines); and as inter-institutional comparisons (between institutions). The chosen method depends on the purpose for which the comparison is being made. However, price-to-cost ratios are limited in the extent of the story they tell. The same price-to-cost ratios may mask different absolute levels of prices, costs, and subsidies, which also have implications for policy. For example, in Figure 14, average tuition amounts for student 1 and student 2 make up the same proportion of respective average costs, yet total tuition, total cost, and total subsidy are vastly different. Price-to-cost ratios, therefore, tell only a portion of the total story.

Relating the Data on Average Costs and Prices

It is clear that establishing a relationship between cost and price across institutions, or finding a link between pricing struc-

Comparisons between average costs and prices for groups of institutions remain both common and relevant, largely because linkages between the two are made at the public policy level.

Average data are sufficient to calculate the **average subsidy provided each type of student,** differences in average subsidy between types of institutions, and changes in subsidy over time.

tures and institutional objectives, requires information beyond average data. Yet average prices and costs tend to vary in somewhat predictable ways. In addition, average costs and prices for each category of students can be compared in terms of price-to-cost ratios, toward evaluating their apparent agreement with certain policy goals. Finally, average data are sufficient to calculate the average subsidy provided each type of student, differences in average subsidy between types of institutions, and changes in subsidy over time.

Cost and Price Patterns

The U.S. General Accounting Office (GAO) (1998) attempted to answer the question of whether there was a relationship between cost and tuition by examining IPEDS data via regression analysis—including the rate of increase in tuition and required fees for full-time, full-year undergraduates over a five-year period (1989-90 to 1994-95), with 15 different factors that might account for the changes.[49] Results included the following:

- In the case of public four-year institutions, the change in government appropriations and the change in instructional expenditures were the two most important factors in explaining the variation in tuition increases.
- In the case of private four-year institutions, the most important factor in explaining the variation in tuition increases was the change in revenue from grants, contracts and other sources.

Thus, changes in other sources of revenue appear to be correlated with tuition increases in addition to changes in costs. As the study concludes: "Costs may be only one of several factors considered when tuition-setting decisions are made" (GAO, 1998, p. 3). This finding supports the assertion that the cost/price relationship in higher education is complicated. At the same time, however, the GAO's analysis focused primarily on overall tuition averages, which do not reflect the differential prices charged to groups or levels of students within certain types of institutions, and the study's cost data did not reflect differences in instructional costs by discipline or by level of instruction.

The data presented in this report reveal that price and cost patterns vary in somewhat predictable ways. For example, data from the Delaware Study and the Arkansas Department of Higher Education suggest specific differences in average costs:

- *By level of instruction (lower division, upper division, and graduate)*, with each level having successively higher costs;
- *By discipline or field*, with such disciplines as engineering, health professions, and multi/interdisciplinary studies having relatively higher costs and English and literature, psychology, and protective services having relatively lower costs; and
- *By institutional type and control*, with research universities having relatively higher costs and comprehensive universities having lower costs, and private institutions having relatively higher costs than public institutions.

At the same time, national aggregate data (primarily from IPEDS) indicate trends in average price differentials:

- *By residency status*, with out-of-state students generally paying higher rates of tuition at public institutions;
- *By level of instruction*, with graduate and first-professional students paying

slightly higher tuition per credit hour than undergraduates; and

- *By institutional type and control*, with private, non-profit institutions charging higher prices than public institutions, and research universities charging higher prices than community colleges.

Nevertheless, these price differentials do not appear to reflect cost differences exactly, even in the cases in which costs and prices vary in the same direction. Holding all else equal, in some cases, pricing patterns appear to differ in the same direction as instructional cost patterns—first-professional student costs and prices are higher than those of undergraduates, and costs and prices both tend to be higher at research universities than at comprehensive institutions. However, the differences often do not appear to be significant to the same extent. At the same time, differences do not appear to be in the same direction in other cases. For example, where public tuition rates seem to differ considerably—that is, by residency status—they are not necessarily reflecting cost differences, but rather the decisions of states to make non-residents bear a larger share of the costs of educating them. Furthermore, although instructional costs differ widely by discipline, it appears that most institutions have not chosen to differentiate their tuition by discipline, preferring instead to allow students to buy into a broader education "package."

Meanwhile, the aforementioned forms of differential pricing may be superimposed by a pattern of net prices—through scholarships and grants for particularly meritorious or minority scholars—that is frequently decided on a case-by-case basis. Because the pattern of price discounting is so complex, it is difficult to know how it affects any analysis of price patterns and their relationship to costs.

Price-to-Cost Ratios

As theory predicts, it appears that to some extent the decision to differentiate tuition rates rests on conscious choices by states and institutions regarding which groups of students should pay more (and would be willing to pay more) of their educational costs, rather than reflecting differences in instructional costs. Because tuition levels do not vary exactly with instructional costs, different students pay different proportions of those costs. The important question here is who is bearing what share of educational costs. In other words, what proportion of the costs of education is met by tuition, on average, for various subgroups of students?

Although the Delaware Study represents a group of specific institutions and therefore is not generally applicable, instructional cost data for these institutions can be matched with tuition data from IPEDS to show average tuition rates as a proportion of average instructional costs for specific subsets of students.[50] In doing so, certain characteristics are examined holding all the others constant; one "slice" of the data is considered without taking into account the manner in which other "slices" cut across it. For example, average price-to-cost ratios by residency status can be compared by assuming that instructional costs are the same for both in-state and out-of-state students. In reality, those costs may differ between the two groups of students if in-state students are more likely to attend a certain type of institution or take courses in specific disciplines. Keeping in mind this complexity, price-to-cost ratios can nevertheless point to broad trends.[51]

Briefly, tuition-to-cost ratios for the Delaware Study group of institutions reveal the following, on average:

- Students at research universities tend to pay a lower proportion of their instructional costs than do their

Although instructional costs differ widely by discipline, it appears that most institutions have not chosen to differentiate their tuition by discipline, preferring instead to allow students to buy into a broader education "package."

What proportion of the costs of education is met by tuition, on average, for various subgroups of students?

counterparts at other types of institutions. Students at baccalaureate institutions appear to pay the highest proportion; however, this may be related to the fact that the institutions in this group are mostly private, nonprofits, whereas the other groups are comprised mainly of public institutions (see Figure 15).

- At public institutions, out-of-state students appear to pay a higher proportion of their instructional costs than in-state students, at both the

Figure 15: Comparisons of Price to Cost, 1996-97 Examples from the Delaware Study Group of 153 Institutions

Holding all else equal:

Subset	Average instructional cost per credit hour	Average tuition per credit hour	Price-to-Cost Ratio
By Carnegie Classification (public and private institutions): See Note 1			
Research universities	$198	$338	171%
Doctoral universities	$170	$349	205%
Comprehensive institutions	$129	$308	239%
Baccalaureate institutions	$163	$608	373%
By residency status (public institutions only): See Note 2			
Undergraduate tuition, in-state	$198	$103	52%
Undergraduate tuition, out-of-state	$198	$299	151%
Graduate tuition, in-state	$198	$159	80%
Graduate tuition, out-of-state	$198	$403	204%
By level of instruction (public and private institutions): See Note 3			
Undergraduate tuition, in-state	$198	$170	86%
Undergraduate tuition, out-of-state	$198	$237	171%
Graduate tuition, in-state	$198	$338	120%
Graduate tuition, out-of-state	$198	$449	227%
By discipline (public and private institutions): See Note 4			
English and literature	$104	$220	212%
Computer science	$153	$220	144%
Engineering	$317	$220	69%
By discipline within Carnegie Classification (public and private institutions): See Note 5			
Research universities, English and literature	$110	$170	155%
Research universities, computer science	$173	$170	98%
Research universities, engineering	$333	$170	51%

1) Using out-of-state undergraduate tuition for all categories, to eliminate the effects of discounts for state residents and lessen the differences by institutional control.
2) Using average costs for research universities, which cannot be disaggregated by level of instruction or by control (although 85 percent of research universities in this group are public). Assumes costs do not differ by residency status. Using tuition for public research institutions only.
3) Using average costs for research universities, which cannot be disaggregated by level of instruction, and using tuition for all research institutions. Assumes costs do not differ by residency status.
4) Using average costs by discipline for all institutions, and using undergraduate in-state tuition for all institutions. Assumes tuition does not differ by discipline.
5) Using average costs by discipline for research universities alone, and using undergraduate in-state tuition for all research universities. Assumes tuition does not differ by discipline.

Note: Many of these examples are for research universities, but the trends also hold for other Carnegie Classifications in almost all cases.
Source: Delaware Study benchmarks, 1996-97 (for instructional costs); NCES, 1997 (for tuition and fees)

undergraduate and graduate level (assuming instructional costs do not differ between the two groups of students).

- When instructional costs are assumed to be the same for the two groups, graduate students appear to pay a slightly higher proportion of their instructional costs than do undergraduate students. However, other evidence has indicated that instructional costs do differ by level of instruction. As the Delaware Study benchmarks cannot be disaggregated by student level, it is impossible to more accurately compare the proportions paid by graduate students versus undergraduates using these data.

- When tuition is the same, students in low-cost disciplines pay a higher proportion of their instructional costs than students in higher-cost disciplines.

In addition, Winston (1997) used IPEDS data from 1994-95 to calculate average cost and price data by control and Carnegie Classification.[52] These data can be used to determine average price-to-cost ratios by type of institution, recognizing that they do not take into account price and cost differentials within each institutional type. The following tendencies can be drawn from these data:

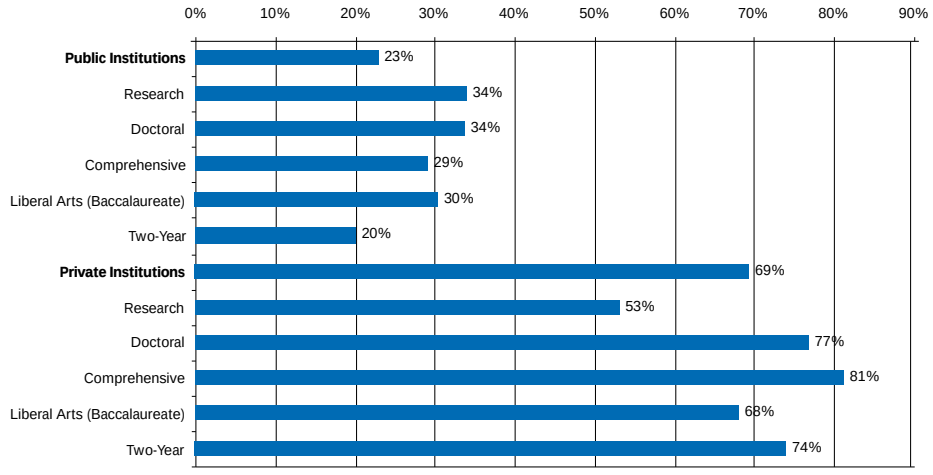
- Students at private institutions tend to pay a higher proportion of their educational costs than do students at public institutions. Average tuition and fees covered 69 percent of average costs at private institutions, but only 23 percent at public institutions (see Figure 16).

- At most public institutions, students at schools with different missions tend to pay similar proportions of their educational costs, ranging from 29 to 34 percent. An exception is students at community colleges, who pay a lower proportion of their costs—20 percent on average—than do students at public universities and other four-

Students at **baccalaureate institutions** appear to pay the highest proportion of their instructional costs.

Figure 16: Sticker Price as Percent of Educational Spending per FTE Student, 1994-95

(2,739 degree-granting institutions)



Note: Measures full costs, not just direct costs.
Source: Adapted from Winston, 1997

Students at community colleges pay a **lower proportion** of their costs—20 percent on average—than do students at public universities and other four-year colleges.

year colleges. At private institutions, the proportions vary more widely, with tuition and fees covering 53 percent of costs on average at research universities but 81 percent at comprehensive institutions.

In general, these trends hold for net price-to-cost ratios as well. However, average net prices are particularly difficult to draw conclusions from regarding the effects on categories of students, because students within a particular subgroup do not pay "average" net prices (Jenny, 1997).

Average Subsidies

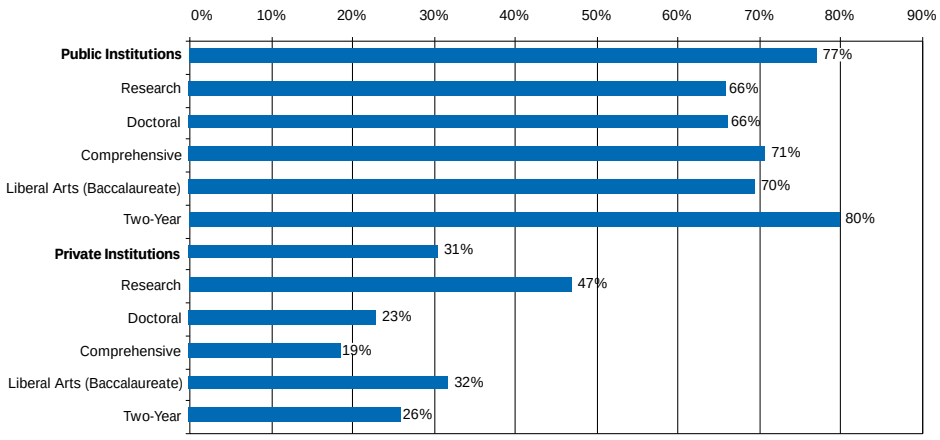
The flip side of price-to-cost ratios is that the proportion of costs paid by non-tuition revenue—including taxpayer money—also differs among groups of students. Average subsidies cannot be calculated for the Delaware Study group, due to the need to use distinct data sets for cost and price data and the lack of data on indirect costs. Thus, it is difficult to get a sense of how average subsidy differs by level of instruction or by discipline (in other words, intra-institutional subsidies) without more detailed analysis. However, Winston (1997) used the IPEDS data on average costs and prices to calculate average subsidy by control and Carnegie Classification. Although the data cannot provide insight into differential pricing strategies, they do reveal the importance of subsidy at every type of institution. The results support the expectations mentioned in the previous sections. Holding other factors constant:

- Subsidy makes up a higher proportion of educational spending for students at public institutions—77 percent, on average—than at private institutions, 31 percent. This is not surprising, given the fact that private institutions tend to rely more on tuition and fee revenue, and less on non-tuition revenue such as government appropriations, than do public institutions (see Figure 17).

- Similarly, subsidy differs by institutional mission. In particular, private research universities appear to have a larger subsidy as a proportion of

Figure 17: General Subsidy as Percent of Educational Spending per FTE Student, 1994-95

(2,739 degree-granting institutions)



Note: Measures full costs, not just direct costs.
Source: Adapted from Winston, 1997

educational costs—47 percent—than other private institutions, such as comprehensive colleges, 19 percent. Subsidy proportions at public institutions are relatively greater, regardless of mission; students at community colleges have the greatest subsidies as a proportion of educational costs (despite comparatively lower subsidies in absolute terms).

As expected, calculation of full subsidy—using net prices rather than sticker prices—reveals similar trends, with the average full subsidy being higher across the board. Again, calculations involving average net price cannot say much about which students actually receive the higher subsidy.

Implications

This report provides a comprehensive description of the cost and pricing structures associated with higher education.

It explains the various factors that determine costs and prices, the differences in costs and prices within and across institutions, and the potential for interaction between cost and price averages. Much can be gained through an understanding of these aspects of higher education finance, for both internal institutional evaluation and broader public policy purposes, especially in an era of increasing pressure for financial accountability.

Broadly, several observations about cost and price structures can be made:

- Alternative sources of revenue subsidize virtually all students to some extent.
- Because institutions have enormous flexibility in selecting their production inputs, each institution has a unique set of costs and highly differentiated outputs.
- Differences in program costs within any single institution imply that some students are subsidized more than others.
- Despite differences in missions and resources across institutions, categories of institutions exhibit somewhat consistent pricing and cost patterns.
- Measurement of costs and related pricing data can be adapted by an institution and used to compare itself with other institutions in order to provide insight into performance and cost effectiveness, while simultaneously recognizing differences in missions, resources, and other conditions.
- Within individual institutions, differential tuitions among different types of students can be used to alter the composition of the student body.

In drawing these observations, the authors of this report highlight the vital role of institutional and state missions and goals in the differentiation of costs and prices. An institution's mission influences the mixture of products (instruction, research, and public service) it strives to produce, while the production process it employs determines its ability to fulfill its mission. Meanwhile, differing patterns of prices impact the characteristics of stu-

Future financial constraints will demand a deepening understanding of the various facts that determine costs and prices in higher education.

Rather than differentiating prices, an institution might decide to shut down certain programs if unit costs are excessive and student demand is low.

dents who attend the institution and the amount of non-tuition revenue that is required to support a range of course offerings, thereby affecting an institution's ability to conform to its mission and objectives. Patterns of differential pricing also may reflect the decisions of state policymakers about spending priorities, at least at public institutions.

Given the essential role of institutional and state objectives, the observations regarding cost and price structures raise some fundamental questions:

- For an institution or group of institutions, are the mission and goals that are incorporated into cost structures the same as those incorporated into pricing patterns, or are they, in fact, operating at cross purposes?
- Is the relationship between costs and prices in alignment with institutional or state goals?
- Is that relationship reflected in price-to-cost ratios and subsidy patterns that are also consistent with an institution's mission or a state's spending priorities?
- Is the *inequality* of prices and costs among different groups of students *inequitable* in any sense?

The answers to such questions have implications for the evaluation of cost efficiency, institutional decisions on pricing, and public policy.

Internal Cost Evaluation

Fundamentally, an understanding of the relationship among costs, revenues, and prices allows administrators to follow the flow of funds within the institution, evaluate the cost efficiency of academic programs, and measure the institution's performance against historical benchmarks or peer institutions. Such self-evaluations continue to influence the future operations of individual institutions, especially those that must choose between raising prices, cutting costs, or a combination of both. Cost accounting techniques may be difficult and complicated to adopt, but many institutions clearly feel it is worthwhile to learn from the effort involved.

The cost evaluation process differs for each institution. For example, many institutions have decided it is important to maintain non-differential prices by discipline or program—in other words, to maintain the situation in which a student pays a certain price regardless of the courses chosen. In this case, knowledge of the courses and programs actually chosen by various students and the costs attached to those courses is highly relevant for future curriculum planning, budgeting, and, if necessary, cost-cutting initiatives. Rather than differentiating prices, an institution might decide to shut down certain programs if unit costs are excessive and student demand is low. Regardless of the decisions an individual institution may make as a result of its evaluation, however, access to these kinds of data is essential in a period of increasing financial pressures.

Pricing Policy

With an understanding of the relationship among costs, revenues, and prices and sufficient information to construct price-to-cost ratios, individual institutions also can evaluate the alignment of subsidy patterns with their missions and goals. If they find a lack of alignment, they may decide to adjust the levels and patterns of tuition to conform with their missions and goals. In addition, institutions may use price-to-cost ratios in combination with demand information to maximize tuition income or to alter the composition of their student bodies through the differentiation of prices.

Although the individual steps will vary considerably for each institution, some examples can demonstrate this process:

- A baccalaureate institution might have the primary mission of providing undergraduate education. At this institution, undergraduate students may pay a lower proportion of their costs—and therefore receiving a proportionally larger subsidy—than graduate students. If cost and price data revealed the opposite, institutional leaders might decide to differentiate tuition so that undergraduate students pay less and graduate students pay more, while still receiving the same amount of total revenue from tuition.

- An institution might have the primary mission of providing access for disadvantaged populations, and disadvantaged students may be paying a lower proportion of their costs than other students. If they are not, the institution's net tuition structure might be altered to reflect this focus by using institutional aid to reduce the net tuition paid by disadvantaged students.

- An institution might have the goal of enhancing tuition revenue. To accomplish this goal, students who are relatively less price-sensitive may need to pay a higher proportion of their costs than students who are more price-sensitive. Thus, institutional leaders might decide to segment the tuition structure to charge higher tuition and fees to individuals who are less sensitive to price.

Institutions also may analyze their pricing strategies within the context of student demand. Students whose tuition covers a relative lower proportion of their educational costs than other students may perceive they are getting a better "value" for their money, and vice versa. Such perceptions may impact the patterns of enrollment across (competing) institutions.[53] If institutions have enough information on potential enrollment shifts, they may try to counter them by targeting a specific ratio between costs and prices or by choosing a pricing strategy that minimizes negative demand effects.

To succeed in the process of evaluating cost, price, and subsidy patterns, the mission of each institution or group of institutions needs to be defined clearly.[54] For one thing, a lack of clarity in mission makes it difficult to evaluate the conformity of subsidy patterns with that mission. This is especially true in a case of "mission creep." For example, when institutions spend greater amounts of money on research, graduate study, and other prestige-oriented activities in order to "expand" their missions, they must be aware of the accompanying shifts in cost and subsidy patterns. Clearly defined institutional missions also are important because decisions about whether to manage tuition income or the composition of student bodies through the use of differential pricing strategies depend upon the mission and goals of the individual institution.

State Policy

State policymakers have an interest not only in decisions made at the institutional level, but also in trends in costs, revenues, and prices over entire public higher education systems. Students at public institutions tend to pay relatively lower proportions of their costs than students at private, non-profit institutions, as a result of states' direct appropriations to public institutions. In 1995-96, state governments accounted for 36 percent of the $124 billion of the current revenue of public institutions.[55] Along with this

When institutions spend greater amounts of money on research, graduate study, and other prestige-oriented activities in order to "expand" their missions, they must be aware of the accompanying shifts in cost and subsidy patterns.

Some states, however, have allowed forms of "tuition engineering," or the individual manipulation of cost/price relationships, at public institutions.

public investment, however, comes a need for accountability. State legislators, governing boards, coordinating boards, and other policymakers must ensure that state funds are being spent in alignment with public priorities. Like institutional pricing strategies, the objectives of state funding may differ—for example, public subsidies may be targeted on undergraduate students, on in-state residents, on students attending community colleges, on students enrolled in a particular curriculum, or on some combination of these factors.

One method of accountability involves the way in which public tuition levels and subsidies are set. As this report describes, many states have mandated fixed relationships of some sort between costs and prices. In doing so, policymakers have attempted to ensure that subsidy patterns conform to their objectives. Other states, however, have allowed forms of "tuition engineering," or the individual manipulation of cost/price relationships, at public institutions.[56] Most state policymakers likely choose some combination of these and other techniques.

Regardless of the process used to set prices and subsidies, state policymakers can examine the resulting price-to-cost ratios for various groups of students attending public institutions in order to evaluate whether the distribution of subsidies actually reflects their states' funding goals. Using this type of analysis, policymakers may decide to change the patterns of the subsidy they provide, by lowering tuition levels for students at institutions with specific institutional missions or with other characteristics, and raising tuition levels for other groups of students. Alternatively, policymakers could alter the relative levels of funding provided to different types of public institutions.

Future Concerns

To construct price-to-cost ratios and evaluate the alignment of cost, price, and subsidy patterns with goals and missions, institutional and other leaders must have complete, meaningful data that reflect pricing and cost differences across and within academic institutions. However, the collection and use of such data face a number of challenges that make higher education different and more idiosyncratic than private sector cost accounting systems.[57]

In addition to methodological and technical problems, cultural resistance to cost accounting and other data collection mechanisms continues to exist at the institutional level. Concern is expressed that a comparison of ratios among institutions or even among departments will miss important aspects of higher education that are uniquely captured by that institution or department. Many activities that are not necessarily valued by specific consumers—for example, unfunded research—are essential parts of the higher education enterprise. As a result, many fear the consequences of revealing these patterns without an accompanying understanding of the higher education "package." These concerns should *inform* the need for greater financial transparence, but do not *preclude* such accountability.

It also is important to re-emphasize the complicating factor of net prices. From the perspective of the institution, patterns of institutional aid affect the distribution of full subsidies within and among institutions. In addition, from the perspective of the student, student aid from state, federal, and other sources has an impact on the price they actually pay. Knowing how student aid patterns compare with stated cost and pricing structures ultimately is essential to the formulation of public policy on many levels. The availability of net price data would allow policymakers to address several issues:

- In theory, student aid programs are intended to "equalize" the burdens faced by students. In practice, however, it currently is almost impossible to determine whether disadvantaged students pay a greater or lesser proportion of their educational costs than other students. This issue is complicated by the concentration of disadvantaged students in certain types of institutions and programs.

- The combination of greater institutional reliance on tuition revenue and greater student reliance on federal loans impacts the differentiation of subsidies in various ways. It might be argued that grants reduce the proportion of educational costs paid by students, while loans do not. Increasing the amount of federal grants, therefore, would substitute public debt burden (through taxes) for student debt burden.

- Patterns of net tuition may have grown so complex as to affect the quality of higher education. From an institutional budget point of view, expenditures may be being reallocated away from instructional programs and toward institutional aid. Without knowing the interaction between shifts in instructional costs and patterns of institutional aid, it is difficult to anticipate the potential effects on academic quality.

Despite these considerations, it is clear that there is much to be gained by institutions themselves, the higher education community as a whole, public policymakers, and students by collecting cost and price data. An improved understanding of cost and price structures is only the starting point. Ultimately, the higher education community should use this knowledge to assess the distribution of subsidies among various groups of students and help ensure that the actual workings of institutional financing structures contribute toward its stated missions and goals. ■

An improved understanding of cost and price structures is only the starting point.

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Appendices

The University of Delaware National Study of Instructional Costs and Productivity

The University of Delaware National Study of Instructional Costs and Productivity is a data-sharing consortium that was established in 1992. The study is intended to be longitudinal, and currently is in its sixth national data collection cycle.[58] Almost 300 colleges and universities have participated in the study, and are aggregated into research universities (Research I and II), doctoral universities (Doctoral I and II), comprehensive institutions (Master's/Comprehensive I and II), and baccalaureate institutions (Baccalaureate/Liberal Arts I and II). In the 1996-97 cycle, 153 institutions participated, including 48 research universities, 35 doctoral universities, 57 comprehensive institutions, and 13 baccalaureate institutions. The participating institutions are primarily public colleges and universities, except in the classification of baccalaureate institutions, which are mostly private liberal arts colleges. (See Figure 18.) Therefore, the Delaware Study group of institutions is not necessarily representative of the national universe of postsecondary institutions, or even of all four-year institutions.

Participants volunteer cost data at the level of academic discipline; in the 1996-97 cycle, 29 academic disciplines were examined for research universities, with slightly fewer disciplines from the other Carnegie Classifications. The study focuses on direct instructional costs (personnel compensation, supplies and services, and departmental research and service that are not separately budgeted), collected on the basis of student credit hours and disaggregated into salaries, benefits, and non-personnel costs. Due to the difficulty in determining their correct allocation, indirect costs are excluded from the Delaware Study. In addition, the study does not capture non-instructional faculty activity that is funded through departmental instructional funds, such as academic advising and supervision of student

Figure 18: Comparison of Institutional Universes

		Number of cases		Percentage of the total		Percentage of each Carnegie Classification	
Control	Carnegie Classifications	Delaware Study benchmarks	IPEDS national data on four-year institutions	Delaware Study benchmarks	IPEDS national data on four-year institutions	Delaware Study benchmarks	IPEDS national data on four-year institutions
Public	Research	41	85	27%	6%	85%	68%
Private, non-profit	Research	7	40	5%	3%	15%	32%
All	Research	48	125	31%	9%	100%	100%
Public	Doctoral	27	64	18%	5%	77%	59%
Private, non-profit	Doctoral	8	44	5%	3%	23%	41%
All	Doctoral	35	108	23%	8%	100%	100%
Public	Comprehensive	41	275	27%	20%	72%	53%
Private, non-profit	Comprehensive	16	245	10%	18%	28%	47%
All	Comprehensive	57	520	37%	38%	100%	100%
Public	Baccalaureate	2	86	1%	6%	15%	14%
Private, non-profit	Baccalaureate	11	535	7%	39%	85%	85%
All	Baccalaureate	13	628	8%	45%	100%	100%
Public	All	111	510	73%	37%	73%	37%
Private, non-profit	All	42	864	27%	63%	27%	63%
All	All	153	1381	100%	100%	100%	100%

Note: For the purposes of this comparison, the IPEDS national data includes only institutions in the research, doctoral, comprehensive, and baccalaureate classifications. In addition, institutions that charge tuition by program—primarily private, for-profit institutions—are excluded.
Source: Delaware Study benchmarks, 1996-97; NCES, 1997

research. The study separately collects direct expenditure data on research and public service. For further definitions and methodology, see University of Delaware (1999) and Middaugh (1999).

National benchmarks for 1996-97, organized by academic discipline and by Carnegie Classification within each discipline, were developed by the University of Delaware and were used in this report. In particular, this report uses the national benchmarks on direct instructional expense per student credit hour taught. The benchmarks are actually "refined means," in which statistical outliers (data more than two standard deviations above or below the mean) have been excluded. In addition, one should note that the benchmarks do not differentiate between public and private institutions, even though instructional costs are likely to differ somewhat by control. This report's analysis of direct instructional costs is derived from the benchmarks rather than individual institutional records—in other words, the reported means are usually averages of averages, weighted by the number of observations. Thus, the means cited in this report may differ slightly from the ones reported in Middaugh, 1999, and elsewhere.

The Integrated Postsecondary Education Data System (IPEDS)

The U.S. Department of Education's National Center for Education Statistics (NCES) uses the Integrated Postsecondary Education Data System (IPEDS) to collect annually information from approximately 10,000 postsecondary institutions in the United States. IPEDS surveys gather data in various areas, including revenues and expenditures, fall enrollment, degree completions, faculty and staff, and other issues of interest. Although IPEDS is the most comprehensive data set on institutional financing available, it is important to keep in mind its various limitations, including the following: institutions may differ in how they report certain activities; the cost reporting structure is not very detailed, and distinctions between certain types of costs (for example, sponsored research versus "departmental" research) may be somewhat vague; and tuition and credit hour data are reported for the "typical" student, masking the significant differences that likely exist.

The Finance survey data provide each institution's current fund revenues by source, and current fund expenditures by function, assets and indebtedness, and endowment investments. Data from the Finance survey for Fiscal Year 1996 are the most recent data available as a final release. Preliminary data are available for more recent years, but cannot be used to generate nationally representative figures. For this report, the 1995-96 data were derived only from those institutions that had filled out all fields in the revenue and expenditure categories (slightly more than 4,000 institutions overall, 3,400 of which were public or private, non-profit institutions). Data also were broken down by institutional control and by Carnegie Classification.

Beginning in the Fiscal Year 1997 collection, the Finance survey for private institutions was changed to reflect new Financial Accounting Standards Board (FASB) guidelines; for example, expenses will be measured according to accrual rather than cost accounting methods (specific changes are noted throughout the text). For public institutions, the Governmental Accounting Standards Board (GASB) recently issued a new accounting rule that will be phased in during the fiscal years beginning after June 15, 2001. Although it is currently unclear how the new standard will affect the IPEDS Finance survey for public institutions, changes similar to those for private institutions are expected in the future.

In addition to other broad institutional information, the Institutional Characteristics survey collects annual data from institutions regarding their tuition and required fees for undergraduates, graduate students, and first-professional students. According to the IPEDS survey instructions and glossary, required fees are the "fixed sum charged to students for items not covered by tuition and required of such a large proportion of all students that the student who does NOT pay is an exception." This implies that only mandatory fees are included, not optional or user fees. Institutions are asked upon what basis they charge tuition. Institutions that charge by program are asked to report tuition and fees for the six programs with the largest enrollments. These institutions were excluded from the analysis in this report, as most institutions charging by program are private, for-profit institutions. Thus, the tuition data provided in this report include only institutions that reported charging tuition by term, by year, or by credit hour (almost 6,400 institutions in total, of which about 4,600 were public or private, non-profit institutions). The report also focuses primarily on research, doctoral, comprehensive, baccalaureate, and associate of arts institutions.

Institutions that charge tuition by credit hour, by term, or by year were asked to report tuition and required fees for full-time students for the full academic year. Tuition and fee levels also must be reported for in-state and out-of-state students at each level of instruction. It should be noted that the tuition charges reflect the typical amount charged to various categories of students, and are averages of the various prices charged by institutions in a certain category. Differential prices charged to particular students in certain targeted categories are lost by averaging.

At the same time, institutions were asked to report the typical number of credit hours taken by full-time, full-year students, by level of instruction (undergraduate, graduate, and first-professional). From these data, we calculated the average tuition and fees per credit hour for each level of instruction, for residency status, for institutional control, and for Carnegie Classification. (Institutions that did not report the typical number of credit hours taken by full-time, full-year students were excluded from the analysis.) In reality, of course, the number of credit hours taken could vary widely among students. For a summary table of the IPEDS national data on tuition per credit hour for 1996-97, see Figure 19 on page 53.

Comparing Costs and Prices

Although the Delaware Study data were provided in the form of benchmarks rather than individual institutional records, the participating colleges and universities were known. Thus, it was possible to use this selected group of institutions for the purposes of comparison with IPEDS data on tuition and fees for the same year. In deriving tuition data for the Delaware Study group, two assumptions were utilized:

- If a secondary campus for a public system was not specified in the list of participating institutions, data were drawn only for the main campus of the system.

- In the few cases in which reported Carnegie Classification codes differed between the Delaware Study and the IPEDS data, the code was changed to remain consistent with the Delaware Study cost data.

For a summary table of tuition and fees per credit hour for the selected group of institutions, see Figure 20 on page 54. Any analysis of this data should keep in mind the fact that the selected institutions are not necessarily representative of the full universe of four-year institutions.

Winston (1997) used a broader universe of institutions in his comparison of costs and prices. Data from the 1994-95 IPEDS Finance survey were used for the colleges and universities in the 50 states that reported positive expenditures, FTE enrollments of more than 100 students, of who 20 percent or more were undergraduates. These requirements led to a group of 2,739 degree-granting institutions. A summary table adapted from his results is shown in Figure 21 on page 55. According to Winston's definitions, the "general subsidy" is equal to educational spending less the stated price of tuition (sticker price), whereas the full "subsidy" is educational spending less the net price (sticker price reduced by institutional financial aid). Thus, the full subsidy includes both the general subsidy to all students and an individual subsidy in the form of student aid.

Additional Data Needs

For state policymakers, price-to-cost ratios and subsidy patterns that hold other factors constant for groups of institutions, such as the ratios revealed in this report, can give some sense of broad trends in the cost/price relationship. For decision-making at the institutional level, a more complex analysis that takes into account lower levels of analysis, cross-cutting categories of students, and demand factors should be accomplished. In the latter case, the theory of the cost/price relationship currently exceeds the ability of the data to support it. Nevertheless, the advantages to be gained by institutions, students, and the public in general make additional data collection efforts worthwhile.

The analysis presented in this report has revealed some of the problems in measuring cost data in particular. Clearly, modified cost accounting techniques are needed in higher education, in order to encourage the collection and dissemination of more detailed cost data. Thus, cost accounting techniques must be applied with reference to the varying missions of postsecondary institutions, the multiple sources of revenue used by most institutions, and the range of units of measurement that exist. Meaningful comparisons and benchmarks require: consistent cost and revenue data; similar data between public and private institutions; and further breakdowns of data by discipline and program. Although the IPEDS data, the Delaware Study cost data, and other datasets each meet some of these objectives, none satisfies all of the needs. At the same time, existing data do not generally make it possible to distinguish between the sticker price and the net price for categories of students. In a period in which universities are expanding their use of differential pricing to attract students of merit, minority students, and so forth, this difference is becoming increasingly important.

As mentioned, changes are currently being made in the IPEDS Finance survey that may address some of these concerns. For example, tuition and fee revenue for private institutions is now reported (as of FY1997) net of price discounts, with an offsetting adjustment to the expense side. Similar—but not identical—changes are expected for public institutions in the next few years. However, revenue and expenditure information will still not be available at a more disaggregated level, and as a result of these changes researchers will have more difficulty in comparing public and private institutions.

Consistent measurement of costs and prices is also essential. Currently, the data are not only kept inconsistently across institutions, but also are difficult to interpret across institutions even when they are compatible. The terms used in higher education finance require precision if comparisons are to be made between institutions, between years, or, for that

matter, between research efforts. Any examination of cost/price data as it applies to institutions, and programs or disciplines within institutions, involves choices that must be explained: (1) how to group differences in costs per program, discipline, or course; (2) how to spread indirect costs among programs, disciplines, or courses within an institution; and (3) how to measure units (per student, credit hour, total enrollment, or other unit). In addition, careful delineation of terms such as "subsidy" (particularly "cross subsidy") or "total cost" can avoid misunderstandings. However, even similar ratios or other cost statistics must be evaluated in light of the unique mission and structure of each institution.

Ultimately, it is important to carefully collect and use cost and price data to respond to the questions that are asked. For example:

- Time series and longitudinal data must be collected using a consistent methodology and must be utilized to respond to questions that refer to changes over time.

- Average data can be used to respond to questions dealing with totals—total costs, tuition revenues, or subsidy, for instance—or totals within specific categories. It is important to remember that summary data, such as averages or ratios, run the risk of masking important details. The same average costs do not directly correspond to identical production functions; one university may use greater faculty input and less technology, while another may use greater technology and less faculty.

- Along similar lines, benchmarks and ratios can be used in selective and appropriate circumstances, especially when they do not mask vastly different underlying totals.

- Marginal data, such as the cost of educating an additional student or the price charged to an additional student, must be used to answer questions regarding the relative incentives of specific pricing policies to targeted categories of students. The relationship between price and cost is only complete if demand characteristics are known for any institution—that is, the extent to which various types of students are sensitive to the prices being charged.

Of course, the technical aspects of cost measurement and data collection comprise only one of the obstacles to greater use of cost accounting in higher education. Ultimately, the cost accounting movement will need to address the cultural resistance to change as well. The clear interest of various state legislatures and competing universities to have information regarding cost/price relationships, and the danger of using that information in a way that reduces student options and choices, could be resolved by publicly providing only averages for groups of institutions rather than individual institution data. Meanwhile, institutions should collect more detailed data for their own internal analyses. ■

Figure 19: National Average Data on Tuition and Fees per Credit Hour, by Level of Institution, Residency Status, and Carnegie Classification, 1996-97

(Includes only those institutions that charge tuition by credit, by term, or by year)

			Undergraduate tuition and required fees per credit hour:			Graduate tuition and required fees per credit hour:			Graduate/undergraduate tuition differential, per credit hour:		First-professional tuition and fees per credit hour: ***		
Control	Carnegie Classification	Number of institutions	In-state	Out-of-state	Ratio, out-of-state to in-state	In-state	Out-of-state	Ratio, out-of-state to in-state	Ratio, graduate to undergraduate, in-state	Ratio, graduate to undergraduate, out-of-state	Average, in-state	Average, out-of-state	Ratio, out-of-state to in-state
Public	Research	85	$115	$325	3.0	$178	$436	2.6	1.6	1.4	$221	$509	2.5
	Doctoral	64	$113	$310	2.8	$152	$374	2.5	1.5	1.3	$201	$426	2.2
	Comprehensive	275	$95	$252	2.8	$148	$330	2.4	1.5	1.3	$222	$565	2.6
	Baccalaureate	86	$96	$237	2.5	$127	$291	2.4	1.3	1.2			
	Associate of Arts	923	$63	$146	3.2								
Private, non-profit	Research	40	$720	$722	1.0	$900	$900	1.0	1.2	1.2	$892	$892	1.0
	Doctoral	44	$470	$470	1.0	$524	$524	1.0	1.1	1.1	$598	$610	1.0
	Comprehensive	245	$421	$421	1.0	$379	$379	1.0	1.0	1.0	$527	$527	1.0
	Baccalaureate	535	$450	$450	1.0	$386	$386	1.0	1.0	1.0	$344	$344	1.0
	Associate of Arts	148	$250	$253	1.0								
All	Research	125	$283	$435	2.4	$368	$558	2.2	1.5	1.4	$361	$589	2.2
	Doctoral	108	$241	$367	2.2	$298	$433	1.9	1.3	1.3	$437	$535	1.5
	Comprehensive	520	$245	$330	2.0	$256	$353	1.7	1.3	1.2	$458	$536	1.4
	Baccalaureate *	628	$394	$415	1.2	$339	$368	1.2	1.0	1.0	$344	$344	1.0
	Associate of Arts *	1273	$101	$163	2.6								
Public **	**All**	**2004**	**$76**	**$184**	**2.9**	**$150**	**$344**	**2.4**	**1.5**	**1.3**	**$216**	**$491**	**2.4**
Private, non-profit **	**All**	**2556**	**$354**	**$355**	**1.0**	**$365**	**$368**	**1.0**	**1.0**	**1.0**	**$364**	**$369**	**1.0**

* The Baccalaureate and Associate of Arts Carnegie Classifications include some private, for-profit institutions.

** The "all public" and "all private, non-profit" categories include some Carnegie Classifications that are not shown.

*** Averages for first-professional tuitions are for only those programs offered by specific Carnegie Classifications, and are averages of averages.

Note: Some schools did not report the typical number of credit hours taken by their students. These institutions were excluded, as tuition per credit hour figures could not be calculated.

Source: NCES, 1997

Figure 20: Tuition and Fees per Credit Hour, by Level of Institution, Residency Status, and Carnegie Classification for the Delaware Study Group of Institutions, 1996-97

			Undergraduate tuition and required fees per credit hour:			Graduate tuition and required fees per credit hour:			Graduate/undergraduate tuition differential, per credit hour:		First-professional tuition and fees per credit hour: *		
Control	Carnegie Classification	Number of institutions	In-state	Out-of-state	Ratio, out-of-state to in-state	In-state	Out-of-state	Ratio, out-of-state to in-state	Ratio, graduate to undergraduate, in-state	Ratio, graduate to undergraduate, out-of-state	Average, in-state	Average, out-of-state	Ratio, out-of-state to in-state
Public	Research	41	$103	$299	3.1	$159	$403	2.7	1.5	1.4	$186	$439	2.6
	Doctoral	27	$109	$310	2.9	$153	$383	2.5	1.5	1.4	$208	$435	2.2
	Comprehensive	41	$104	$254	2.6	$164	$342	2.2	1.5	1.3	$274	$564	2.0
	Baccalaureate	2	$77	$265	3.7	$130	$374	3.4	1.6	1.4			
Private, non-profit	Research	7	$561	$568	1.1	$756	$756	1.0	1.0	1.0	$1,332	$1,332	1.0
	Doctoral	8	$471	$471	1.0	$501	$501	1.0	1.1	1.1	$678	$678	1.0
	Comprehensive	16	$451	$451	1.0	$421	$421	1.0	0.9	0.9	$385	$385	1.0
	Baccalaureate	11	$676	$677	1.0	$491	$491	1.0	1.1	1.1			
All	Research	48	$170	$338	2.8	$237	$449	2.5	1.5	1.3	$300	$528	2.4
	Doctoral	35	$197	$349	2.4	$235	$410	2.2	1.4	1.3	$469	$570	1.5
	Comprehensive	57	$199	$308	2.2	$232	$363	1.9	1.4	1.2	$341	$457	1.4
	Baccalaureate	13	$576	$608	1.5	$388	$458	1.7	1.3	1.2			
Public	**All**	**111**	**$104**	**$285**	**2.9**	**$159**	**$376**	**2.5**	**1.5**	**1.4**	**$194**	**$446**	**2.5**
Private, non-profit	**All**	**42**	**$532**	**$534**	**1.0**	**$515**	**$515**	**1.0**	**1.0**	**1.0**	**$776**	**$776**	**1.0**
All	**All**	**153**	**$220**	**$352**	**2.4**	**$243**	**$409**	**2.1**	**1.4**	**1.3**	**$339**	**$529**	**2.1**

* Averages for first-professional tuitions are for only those programs offered by specific Carnegie Classifications.
Note: Some schools did not report the typical number of credit hours taken by their students. These institutions were excluded, as tuition per credit hour figures could not be calculated.
Source: NCES, 1997

Figure 21: Subsidies, Costs, Prices and Aid by Control and Carnegie Classification, 1994-95

(in dollars per FTE student)

	Number of Institutions	Average Educational Spending	Average Sticker Price	Sticker Price as Percent of Educational Spending	Average General Subsidy	General Subsidy as Percent of Educational Spending	Average Net Price	Net Price as Percent of Educational Spending	Average Full Subsidy	Full Subsidy as Percent of Educational Spending
All Institutions	**2,739**	**$11,967**	**$5,919**	**49%**	**$6,048**	**51%**	**$3,770**	**32%**	**$8,197**	**68%**
Public Institutions	**1,420**	**$9,919**	**$2,272**	**23%**	**$7,647**	**77%**	**$1,233**	**12%**	**$8,686**	**88%**
Research	83	$13,448	$4,571	34%	$8,877	66%	$3,150	23%	$10,298	77%
Doctoral	63	$11,155	$3,776	34%	$7,379	66%	$2,656	24%	$8,499	76%
Comprehensive	271	$9,933	$2,907	29%	$7,026	71%	$1,816	18%	$8,117	82%
Liberal Arts (Baccalaureate)	80	$9,389	$2,857	30%	$6,532	70%	$1,580	17%	$7,809	83%
Two-Year	874	$8,022	$1,623	20%	$6,399	80%	$714	9%	$7,308	91%
Private Institutions	**1,319**	**$14,172**	**$9,846**	**69%**	**$4,326**	**31%**	**$6,502**	**46%**	**$7,670**	**54%**
Research	39	$32,014	$16,975	53%	$15,039	47%	$11,646	36%	$20,368	64%
Doctoral	43	$18,736	$14,417	77%	$4,319	23%	$11,016	59%	$7,720	41%
Comprehensive	245	$12,903	$10,484	81%	$2,419	19%	$7,399	57%	$5,504	43%
Liberal Arts (Baccalaureate)	526	$15,425	$10,505	68%	$4,920	32%	$6,361	41%	$9,064	59%
Two-Year	243	$10,227	$7,565	74%	$2,662	26%	$5,063	50%	$5,164	50%

General Subsidy = Educational Spending Less Sticker Price
Full Subsidy = Educational Spending Less Net Price
Source: Adapted from Winston, 1997.

Endnotes

1. For discussion of the impact of prices and costs on "quality," see McPherson and Winston, 1993.

2. "Pricing" in this report refers to the amounts charged to external consumers—primarily students—rather than "internal" pricing strategies involving various academic departments. Cost accounting would allow, indeed would require, that an institution trace and impute internal costs, as well.

3. This section discusses costs to institutions, not costs to students, which would consist of both price and foregone income.

4. In other words, an input is any resource the institution uses in its production process.

5. For further discussion of the special characteristics of higher education, see various papers produced under the Williams Project on the Economics of Higher Education, Williams College, MA (www.williams.edu/Mellon); Bowen, 1980; and Allen and Brinkman, 1983.

6. With multiple revenue sources: (1) relatively high subsidy attracts high quality students; (2) high quality students perform well in school and beyond; (3) persons who perform well beyond school earn higher incomes, add significantly to the institution's prestige (and ability to attract gifts, grants and donations), and give larger donations; (4) larger gifts, grants, and donations provide larger subsidies, and so on.

7. Studies of the production functions of various commodities generally attempt to answer one or more of the following questions in a predictive manner: 1) If all inputs are doubled, tripled, or multiplied by some amount, will the output be increased by more or less than that multiple? In other words, are there "economies of scale" in production? 2) Can the proportions of the inputs be altered and still produce the same output? Or, conversely, is output for the given set of inputs being maximized? 3) Subsequently, how do the costs of the inputs alter the proportions of inputs used?

8. Various papers have described and estimated production functions for higher education (for example, see Allen and Brinkman, 1983; Hopkins, 1990; Schapiro, 1993; Dundar and Lewis, 1995) and K-12 education (Walberg, 1982; Hanushek, 1986; Monk, 1990 and 1992). Debate over the usefulness of the approach has centered on the ability of the functions to capture all aspects of achievement (for example, see Fortune, 1993; and Hodas, 1993).

9. The appropriate breakdown depends upon the question that is being asked of the accounting data.

10. Though somewhat ad hoc, student units also may be weighted per level of student to reflect increasing costs in upper-level courses (Bowen, 1980).

11. It should be noted that just because a measure correlates strongly with an output variable, this does not imply that the measure is an input variable or a proxy for an input variable, and certainly not that the relationship constitutes a production function. It is a correlation. For example, the discussion regarding whether expenditure impacts student outcomes at levels K-12 is a question of correlation, not the K-12 production function, as is often suggested. For example, see the discussion in Picus, 1995.

12. Whether it is tuition or non-tuition revenue that is actually treated as the residual by policymakers is a question that cannot be answered here.

13. Various authors have suggested constructing marginal data by looking at cost accounting data over time, which could reveal costs at differing levels of matriculation or instruction; for example, see Allen and Brinkman, 1983.

14. For a discussion of the problems of accounting for capital costs, see McPherson and Winston, 1993. In addition, some studies of the "cost burden" on students argue that other types of costs, such as the costs of student subsistence (room and board) and foregone student earnings, should be included in a broader assessment of the costs of higher education (see Kramer, 1993).

15. Methods for IPEDS Finance data collection are changing. For private institutions, survey forms have been changed to reflect new Financial Accounting Standards Board (FASB) standards (116, 117, and 124). Under the new forms, which became effective in FY1997, expenses will be measured according to accrual rather than cost accounting methods. Similar changes are expected for public institutions in the future, as the Governmental Accounting Standards Board (GASB) recently issued a new government accounting rule.

16. Under the new IPEDS form for private institutions, functions are called "expenses" rather than current expenditures, and there is no E&G expenditures category.

17. The balance of E&G expenditures also includes mandatory and non-mandatory transfers of funds out of the institution's current funds account—for example, for the amortization of debt.

18. In the new IPEDS form for private institutions, this category includes only student aid that is recognized as an expense in the institution's financial statements; tuition remissions are reported as a net reduction of revenue.

19. Some cost studies (for example, Winston, 1998; McPherson and Schapiro, 1998) suggest subtracting all scholarships and fellowships from total educational costs because they represent a reduction in the price faced by students (and therefore in the net tuition receipts of the institution) rather than a cost. However, this approach cannot be applied at lower levels of analysis (for example, by level of instruction). At the same time, some institutional aid may legitimately represent a cost rather than simply a discount in price—for example, improved quality of students (inputs) at selective institutions—and it is difficult to separate out the two types of uses (Winston, 1998). As a result, price discounts may be treated as expenditures in cost studies (a "generally accepted accounting practice" in private industry) rather than as reductions in tuition revenue, and in fact are treated as expenditures in data collected for IPEDS (for private institutions, before the FASB changes). Because of the nature of the federal data, scholarships and fellowships are effectively described as a cost in this report, although they are excluded from instructional costs.

20. As mentioned in the previous note, some cost studies suggest treating scholarships and fellowships as a reduction in the price faced by students. Others disagree (see Bowen, 1980, 1981). In this report, scholarships and fellowships are effectively described as an indirect cost, but they are excluded from the discussion of instructional costs.

21. In addition, cost studies have various ways of dealing with capital costs and other issues.

22. In this report, this category is referred to simply as comprehensive institutions.

23. In fact, Brinkman (1993, p. 4) has called this use of upper-division students to teach lower-division students an example of "cross-subsidization," although the term does not conform to the definition of cross-subsidy discussed below.

24. See appendices for more detailed explanation and description of how this group of institutions differs from the national distribution.

25. For example, means calculated by Carnegie Classification and reported here differ from the ones reported in Middaugh (1999), which are presumably calculated from the individual records. The rank order is the same, however, with the exception of baccalaureate colleges.

26. See appendices for details.

27. Optional fees also may be excluded because they are charged upon use.

28. Some examinations of higher education finance (for example, McPherson and Schapiro, 1998) subtract institutional aid—a subcategory of the scholarships and fellowships category—from total tuition revenue in order to arrive at net tuition revenue. However, this approach cannot be applied at lower levels of analysis. In other words, we could achieve an average net tuition figure, but not figures representing the net prices faced by various categories of students. In addition, many price discounts are based on the total price of

attendance, including room and board, rather than on tuition and fees alone (Jenny, 1997). Given these considerations, the tuition data presented in this report generally do not take into account institutional aid.

29. Note that "tuition" as used in this report means tuition and fees, and is not net of financial aid unless stated otherwise.

30. Ideally, this calculation would be net of tuition discounts and other forms of institutional aid. If so, the equation would be: [Average Net Tuition per Student Unit] x [Number of Student Units] = Total Net Revenue from Tuition.

31. Muskingum College president Samuel Speck has claimed that after annual tuition was slashed by $4,000 (about one-third), the institution's gross revenues increased by 6 percent, the freshmen class climbed by 35 percent, and the number of transfer students grew by 50 percent without sacrificing the quality of education; see Fischer, 1996, p. 24.

32. Under the new IPEDS form for private institutions, all revenue includes both current and non-current revenue; the previous form included only current revenue.

33. Under the new IPEDS form for private institutions, tuition and fees are to be reported net of student aid that was applied to tuition and fees. One should also keep in mind that some forms of government-provided student aid—such as student loans—and some private scholarships that are awarded directly to students may show up as tuition revenue. Other forms of student aid show up in other revenue categories; for example, Pell Grants are reflected in the federal grants and contracts category.

34. The new IPEDS form for private institutions includes a new category: contributions from affiliated entities. Such as fund-raising foundations and booster clubs.

35. Under the new IPEDS form for private institutions, this category is called "investment return" and differs slightly in its definition.

36. The data that follow include only institutions that reported charging tuition by term, by year, or by credit hour. See appendices for more details.

37. Note that tuition charges reflect the amount charged to various categories of students, and tuition per credit hour is calculated using the *typical* number of credit hours taken by all full-time, full-year students. See appendices for more details.

38. For a summary table of national price averages that shows these trends, see Figure 19 in the appendices.

39. The latter category was directed only toward students who had been enrolled prior to summer 1996; full-time students who enrolled since that time paid a package rate of $14,070 for 12-18 credit hours.

40. These rates are for students registered for 12 or more semester hours.

41. In a private market with highly differentiated producers, economic theory suggests only the following: 1) the average revenue must equal or exceed the average costs if the enterprise is to stay in business—a business can't operate at a net loss; 2) if the cost of producing each additional unit increases as production increases, then the producer's profitability is maximized when the cost for the additional unit equals the revenue generated by the additional unit—in other words, when the marginal cost equals the marginal revenue (in private industry, profitability must be the prime consideration); and 3) the price that can be charged does not depend directly upon costs, but rather depends upon the price that consumers are willing to pay for the level of production that the producer has decided is the optimal level to produce.

42. Winston (1997) and the National Commission on the Cost of Higher Education (1998) call this the "general subsidy." The other part of subsidy is institutional scholarships and other price discounts; thus, the full student subsidy would be measured as average educational cost less average *net* price. However, since the currently available data measure stated tuition and fees rather than net tuition, "general subsidy" rather than "full subsidy" is used primarily in this report.

43. Information derived through cost accounting for an individual institution could provide a considerable portion of the data required to describe the cost/price relationship for that institution. Over time, cost accounting data could even outline the demand characteristics associated with the institution.

44. In fact, "...any given level of subsidy resources can support an infinite variety of cost and price strategies so long as the difference between costs and price matches those non-tuition resources" (McPherson, Schapiro, and Winston, 1996, p. 8).

45. This statement also assumes that auxiliary enterprises and other independent operations break even, and does not take into account capital expenditures. Furthermore, it assumes that the institution is not "saving" revenue.

46. Again, this description of subsidy does not take into account financial aid and other price discounts. In addition, costs here refer to total educational costs, not total E&G and other expenditures.

47. In these instances, a college takes on many of the price/cost characteristics of a regulated utility, where prices are restricted to average cost by regulation—not by market force. Generally, the relationship in regulated utilities relates price not to average cost but to some rate of return on invested capital that the regulators find acceptable. In the case of higher education, the rate may be indexed, established as a constant proportion of cost, or set as a fixed percentage of appropriated amounts.

48. Overall average tuition ignores the varying tuition rates charged to non-residents, graduate students, and other groups, and does not incorporate any estimate of tuition net of discounts or student aid.

49. Tuition and all financial variables were adjusted for inflation. The 15 possible explanatory variables included the change in: government appropriations; revenue from grants, contracts and other sources; instruction expenditures, student services expenditures; institutional scholarships, fellowships and grants; other student-related expenditures; research expenditures; other non-student related expenditures; the ratio of in-state undergraduate tuition to average tuition received per FTE student; the amount of tuition used for non-current fund purposes; the market value of the endowment fund; the amount by which revenues exceeded expenditures; and the surplus or deficit from independent operations, auxiliary enterprises, and hospitals. The absolute ratios of in-state undergraduate tuition to average tuition received per FTE student and the level of in-state undergraduate tuition in 1989-90 also were used as explanatory variables.

50. See appendices for more detailed methodology.

51. Because prices are being compared to direct instructional costs rather than to full costs, the price-to-cost ratios frequently are greater than 100 percent.

52. See appendices for more details.

53. The concept of a better value for the money has been raised by McPherson and Winston (1993) and by Winston, Carbone, and Lewis (1998), who also suggested that enrollment in the public sector may have been shifting to community colleges because of the relatively low increase in the prices students pay for a dollar's worth of education. It also appears that consumers are paying higher proportions of their educational costs now than they did in the past. Although it is beyond the scope of this report, it is possible to construct trends in price-to-cost ratios and in average subsidies over time using IPEDS Finance data, at least by institutional type. Lewis and Winston (1997), Winston, Carbone and Lewis (1998), and others have attempted to do this, with the resulting conclusions that students are paying more for the education they get.

54. As Robert Zemsky (1999) suggests, especially in public systems, the goals of each type of institution should be more distinct from each other.

55. Federal government funds accounted for 11 percent of the funds used by public institutions. State governments accounted for only 2 percent of the funds for private institutions, while the federal government accounted for 14 percent. (NCES, 1998, p. 193).

56. The choice between the extremes of mandating fixed price-to-cost relationships or allowing tuition engineering has several consequences. Fixed relationships between prices and costs have the danger of lessening any institution's ability to: (1) compete with other institutions in the same or similar market niche for students with particular characteristics; (2) maximize tuition income in order to reduce reliance on alternative income sources; and (3) structure cost/price relationships that accomplish other objectives of the institution. On the other hand, tuition engineering has two major problems: (1) it produces a complex structure that is not transparent to the student or parent who must plan for the college education, and (2) it runs the risk of substituting ad hoc policies selected by colleges for open public policies selected through a political process. Furthermore, tuition engineering can create a dynamic of competition for gifted students that can ultimately lead to a situation in which good students pay less at good schools than poorer students pay at lesser schools—the result being an increasingly hierarchical structure of students and institutions.

57. Ideally, such data should be collected in a well-defined and consistent manner across institutions and programs within institutions. However, recognizing the various methodologies that exist and the fact that even consistent data do not necessarily mean the same thing for each institution, the available data may still be useful in terms of its application to institutional operations and public policy. For more details regarding additional data needs, see appendices.

58. Prior to 1997, all of the data were collected in a single survey, whereas beginning with the 1997 data, collection cycles were divided into two phases. The change in data collection time frame resulted in the absence of fall 1995 teaching load data and academic/FY 1995-96 cost and productivity data (see Middaugh, 1999). The data presented in this report reflect the 1996-97 academic and fiscal year.

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