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Denison Gatehouse
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Costs, Prices, Subsidies, and Aid in U.S. Higher Education

Gordon C. Winston
Williams College

Ivan C. Yen
Williams College

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ABSTRACT

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in

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Studies of student subsidies in US higher education -- how much more it costs to educate a student than he or she pays -- have focused on the distribution of subsidies by *student characteristics:* "Which students with what characteristics get how much subsidy?" This paper turns to the very different question of *institutional strategies* with respect to price, costs, and aid to ask, "Which colleges and universities grant how much student subsidy and in what form?' Enrollment and financial data from 2687 US colleges and universities for 1991 are used to describe price, costs, and aid patterns for public and private institutions by Carnegie type and, most important, by size distribution of the subsidies among schools. These appear to be defining characteristics of both individual colleges and universities and, more fundamentally, of the economic structure of higher education.

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Costs, Prices, Subsidies, and Aid in U.S. Higher Education

Gordon C. Winston and Ivan C. Yen*
Williams College

Surely one of the most fundamental anomalies in the economics of higher education is the fact that US colleges and universities sell their primary product -- education -- at a price that is less than the average cost of its production. The subsidy that that gives to nearly every college student in the country is neither temporary nor small nor granted only by government institutions: student subsidies are a permanent feature of the economics of higher education; for the average student they represent a large part of total costs; and they are only slightly smaller in private than in public institutions. In total, such subsidies exceeded $7 1 billion in 199 1.

Subsidies involve a unique set of strategic decisions for institutions in higher education, decisions that are familiar neither to for-profit firms nor to the economics designed to understand them. In 1991, the average American college produced a $10,653 education that it sold to its students for $3,101, for a subsidy of $7,551 a year: it's as if cars that cost the dealer $20,000 to put on the showroom floor were routinely sold for $5,800. We expect normal, for-profit firms to grant negative subsidies -- to earn a profit -- by selling at a price greater than the costs of production. That non-profit firms don't do that, of course, is what makes them "non-profits."[1]

This paper will describe the interrelated patterns of costs, prices, subsidies, and student aid among institutions in US higher education. They provide evidence of broad differences in circumstances and strategic decisions within higher education: by type of institution -- two and four year colleges and universities -- by their control -- public or private -- and by the size of their subsidies. A further paper will describe these differences in subsidies as defining characteristics of colleges and universities that are crucially important to understanding the current realities, structure, and dynamics of US higher education. In this paper, though, just the facts.

No claim is being made, it is important to say at the outset, that student subsidies have been ignored in the analysis of higher education; they have, indeed, attracted a great

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1 Often more to the point, though, is the fact that since non-profits have sources of income other than from sales of their products, they usually do earn a "profit" when income from all sources is compared to costs of production. See Hansmann.

deal of attention since the 1969 Hansen-Weisbrod study asserted that the university system in California seemed to subsidize high income students at the expense of lower income taxpayers. But that study also established what has become the conventional framing of the issue of subsidies as one of student characteristics -- Which students with what characteristics get how much subsidy? In this study, the focus is shifted to institutions -- Which colleges grant how much subsidy to their students and how do they choose to do it? Subsidies are here seen as a central part of the admissions-quality-pricing policies of colleges and universities.

I. THE CONTEXT: A MODEL OF HIGHER EDUCATION

While it can only be sketched here, a sense of the analytical context into which this paper fits will prove useful in evaluating its findings. They will be used to test a view of US higher education that sees:

- a very great degree of differentiation among institutions -- only at the most superficial level can it be said that "a college is a college is a college." There are vast and fundamental differences among colleges and universities.

- the availability of non-tuition resources as a basic source of those differences -- rich schools are very different from poorer schools and the effects of those differences permeate their activities, their prices, their strategies, and behavior.

- schools use their non-tuition resources to subsidize their students -- schools with a lot of resources give, quite simply, more educational services per dollar of cost to the student -- a better bargain -- than do schools with meager resources.

- student demand is sensitive to that bargain so schools that give larger subsidies will experience greater demand, other things being equal, than schools that give small subsidies.

- if schools that face strong demand also restrict supply -- limit enrollments -- they create a queue of applicants from which they can *select* the most desirable. The greater this excess demand, the greater the potential for selectivity, hence the greater the school's control over its student quality.

- student quality is a primary determinant of educational quality because, in important measure, students educate students.

- student demand is sensitive to educational quality, hence to student quality.

- absent strong student demand, schools will resort to a variety of devices to improve it: with declining demand, we will see an increasing 'vocationalization' of the curriculum [Breneman] along with more remedial courses; broadening the student base to include more non-traditional students; taking a larger proportion of part-time

students and those less committed to higher education as manifested in lower completion rates; offering more “distance learning,” etc..

So, in sum, schools with significant non-tuition resources grant larger student subsidies that increase student demand creating excess demand, given restricted supply. That allows selective admissions to improve student quality which feeds back to further amplify demand. Higher education operates in a “winner-take-all market” (in the sense of Cook and Frank) in which subsidy resources, restricted supply, and student quality provide the key feedback mechanisms that amplify differences among institutions.

II. INCOME, COSTS, AND SUBSIDIES

The structure of costs, prices, and subsidies in colleges and universities is not part of the familiar logic and vocabulary of for-profit economics or accounting, so it is worth a few paragraphs to spell it out.

Figure 1 provides a useful if stylized description of that structure in a typical college or university. In the first two columns, the stuff of a school’s yearly accounts is pictured as (a) the sources of its income and (b) the ZLY~S of that income. By definition, they are equal. The height of the bars represents dollars per student per year. Income, it should be noted, is inclusive, global, income -- the value of all the resources that accrue to the institution in the course of the year -- rather than a sub-component of that income like current fund revenues.[2] For present purposes, not a lot of detail about the specific sources of income is needed -- how much of it comes separately from government appropriations, gifts and grants, asset income, auxiliary and other income, etc. -- so only tuition and auxiliary income components are shown explicitly in column (a). And in column (b), the uses of that income can similarly by simplified, described as auxiliary expenditures, educational and general spending (including capital costs),[3] and saving. Finally, since auxiliary activities are usually expected to break even, we can simplify things at the outset by setting auxiliary revenues equal to auxiliary expenditures and ignoring them in what follows.

The sources, then, are tuition and non-tuition income. That income is used to cover the costs of production. What’s left over is saving. Sources equal uses in any period.

These two broad categories, sources and uses, would fully encompass yearly flows in the accounts of a for-profit firm. More details would, of course, be needed to answer

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2 See, for more details on global accounting as superior to fund accounting, Winston, *Planning.*

3 Notes that current spending is *net of institutional aid, so* aid is treated as a price discount rather than a legitimate cost. On this thorny issue, see McPherson & Schapiro.

important questions, but they would simply come from disaggregation of columns (a) and (b) -- to tell where, more specifically, the money came from and where it went. In the typical for-profit firm, its income would come largely from the sale of its product. When that income was larger than production costs, the firm would show a profit (positive saving); when costs were larger than income, it would show a loss.

So a whole additional set of questions, embedded in columns (c) through (f), is introduced by the fact that for a college, only a fraction of its total income is generated by sales proceeds -- by the tuition and fees paid by its student-customers. In Figure 1, the sources column, (a), appropriately shows income from sources other than the sale of educational services -- non-tuition income -- to be a lot greater than tuition income. The uses column, (b), is more conventional in showing that total income can be used for production costs or, if it's big enough, that some can be left over as saving (profits).

Together, columns (a) and (b) illustrate the fact that those who buy the product in higher education are getting something that costs a lot more to produce than they're paying for it -- net tuition and fee income is a good deal less than the average cost of producing the services that the student gets.

The next four columns, then, frame the key question of how that subsidy is divided up among students: the institution's decisions on the sticker price that determines the general subsidy, and on individually targeted aid, need-based or merit.

Column (c) recognizes that higher education is a multi-product industry that makes a lot of things beside instruction. Just above, we acknowledged the college's sale of (largely) hotel and restaurant services in the form of its auxiliary income. Here we recognize other major products of the university that don't have a lot to do directly with its instructional functions, by subtracting off its funded research, public service, and a share of joint costs to leave instructional costs. These are identified in the data we use.[4]

Column (d), then, shows how that remaining instructional cost per student is divided between the part the average student pays in net tuition and fees -- his price -- and the part that represents a subsidy. Column (e) describes how that subsidy portion is divided, in turn, between general and individual student aid. A "general subsidy" is given equally to each student at a college whenever its sticker price is set below production cost while "targeted student aid"[5] is a further price reduction based on individual student characteristics. Finally, column (f) divides that targeted aid between the part that is awarded on the basis of an individual student's economic ***need*** and the part that's based on ***"merit" --*** his other characteristics like athletic or academic abilities or race. Since the height of these columns represents dollars per student, we can indicate, at the far right of

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4 It would be useful, too, to pull out all the other primary non-instructional products of the university and their costs -- like television programming through athletics -- but these can't be disentangled from strictly instructional costs for many schools, so they aren't segregated.

5 Lee calls these "institutional subsidies" and "student subsidies." [Lee and Sango-Jordan]

Figure 1

Global Income, Costs, Prices, Subsidies, & Aid

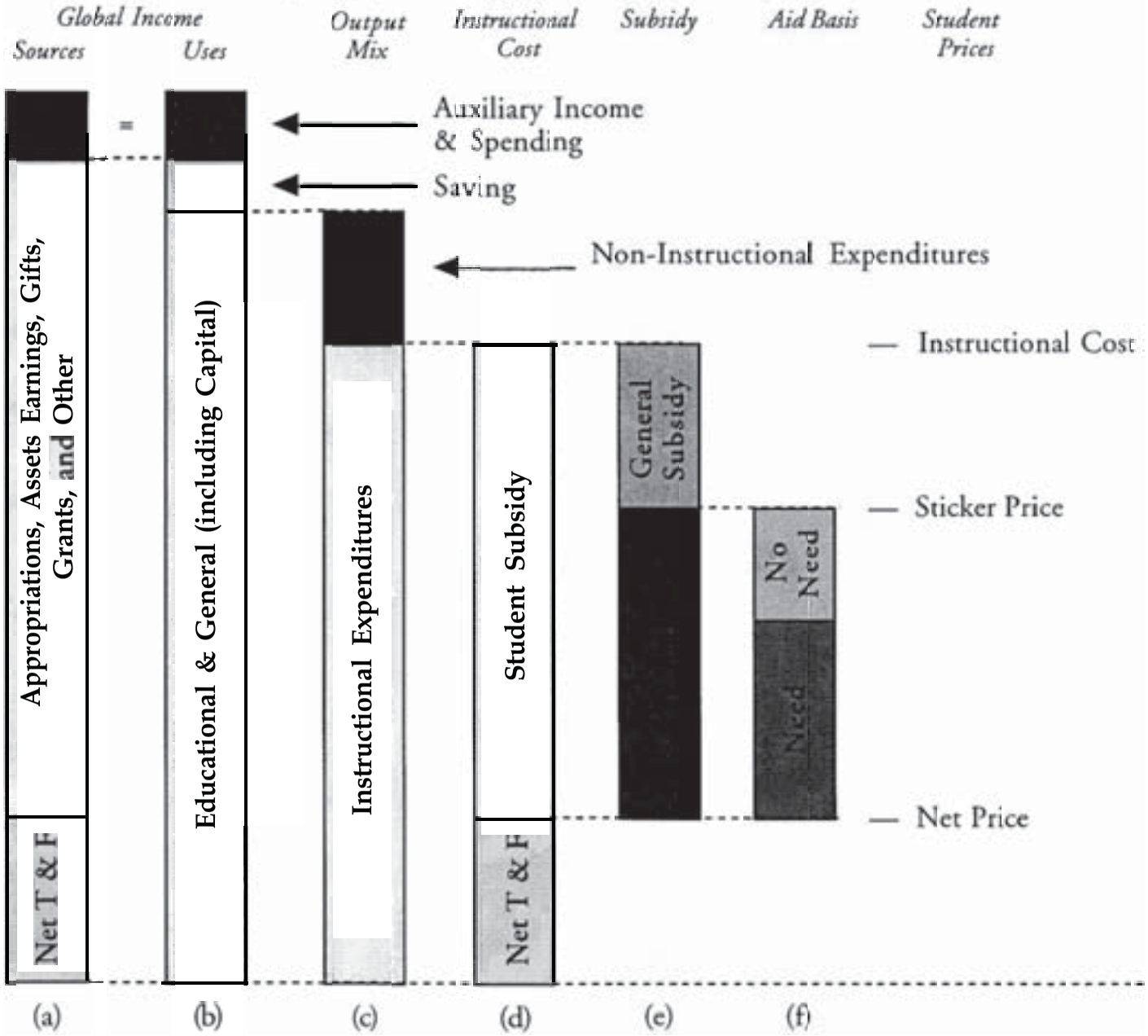

Figure 1, the sticker price and net price levels consistent with the breakdowns shown in the columns (d) through (f).[6]

Before turning to the US data and the behavioral patterns that emerge from them, note that the schema of Figure 1 usefully maps some of the most important strategic decisions facing a college or university. Given its total non-tuition income, the school must make (implicitly or explicitly) the following decisions:

- **a decision on size --** its total enrollment -- that will influence[7] non-tuition income per student. So, for instance, by restricting its student body to 1,300, Swarthmore has protected its per-student endowment income; if it had twice as many students, other things being equal, it would have half as much endowment income per student. And as suggested in our brief description of the context of analysis above, size enters importantly, too, as a determinant of student quality -- but that is a subject of the next paper.

- **a decision on cost per student, and hence on net tuition and fees,** given its non-tuition income. A school's per student non-tuition income fixes the difference between costs and price -- its maximum subsidy -- but it supports any combination of costs and price that maintains that difference. So the school must determine, simultaneously, the quality' of the school's product and how much students will have to pay for it. With, say, $10,000 of non-tuition income per student to support the subsidy, one school could produce a $15,000 a year education to be sold at a $5,000 net tuition while another produced a $35,000 a year education to sell at a $25,000 net tuition. For two concrete examples from these data, Cooper Union and Williams subsidize their students similarly -- $26,656 and $28,759 per year, respectively. But Cooper Union provides its $27,000 of education at a net price of zero while Williams provides $40,349 of education at a net price of $11,554. This is probably the most difficult -- and one of the most important -- decisions facing college administrations, since it involves an estimate of the price elasticity of demand for a product whose quality is being redefined as its price changes. And, to make matters worse, because the wedge made up of non-tuition resources is frequently fixed for any given school,

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6
1) Income Sources = Net Tuition and Fees + Non-tuition Income + Auxiliary Income
2) Income Uses = Auxiliary Expenditures + Saving + Educational and General Spending (E&G&K)
3) E&G&K = Instructional E&G&K + Research + Service
4) Instructional E&G&K = Net Tuition & Fees + Subsidy
5) Subsidy = General Aid + Individual Aid
6) Individual Aid = Need-based Aid + No-need Aid

so

7) Income = Net Tuition and Fees + Auxiliary Expenditures + Saving + Need-based Aid + No-need Aid + General Aid + Research + Service.

7 For a private institution with subsidy resources that are fixed without regard to enrollment -- like endowment -- size *determines* per student resources.

8 While resources don't translate simply into educational quality, the magnitude of the differences in resources per student in these data justify associating quality and costs.

in any simultaneous adjustment of cost and price, their percentage changes can be highly disproportional -- with $10,000 in fixed non-tuition income and a $5,000 net tuition, a school would need a full 30% increase in tuition to get a 10% increase in expenditures.[9] Subsidy resources (S), costs (C), and price (P) are locked together by the tautology, S = C - P.

- **a decision on output mix** determines how much of the school's total spending will go to instruction. At the highly stylized level of Figure 1, that's about all that can be said, but at the finer grained level on which colleges actually function, this decision involves urgent questions of identifying an institution's core activities, setting priorities, and increasing the efficiency with which those activities are done. The higher the share of instructional costs, the more the student is subsidized, other things being equal.

- **a decision on the sticker price** divides the subsidy into the part (typically the largest) that goes to all students, undifferentiated, and the part that goes to those who have specific, desirable characteristics -- into a general subsidy and individually targeted aid. The same $10,000 average yearly subsidy can be given in equal amounts to all enrolled students through a sticker price set just $10,000 below instructional costs or -- at the other extreme -- it can be given through a sticker price set the same as costs, then offset selectively by individually targeted student aid that averaged $10,000 per student. Finally,

- **a decision on merit-based and need-based aid --** the division of any individually differentiated subsidies according to student characteristics -- whether it is to be based on the student's economic circumstances or on other characteristics, academic or athletic or artistic merit or other criteria.

These are strategic decisions that all colleges and universities have to make about output, quality, and pricing. They have no parallel in for-profit firms. In describing them as a sequence of decisions that start with a given level of non-tuition income that is somehow impervious to the decisions that follow, we emphasize structure over realism, of course. In public institutions, in contrast, ongoing appropriations often provide the bulk of non-tuition income and they are quite likely to be affected by an institution's strategic decisions on, e.g., size or sticker price. And in any institution, history matters a whole lot -- resources can be highly "illiquid" and traditions, cultures, alumni, and faculties highly resistant to change. But Figure 1 pictures the underlying accounting relationships, in their barest structural form, that define possibilities and set constraints on a college's costs, prices, subsidies, and aid. The magnitude of a school's subsidies is

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9 This relationship bears further development that it won't get here. In the example above, that same school could achieve a 3% reduction in net tuition on the basis of a 1% reduction in costs. And since it is the size of the subsidy relative to costs that determines the magnitude of this arithmetic amplification, schools with relatively larger subsidies can achieve greater percentage tuition reductions for any given percentage cost reduction. The high-subsidy schools, then, could more easily lead tuition reductions.

determined by its non-tuition resources and its size and any subsidy is exhaustively divided between general aid and targeted aid based on need or merit.

III. THE DATA ON SUBSIDIES

2687 out of the 3356 US institutions that show non-zero enrollments in the 1990 IPEDS[10] Fall Enrollment data form the basis for the patterns reported here. These include 1386 public and 1301 private institutions. Their IPEDS financial data are for 1991. Schools with less than 20% undergraduate FTE enrollment were dropped as being inappropriate to a study of student subsidies and those with undergraduate FTE enrollments smaller than 100 were dropped simply because they appeared incapable of generating reliable data. These two steps eliminated 419 or 11% of all the schools and 122,675 or 1% of the FTE students in the original data. Student FTE enrollments were calculated from the IPEDS Fall enrollment data in the conventional way -- three part-time students were taken as equivalent to one full time student.

1. costs

The desired category, "Instructional costs," is not reported as such in the IPEDS financial data, but its components -- or the basis for estimating them -- are. Educational and General expenditures (E&G) from the current fund[11] -- net of Scholarships and Fellowships and mandatory transfers -- can be separated into direct instructional costs (Instruction and Student Services) and costs irrelevant to instruction (Funded Research and Service) so that the remaining joint costs (including General Administration, Academic Support, Library, etc.) can be allocated between relevant and irrelevant costs in proportion to their size. The resulting measure of instructional E&G costs is the one that we use.[12]

Institutional financial aid "costs" reported in E&G spending as Scholarships and Fellowships are not included, nor were they considered as income in the logic of Figure 1. The strange college accounting practice of reporting any money given a student as financial aid first as a cost, then as income to the college does not serve to increase clarity or understanding. It is more legitimately characterized as a price discount. So institutional student aid -- Scholarships and Fellowships -- appears only as a reduction of gross tuition and fees and subsequently in the individual component of student aid. Mandatory transfers are excluded to avoid double counting since they typically represent the capital costs that we estimate explicitly below.

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10 The Integrated Postsecondary Educational Data System, reported in National Science Foundation, CASPAR Database System. Version 4.4.

11 "Adjusted Total E&G" in CASPAR, to exclude Pell and non-mandatory transfers.

12 See Due-Le To for a more detailed description of this joint cost allocation.

2. Capital Costs

A significant part of the current cost of producing education is neglected in college accounts, and in IPEDS' cost data, as they leave out the costs of the services of buildings, equipment, and land. And since that component adds more than 40% to total current costs -- and since it varies considerably among schools -- its omission in subsidy calculations would be particularly serious.

It's clear from the economics of capital costs[13] that for present purposes what is needed is simply "the rental rate" for the physical capital used in producing education at a given institution -- in effect, what it would cost that institution to rent its instructional buildings, equipment, and land for the year from a profit-making entrepreneur in a competitive market. That yearly rent, in turn, will depend on the replacement value of its capital, on its actual yearly depreciation, and on an opportunity cost -- the income sacrificed by its owner in having his wealth tied up in physical, rather than financial, capital. The year's rental rate, then, is the product of the value of a capital stock and the sum of its yearly depreciation and opportunity cost rates. That's the cost of the capital services used by a college.

IPEDS data provide a good deal of that and while the details of the steps needed to fill in estimated replacement values of capital for some of the schools in this population is relegated to an appendix (and a forthcoming paper), broadly, the procedure was, for each school, (a) to estimate depreciation on buildings and equipment at 2.5% per year (b) to estimate the opportunity cost on buildings, equipment, and land at 8.55% per year (the long term Federal bond rate in 1991) and (c) to take the product of their sum and the replacement value of the school's capital stock as the estimated yearly rental rate. That total cost of capital services for the institution was then allocated to E&G and other activities (Auxiliary Enterprises, Hospital and Independent Operations) and to our estimated instructional costs within E&G in proportion to reported spending. So the instructional cost we use is the sum of instructional E&G and capital costs or "Instructional E&G&K."

3. Net Tuition and Fees

To get at what the average student actually pays at a school, total tuition and fee income per FTE -- the average sticker price -- was reduced by subtracting off what the school reports in Pell income and what they give in institutional Scholarships and Fellowships, both per FTE. The result is reported as "Net Tuition and Fees." This is the average student's "discounted price" for the year's education.

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13 See Jorgenson-Griliches.

4. Subsidies

In keeping with the logic described by Figure 1, the average student subsidy is defined simply as Instructional E&G&K, less Net Tuition and Fees -- the part of the cost of a year's education that the student does not pay. A student's subsidy is further divided by the college's sticker price and aid policies into the general subsidy component and individual aid. Individual aid is reported as institutional Scholarships and Fellowships plus Pell grants; general subsidies are derived as the residual, total subsidy less individual aid. Finally, we borrow from the recent work of McPherson and Schapiro on need-based and merit aid to estimate the division of individual student subsidy between those categories. Subsidies, then, accrue to students as (a) general aid (b) merit aid and (c) need-based aid.

5. Undergraduate, Graduate, and Professional Student Subsidies

A number of authors, including H. Bowen, James, Lee and Sango-Jordan, Due-Le To, and Baum, have treated instructional costs as different by level of educational progress.[14] Bowen's is the most detailed such breakdown, giving freshmen and sophomores a cost-weight of 1 .0, juniors and seniors a weight of 1.5, first year graduate students 2.1, professional degree students 2.5, and advanced graduate students 3.0. Other authors have examined cost differences between science and non-science students [Carnegie, Bowen and Douglass], by major subject and by geographical region [Due-Le To].

While not rejecting their appeal, we have ignored these possible differences in costs in the main body of our investigation primarily because they would have us adjust one term in the difference that defines student subsidies -- costs -- even though there are no data with which to adjust the other term -- net tuition and fees. Institutional data are not available on either tuition or aid broken down by level of student.[15] Out of concern that our analysis might be compromised by their neglect of student status, we tested its broad conclusions against an identical data set in which costs fully reflected Bowen's weights with undifferentiated net tuition and found little difference.

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14 Because these cost differences play so central a role in supporting her hypothesis on cross subsidization within higher education, James' discussion of their background is especially rich.

15 Studies of the distribution of subsidies by student characteristics -- "Which students get how much subsidy?' -- like those of Lee and Sango-Jordan or Baum, do not run into this problem because they begin with data (National Postsecondary Student Aid Survey (NPSAS) in these studies) on a population of identified students that includes information on each student's tuition and fees, targeted aid, and the school attended. So their attention to institutional subsidies -- our 'general subsidy' -- is motivated largely by an interest in capturing all forms of subsidy received by those students. To use the same method for the institutional focus of this study -- "'Which colleges give how much subsidy" -- would require that we have similar NPSAS information representing each student at each of our 2687 institutions.

IV. THE STRUCTURE OF COSTS, PRICES, SUBSIDIES, AND AID

1. All Institutions

Table 1 reports the results for this population. The figures are dollars per FTE student for the average institution. Percentages refer to Instructional E&G&K per student -- so "Price/Cost" is Net Tuition and Fees as a percent of Instructional Cost, showing what part of the average student's total instructional expense he or she bears. Or percentages refer to total subsidy per student -- so "General Subsidy/Subsidy" shows how the average school's subsidy is distributed between general and individually targeted aid. The first line of Table 1 reports the averages for all 2687 institutions, together; the next ten lines report averages by decile on descending size of subsidies.

By way of introduction above, we noted the three most basic figures for all institutions taken together: that the average school in the US in 1991 gave its students an education that cost $10,653 for which it charged $3,101. The resulting subsidy of $7,551, Table 1 shows, was divided into $6,063 of general aid and $1,488 of individually targeted aid. As noted, these IPEDS data don't let us break that individual aid down further into the part that was granted on the basis of a student's income -- need-based aid -- and the part granted on the basis of the student's athletic, academic, artistic "merit" or place of residence, but we will, in a final section below, borrow from the results reported by McPherson and Schapiro to show what that breakdown would probably look like.

The institutional strategic decisions implied by these numbers -- and described above -- may appear more clearly when they are expressed as percentage shares of costs or subsidies and their allocation in the last five columns of Table 1 -- they reveal "Who pays how much for what?" on the one hand and, "How is the subsidy divided?" on the other.

In the typical school, students are asked to pay a relatively modest 29% of their educational costs so they pay the relatively modest sum, just noted, of a bit over $3,000 a year. Recall that in principle a given amount of non-tuition resources -- here, $7,551 of them per year on average -- can support any level of instructional costs if differences in cost are simultaneously matched by differences in what the student pays. So the average American college has chosen to keep its costs at a modest level enabling it to keep its net tuition and fees low, too. The other strong conclusion from line 1 of Table 1 is that of the 71% of total costs given as student subsidy in the average school, most of it by far (80% of the subsidy) takes the form of general, undifferentiated aid to all enrolled students and only a small part (the remaining 20%) is given differentially on the basis of individual student characteristics: general aid accounts for 57% of educational costs while targeted aid accounts for only 14%.

Table 1

Subsidies, Costs, Prices, and Aid

All Institutions

	Enrollments	Subsidy $/FTE	costs: Instructional E&G&K $/FTE	Price: Net Tuition & Fees $/FTE	General Subsidy $/FTE	Individual Student Aid $/FTE	Price/ cost %	General Subsidy/ cost %	Indiv. Aid/ cost %	General Subsidy/ Subsidy %	Indiv. Aid/ Subsidy %
										(10)	
All Institutions	3,462	7,551	10,653	3,101	6,063	1,488	29.1	56.9	14.0	80.3	19.7
Decile 1	3,224	20,801	25,461	4,660	18,195	2,606	18.3	71.5	10.2	87.5	12.5
Decile 2	3,166	10,594	13,879	3,285	8,552	2,042	23.7	61.6	14.7	80.7	19.3
Decile 3	4,281	8,680	10,940	2,260	7,106	1,574	20.7	65.0	14.4	81.9	18.1
Decile 4	4,126	7,627	9,882	2,256	6,228	1,399	22.8	63.0	14.2	81.7	18.3
Decile 5	4,333	6,760	9,119	2,359	5,462	1,298	25.9	59.9	14.2	80.8	19.2
Decile 6	3,637	6,010	8,270	2,261	4,736	1,274	27.3	57.3	15.4	78.8	21.2
Decile 7	3,821	5,300	7,899	2,599	4,049	1,251	32.9	51.3	15.8	76.4	23.6
Decile 8	3,165	4,591	7,381	2,79 1	3,412	1,179	37.8	46.2	16.0	74.3	25.7
Decile 9	3,094	3,646	7,145	3,499	2,445	1,201	49.0	34.2	16.8	67.1	32.9
Decile 10	1,767	1,457	6,508	5,052	403	1,054	77.6	6.2	16.2	27.7	72.3

Notes: Includes 2687 imtitutiom, of which 1386arepubLic and 1301 are *private.*

The Size Distribution of Subsidies

The bottom section of Table 1 reports the distribution of costs, prices, subsidies, and aid *within* the population of 2687 schools. Schools are grouped in the table in deciles of descending order by subsidy per student from the well-subsidized to the poor.

Subsidies per student vary a great deal among institutions, even when averaged within deciles. This is, if anything, even clearer in Figure 2 where the height of the first bar describes the average subsidy over all institutions while the next ten bars show averages for deciles of descending subsidies. In the top decile, the average student gets a subsidy of nearly $21,000 a year while in the bottom decile the average student gets 93% less. Put a bit differently, students at the top 20% of the schools get more than 36% of all the subsidies in US higher education, while those in the bottom 20% of the schools get a bit more than 5% -- about the same amount as those at the top 1%. The skewedness of subsidies across schools is apparent in Figure 2.

But recalling, once again, that a given level of subsidy can, in principle, be associated with any pattern of cost and net tuition (so long as their difference remains constant), it is significant that instructional costs -- Figure 3 and column 3 of Table 1 -- fall monotonically with subsidy. It is the high cost schools that grant the highest subsidies and subsidies fall, from one decile to the next, as the cost and hence the quality of education falls. In the top decile, a student gets more than $25,400 per year of educational resources that carry the $21,000 subsidy; at the bottom, the average student gets a bit more than $6,500 of resources a year and a subsidy a bit less than $1,500.

With educational costs and student subsidies falling together as we move down the columns, the student's price -- column 4 -- describes their *relative* change: as both educational costs and subsidies decline, do students wind up paying more dollars or fewer for their education? The answer reflected in Figure 3 is, first, that students at the high cost-high subsidy schools -- the top twenty percent -- pay more in absolute dollar terms than do students in the middling schools. So those in the top decile pay $4,660 in net tuition and fees while those in the second decile pay $3,285 and both of these compare to the low $2,000~ ($2,256 to $2,359) for students in the next four deciles. So there is a fall in price from high- to middle-subsidy schools but there seems to be not much pattern in net tuition and fees <u>amongt</u>hese middling schools -- from the third to the sixth deciles.

But the other part of the answer is that net student charges for schools in the bottom 40% rise again in absolute terms. The student going to an average school in the last decile actually pays almost $400 *more* than students going to the *most* expensive and heavily subsidized schools. The student at the bottom is getting an education that costs only a bit more than $6,500 a year to produce, and he's paying for it more than $5,000 in net tuition and fees -- he's getting less than $1,500 in subsidy.

Figure 2
Average Subsidy
All Institutions

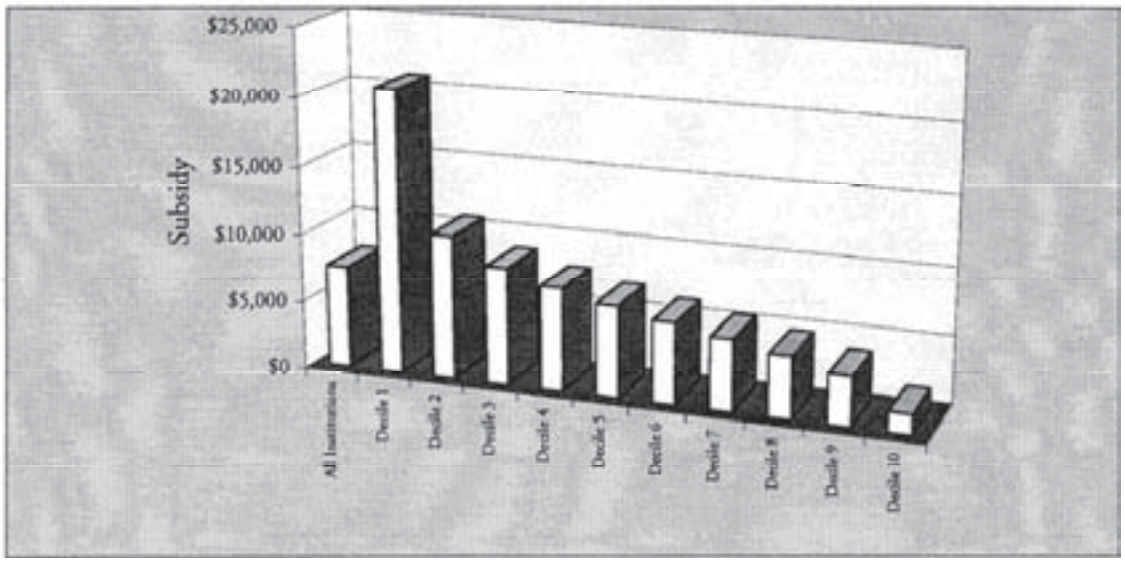
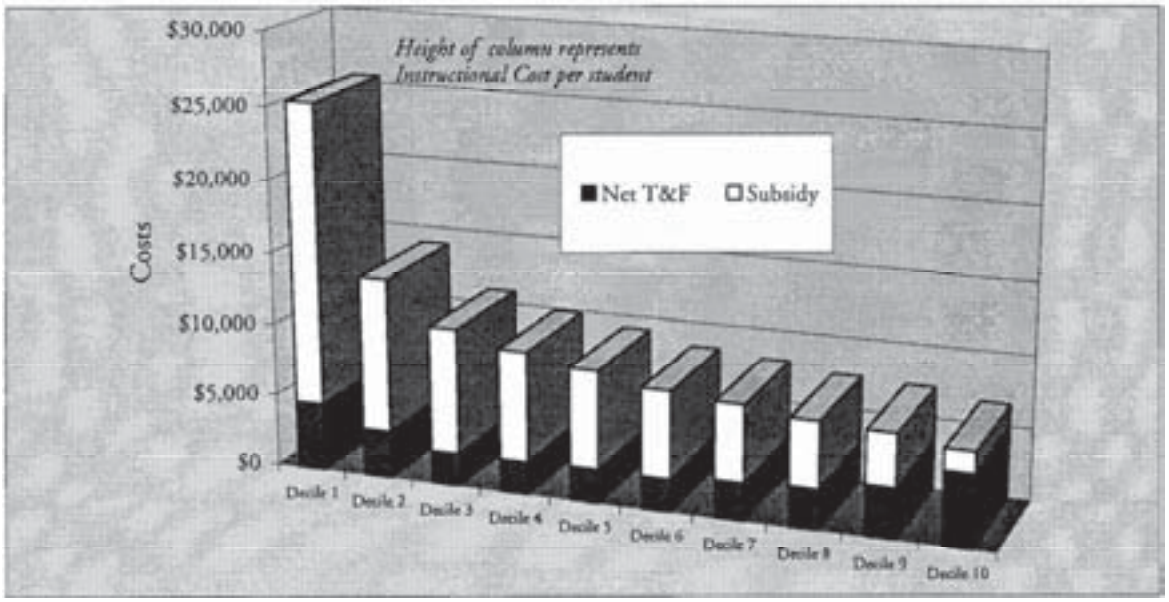


Figure 3
Costs: Subsidies and Net Tuition &Fees
All Institutions



This pattern of declining price-cost advantage to students in poorer schools is even more apparent when the student's net price is expressed as a price/cost ratio -- net tuition as a percent of instructional cost -- as in Column 7 of Table 1 and in the foreground of Figure 4. This is, in an important sense, a measure of what the student is paying for what he's getting. To the extent that instructional costs are a reasonable proxy for the quality of education being produced, this column indicates what the student is paying per dollar of educational quality. The student in an average school in the top decile is paying a bit more than 18 cents for a dollar's worth of education: the student in an average school in the bottom decile is paying 78 cents. With the exception of a twitch at the second decile, as we work down Column 7 or across Figure 4, what the student has to pay for his education (what he gets for his money) rises (falls) systematically as the quality of that education falls. Again, those going to the poorest 40% of the schools appear most disadvantaged -- in the eighth decile, students pay 38 cents for a dollar's worth of education and in the ninth, they pay 49 cents. In contrast, students in the average third decile school pay 21 cents. And there's the further discontinuity for those in the lowest decile where students' net price goes up sharply while the quality of what they get goes down further. With the current emphasis on "access to higher education," it is hard not to ask "access to what?'

So the student's subsidy falls with falling educational expenditures, but there remains the question of how that diminishing subsidy is allocated -- how much goes to students as general aid and how much as individual aid. Column 5 in Table 1 shows, not surprisingly, that the dollar amount of general aid declines monotonically with subsidies -- the smaller the subsidy, the smaller is the size of general aid. But more interesting is the pattern of the ***share*** of the subsidy that takes the form of general aid -- Figure 5 and Column 10 in Table 1. Again, the population of schools seems to divide into four groups – the top 10% granting the biggest subsidies, the next 70%, the 10% that are low but not quite at the bottom, and, finally, the bottom 10%. The highest cost, highest subsidy schools -- the top decile -- give the largest share of their substantial subsidy in the form of general aid, therefore the smallest share in individually targeted aid. The next seven deciles reveal no strong pattern -- while subsidies fall from $10,594 to $4,591 within this group, they all give 74-82% of that subsidy in the form of general aid leaving around 20% for individual aid. But the next decile -- the ninth -- increases the percent of subsidy in the form of individual aid to almost 33% while the bottom decile puts more than 70% of its subsidy in that targeted form. Note that this sharp increase in targeted aid is, in part, an artifact resulting from the decline in subsidy combined with relatively constant levels of Pell support per FTE[16]

Finally, it is worth noting that when schools are arranged in descending order of subsidy, there is no clear pattern in average school size. It could be argued from Column 2 of Table 1 that as we work down the subsidies, size first increases, peaking in the fifth

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16 Over the ten deciles, Pell/FTE ranges from $43 1 to $549 with little relation to subsidy; in the bottom decile, it is $446. It should be noted that we limited a school's reported Pell/FTE figure to $2,400, the maximum individual award in 1991.

Figure 4

Shares of Cost: Subsidy and Net Tuition & Fees
All Institutions

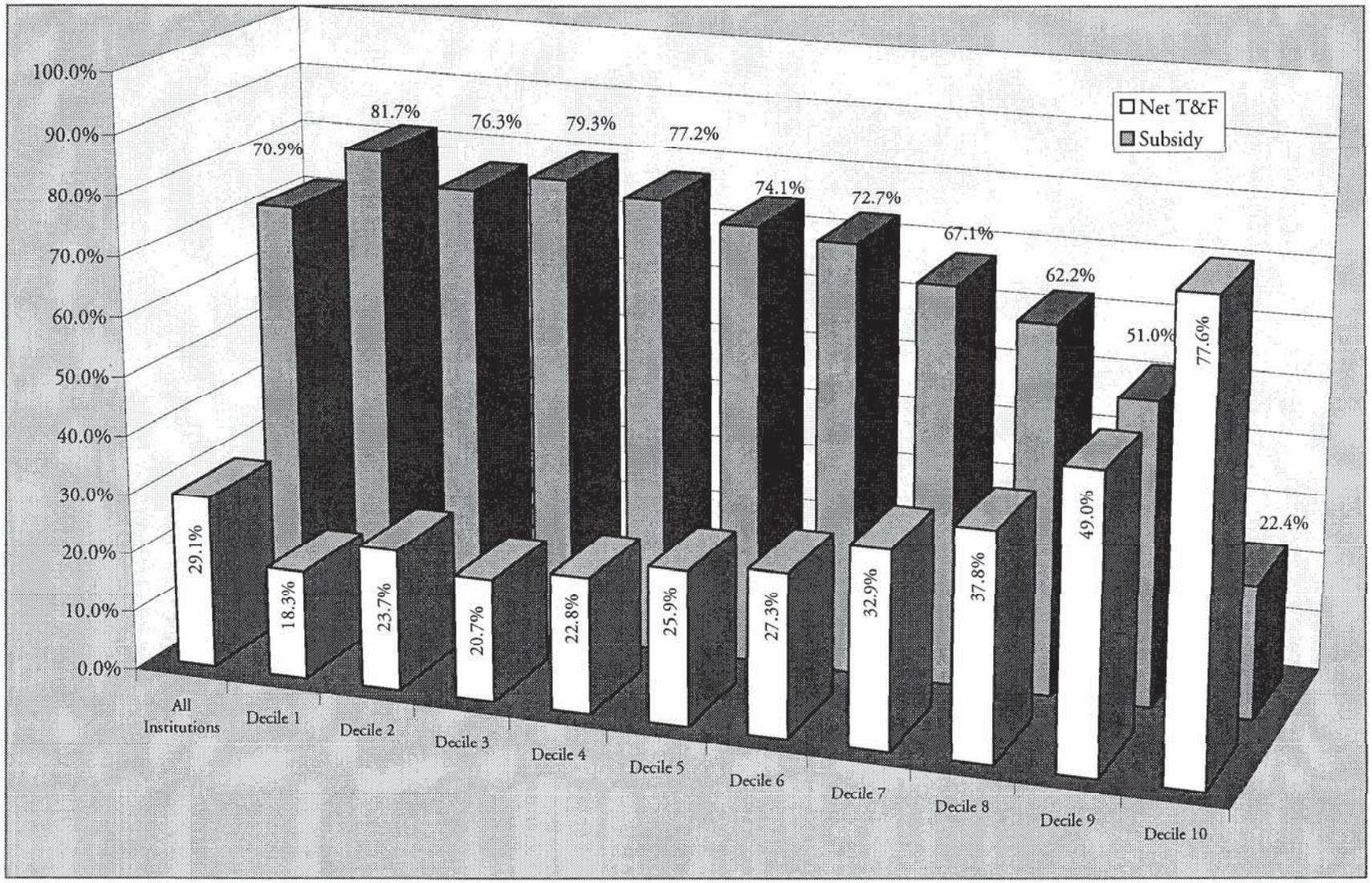
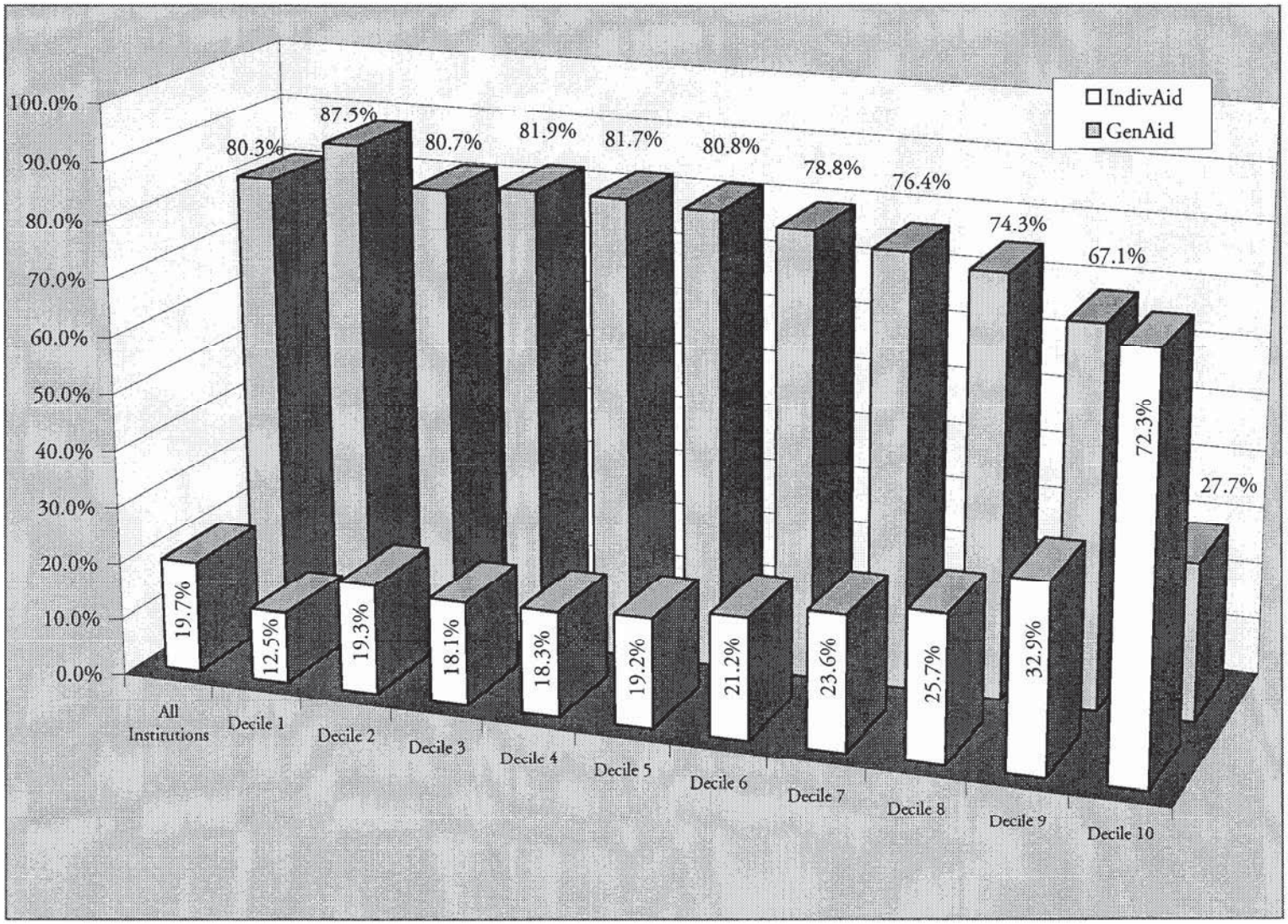


Figure 5

Shares of Subsidy: General and Individual Aid
All Institutions



decile, then stumbling down through the ninth, but it seems hard to make much of that. It is clear, though, that the schools in the tenth decile are smaller than the rest.

Type and Control

Nothing has been said, so far, about the kinds of schools that appear in these subsidy rankings so it is useful to turn to Table 2 and Figure 6 where the distribution of schools by condensed Carnegie type over subsidy levels has been spelled out.[17] Some useful things can be said about the structure of US higher education, and about our data.

Overall, two fifths of the institutions in this population are two-year colleges, about a fifth are comprehensive colleges and universities while another fifth are four year liberal arts colleges and 11% are "special" institutions, ranging from business to religious schools. Research and doctoral universities make up only a bit under 8%.

But it's shown in Table 2 -- and more dramatically in Figure 6 -- that these institutions are far from evenly distributed across the range of subsidy levels.

Liberal arts colleges and research universities are generally concentrated at the high subsidy-high quality end where together they make up almost 50%. Their dominance declines as we move to lower levels of subsidy and educational cost. Two year colleges, on the other hand, become increasingly important as we move to smaller subsidies, accounting for just over 15% of the schools in Decile 1 but close to half of the schools in the bottom half of the subsidy range. Comprehensive universities have a small share of the top deciles, but account for about a quarter of the schools in the bottom 80% and "special" institutions are important primarily in the top and bottom deciles -- where "special" appears to mean very different things (medical and religious schools in the top decile and business, engineering, and art schools in the bottom).

In Table 3, the distribution of schools over subsidy levels is separated by control -- public and private institutions -- for each decile. Recall that there are 1383 public and 1301 private institutions in this population -- 52% and 48%, respectively. The general pattern of their distribution is clear. At the top end, the highest cost/highest subsidy schools are predominantly private -- more than 60% of the 289 schools in the top decile -- while in the middle range, schools are predominantly public -- as many as 68% in the fourth decile -- and at the very bottom, private institutions again predominate with nearly 95%, leaving only 6% of the bottom-decile schools in the public sector.

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17 The Carnegie Foundation classification recognizes (a) research universities (which receive major funding for support of research), (b) doctorate-granting universities (which receive less external research support), (c) comprehensive universities (with graduate programs, but fewer doctorates), (d) liberal arts colleges, (e) two-year colleges, and (f) various categories of specialized institutions. The first four of these are further classified by quality levels, "I" and "II".

Table 2

Distribution of Institutions by Carnegie Type
All Institutions

	Research and Doctorate		*Comprehensive*		*Liberal Arts*		*Special*		*Two-Year*	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
All Institutions	206	7.7%	568	21.1%	540	20.1%	296	11.0%	1077	40.1%
Decile 1	45	16.7%	25	9.3%	82	30.5%	76	28.3%	41	15.2%
Decile 2	26	9.7%	46	17.1%	97	36.1%	28	10.4%	72	26.8%
Decile 3	25	9.3%	69	25.7%	62	23.1%	25	9.3%	88	32.7%
Decile 4	29	10.8%	47	17.5%	58	21.6%	14	5.2%	121	45.0%
Decile 5	24	8.9%	68	25.3%	51	19.0%	17	6.3%	109	40.5%
Decile 6	15	5.6%	67	24.9%	50	18.6%	12	4.5%	125	46.5%
Decile 7	14	5.2%	80	29.7%	37	13.8%	13	4.8%	125	46.5%
Decile 8	10	3.7%	50	18.7%	41	15.3%	22	8.2%	145	54.1%
Decile 9	12	4.5%	67	25.0%	42	15.7%	19	7.1%	128	47.8%
Decile 10	6	2.2%	49	18.3%	20	7.5%	70	26.1%	123	45.9%

Each decile contains either 269 or 21% institutions.

Figure 6
Distribution of Institutions by Carnegie Type

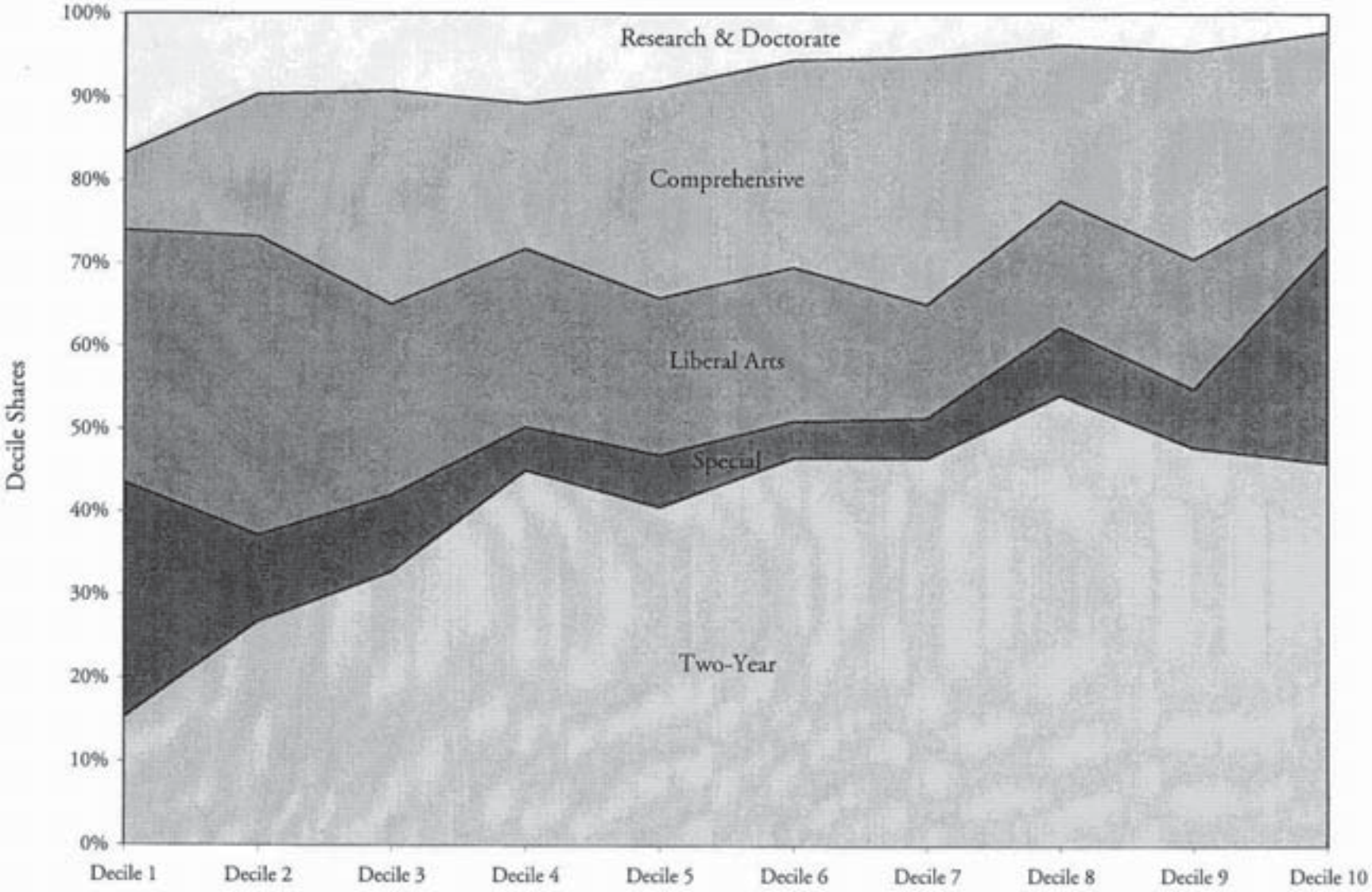


Table 3
Distribution of Institutions by Control
All Institutions

	Public		*Private*	
	Number	*Percent*	*Number*	*Percent*
All Institutions	1386	**51.6%**	1301	**48.4%**
Decile 1	101	37.6%	168	62.5%
Decile 2	127	47.2%	142	52.8%
Decile 3	163	60.6%	106	39.4%
Decile 4	184	68.4%	85	31.6%
Decile 5	175	65.1%	94	34.9%
Decile 6	182	67.7%	87	32.3%
Decile 7	169	62.8%	100	37.2%
Decile 8	154	57.5%	114	42.5%
Decile 9	115	42.9%	153	57.1%
Decile 10	16	6.0%	252	94.0%

Each decile contains either 269 or 268 institutions.

These type and control perspectives for the public institutions are combined in Table 4 and Figure 7. Among public institutions, research and doctoral universities -- the public ivies -- and special institutions, largely medical -- are relatively highly represented in the top decile. Two year public colleges and comprehensive universities account for an increasing proportion of all public schools as subsidies decline from the very top with two-year colleges becoming more and more dominant at lower levels of cost and subsidy. But at the bottom of Table 4, there are not many public institutions of any sort -- few public colleges or universities offer as little by way of subsidy as do many private institutions. It's noteworthy that at the bottom there are no public liberal arts colleges, no public research universities, and very few public colleges in Carnegie's special category. In the bottom half, public two year colleges and comprehensive universities predominate.

The picture of the distribution of private institutions by subsidy decile in Figure 8 — and the underlying Table 5 -- is, of course, the complement of the one for public institutions. In sheer numbers, private colleges and universities predominate at the upper and lower ends while public institutions fill out the middle. Private two-year colleges are far less important than public two-year colleges all the way down the subsidy scale until the bottom decile. There, private two-year institutions proliferate, accounting for more than 40% of all schools and outnumbering public two-year colleges ten to one. Private special schools, too, become important in the bottom decile -- with 25% of all schools -- as do private comprehensive universities with 18%. At the top end, private liberal arts colleges account for more than a quarter of all schools, private research and doctoral universities for almost ten percent, and special schools for nearly a fifth. As we move to lower subsidies and costs, private liberal arts colleges decline in relative importance while private comprehensive and two-year schools increase.

Table 4

Distribution of Institutions by Carnegie Type

Public Institutions

	Research and Doctorate		*Comprehensive*		*Liberal Arts*		*Special*		*Two-Year*	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Public Institutions	131	9.5%	322	23.2%	31	2.2%	62	4.5%	840	60.6%
Decile 1	19	7.1%	16	6.0%	5	1.9%	31	11.5%	30	11.2%
Decile 2	22	8.2%	42	15.6%	4	1.5%	6	2.2%	53	19.7%
Decile 3	21	7.8%	57	21.2%	5	1.9%	8	3.0%	72	26.8%
Decile 4	24	8.9%	35	13.0%	8	3.0%	3	1.1%	114	42.4%
Decile 5	15	5.6%	52	19.3%	3	1.1%	3	1.1%	102	37.9%
Decile 6	14	5.2%	44	16.4%	1	0.4%	3	1.1%	120	44.6%
Decile 7	9	3.4%	41	15.2%	2	0.7%	2	0.7%	115	42.8%
Decile 8	7	2.6%	17	6.3%	2	0.8%	4	1.5%	124	46.3%
Decile 9	0	0.0%	16	6.0%	1	0.4%	0	0.0%	98	36.6%
Decile 10	0	0.0%	2	0.8%	0	0.0%	2	0.8%	12	4.5%

Each decile contains either 269 or 268 institutions.

Figure 7
Distribution of Public Institutions by Carnegie Type

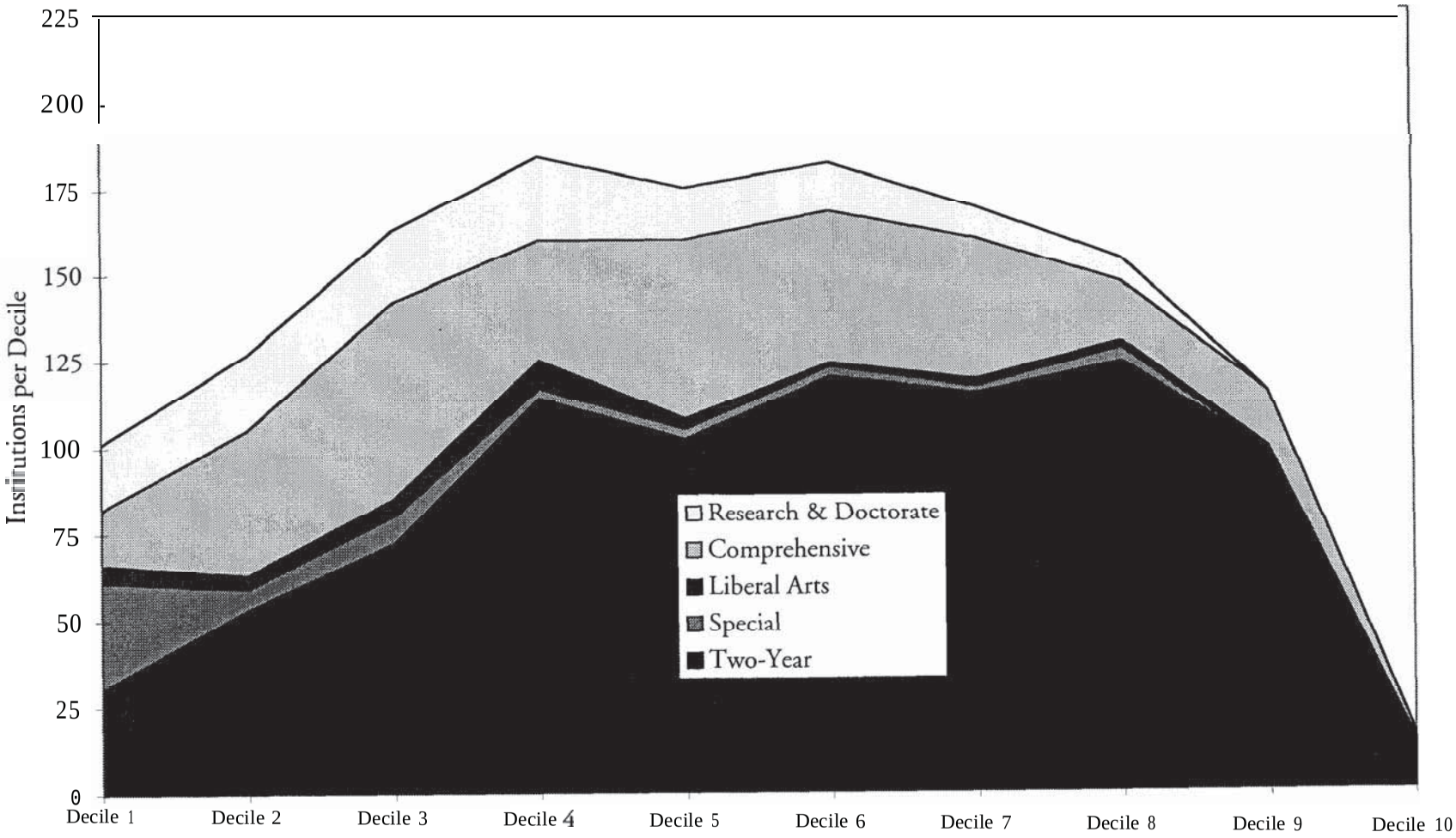


Table 5

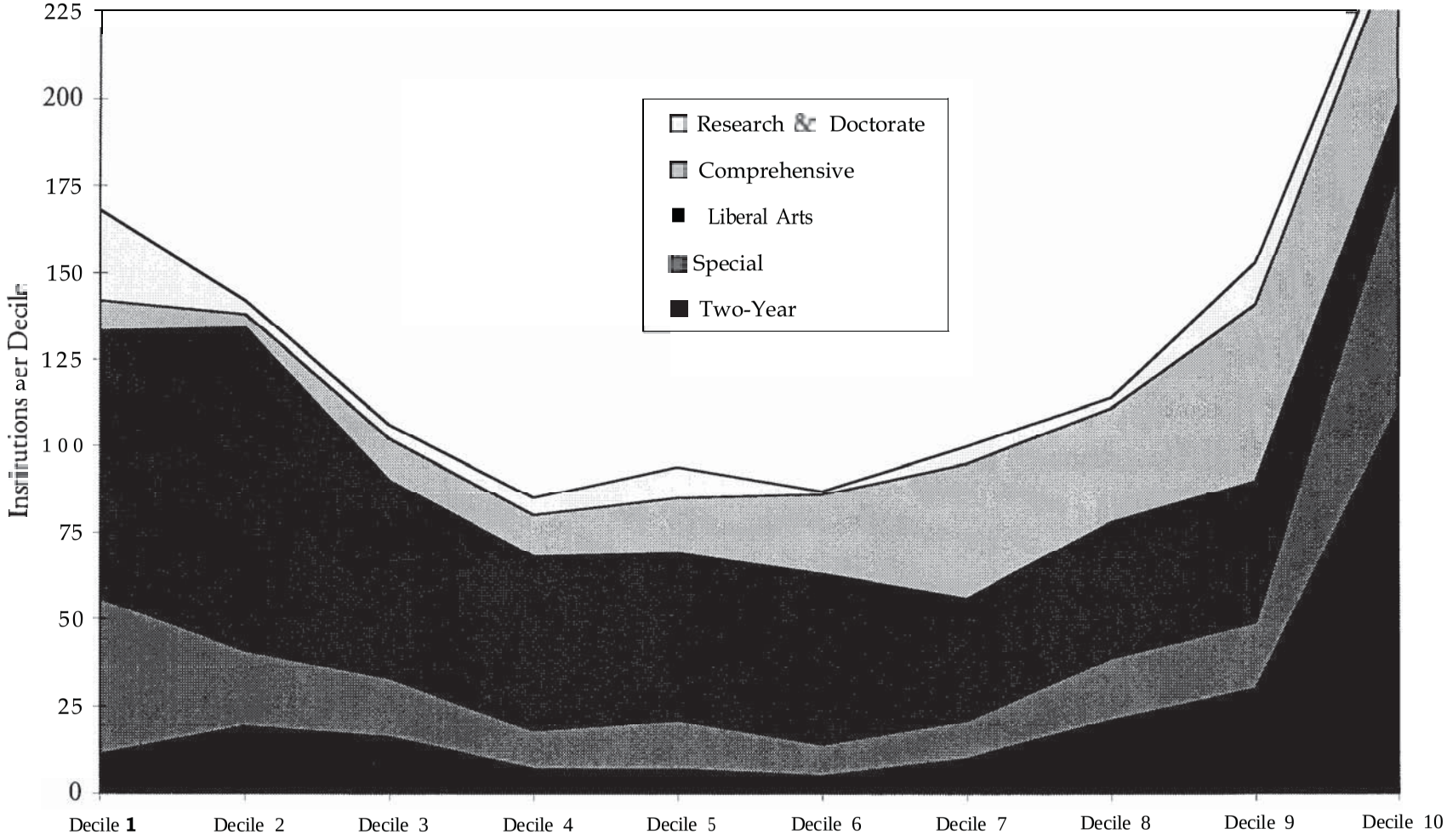
Distribution of Institutions by Carnegie Type
Private Institutions

	Research and Doctorate		*Comprehensive*		*Liberal Arts*		*Special*		*Two-Year*	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	Number	*Percent*	*Number*	*Percent*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Private Institutions	75	5.8%	246	18.9%	509	39.1%	234	18.0%	237	18.2%
Decile 1	26	9.7%	9	3.4%	77	28.6%	45	16.7%	11	4.1%
Decile2	4	1.5%	4	1.5%	93	34.6%	22	8.2%	19	7.1%
Decile3	4	1.5%	12	4.5%	57	21.2%	17	6.3%	16	6.0%
Decile4	5	1.9%	12	4.5%	50	18.6%	11	4.1%	7	2.6%
Decile5	9	3.4%	16	6.0%	48	17.8%	14	5.2%	7	2.6%
Decile6	1	0.4%	23	8.6%	49	18.2%	9	3.4%	5	1.9%
Decile7	5	1.9%	39	14.5%	35	13.0%	11	4.1%	10	3.7%
Decile8	3	1.1%	33	12.3%	39	14.6%	18	6.7%	21	7.8%
Decile9	12	4.5%	51	19.0%	41	15.3%	19	7.1%	30	11.2%
Decile 10	6	2.2%	47	17.5%	20	7.5%	68	25.4%	111	41.4%

Each decile contains either 269 or 268 institutions.

Figure 8

Distribution of Private Institutions by Carnegie Type



2. Separating Public and Private Institutions

Though the results presented so far suggest otherwise, it might be that quite basic differences in the behavior, policies, and strategies of public and private institutions are hidden under the aggregate data organized into deciles within which public and private institutions are not differentiated -- that their distribution over the deciles in aggregate subsidy data mask systematic underlying differences between public and private institutions. There certainly are reasons -- including the sources of support and control -- to believe that this might be the case. So in this section, the sample is broken into its two separate parts by control and those public and private sectors are analyzed separately -- decile rankings by subsidy in this section are generated for each set of institutions alone.

The top of Table 6 reports average values for public and private sectors separately the first line simply repeats, straight from Table 1, the comparable information for all institutions, together. Most surprising, we think, is the fact that the subsidies provided at the average public and private institutions are nearly the same. At public colleges and universities the average subsidy is $7,839 per student; at private colleges and universities it is $7,244 -- they differ by less than $600; less than 8%. But average instructional costs, and therefore, of necessity, net tuition and fees, differ a whole lot. With much the same non-tuition resources per student, public and private schools adopt very different cost-pricing strategies. The $12,669 average cost of instruction at private institutions is $3,909, or 45%, more than the $8,760 average cost at public institutions. So with relatively similar subsidies, Net Tuition and Fees have to be $4,500 or nearly 400% more, on average, at private than at public colleges. The student at an average public college pays about 10% of his educational costs while the student at a private school pays more than 40%.

In the average private school, the student gets more but he pays more and, indeed, he pays for everything extra he gets, and then some. In the terms we used above, the student at the average public college pays eleven cents for a dollar's worth of education while the student at the average private school pays 43 cents per dollar. These cost-price-subsidy relationships are pictured in Figure 9.

Looking -- Figure 10 and Table 6 -- at how the similar subsidies in public and private schools are divided up among students reveals quite basic, if unsurprising, differences in overall cost-pricing strategies. In public institutions, virtually all of the student subsidy takes the form of general aid (9 1% of all subsidies; 8 1% of costs) so very little is used for individual aid -- either need or merit -- (9.4% of all subsidies; 8.4% of costs). In private institutions, in contrast, general undifferentiated aid plays a smaller role (68.5% of subsidies; 39% of costs) leaving much more to be targeted differentially to individual students (31.5% of subsidies; 18% of costs). Private schools average $2,285 in targeted student aid while public schools average $740 -- a third as much.

It is at the next level of disaggregation, when we look at the distribution of costs, prices, subsidies, and aid over the varying levels of subsidy in each sector -- again arranged in descending deciles -- that more can be said about differences and similarities

Table 6

Subsidies, Costs, Prices, and Aid

All Institutions, Public and Private

	Enrollments	Subsidy $/FTE	costs: Instructional E&G&K $/FTE	Price: Net Tuition & Fees $/FTE	General Subsidy $/FTE	Individual Student Aid $/FTE	Price/ cost %	General Subsidy/ cost %	Indiv. Aid/ cost %	General Subsidy/ Subsidy %	Indiv. Aid/ Subsidy %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
All Institutions	3,462	7,551	10,653	3,101	6,063	1,488	29.1	56.9	14.0	80.3	19.7
All Public	5,128	7,839	8,760	921	7,099	740	10.5	81.0	8.4	90.6	9.4
All Private	1,688	7,244	12,669	5,424	4,960	2,285	42.8	39.2	18.0	68.5	31.5
All Public Decile Averages											
Decile 1	5,318	20,149	21,321	1,172	19,032	1,117	5.5	89.3	5.2	94.5	5.5
Decile 2	5,384	9,811	10,615	804	8,906	905	7.6	83.9	8.5	90.8	9.2
Decile 3	6,573	8,355	9,229	874	7,506	849	9.5	81.3	9.2	89.8	10.2
Decile 4	5,204	7,610	8,412	802	6,851	759	9.5	81.4	9.0	90.0	10.0
Decile 5	5,457	6,917	7,837	920	6,202	714	11.7	79.1	9.1	89.7	10.3
Decile 6	5,052	6,307	7,071	764	5,604	703	10.8	79.2	9.9	88.9	11.1
Decile 7	5,255	5,762	6,605	843	5,092	670	12.8	77.1	10.1	88.4	11.6
Decile 8	4,350	5,198	6,153	954	4,586	612	15.5	74.5	9.9	88.2	11.8
Decile 9	4,461	4,600	5,584	985	4,025	575	17.6	72.1	10.3	87.5	12.5
Decile 10	4,208	3,597	4,689	1,092	3,101	496	23.3	66.1	10.6	86.2	13.8
All Private Decile Averages											
Decile 1	2,420	21,135	28,061	6,926	17,612	3,522	24.7	62.8	12.6	83.3	16.7
Decile 2	1,224	11,552	17,451	5,899	8,358	3,194	33.8	47.9	18.3	72.4	27.6
Decile 3	1,068	9,233	13,816	4,583	6,522	2,710	33.2	47.2	19.6	70.6	29.4
Decile 4	1,849	7,666	13,033	5,367	4,927	2,739	41.2	37.8	21.0	64.3	35.7
Decile 5	1,422	6,471	11,433	4,962	4,046	2,426	43.4	35.4	21.2	62.5	37.5
Decile 6	1,711	5,427	10,736	5,309	3,089	2,338	49.5	28.8	21.8	56.9	43.1
Decile 7	1,679	4,534	9,884	5,350	2,555	1,979	54.1	25.8	20.0	56.4	43.6
Decile 8	2,175	3,579	8,950	5,372	1,841	1,738	60.0	20.6	19.4	51.4	48.6
Decile 9	1,743	2,413	7,548	5,135	1,076	1,337	68.0	14.3	17.7	44.6	55.4
Decile 10	1,589	488	5,826	5,338	(386)	874	91.6	(6.6)	15.0	(79.0)	179.0

Notes: Includes 2687 *institutions. The all-public group includes 1386 institutions, while the all-private group includes 1301.*

Figure 9

Costs: Subsidies and Net Tuition & Fees
All Institutions, Public and Private

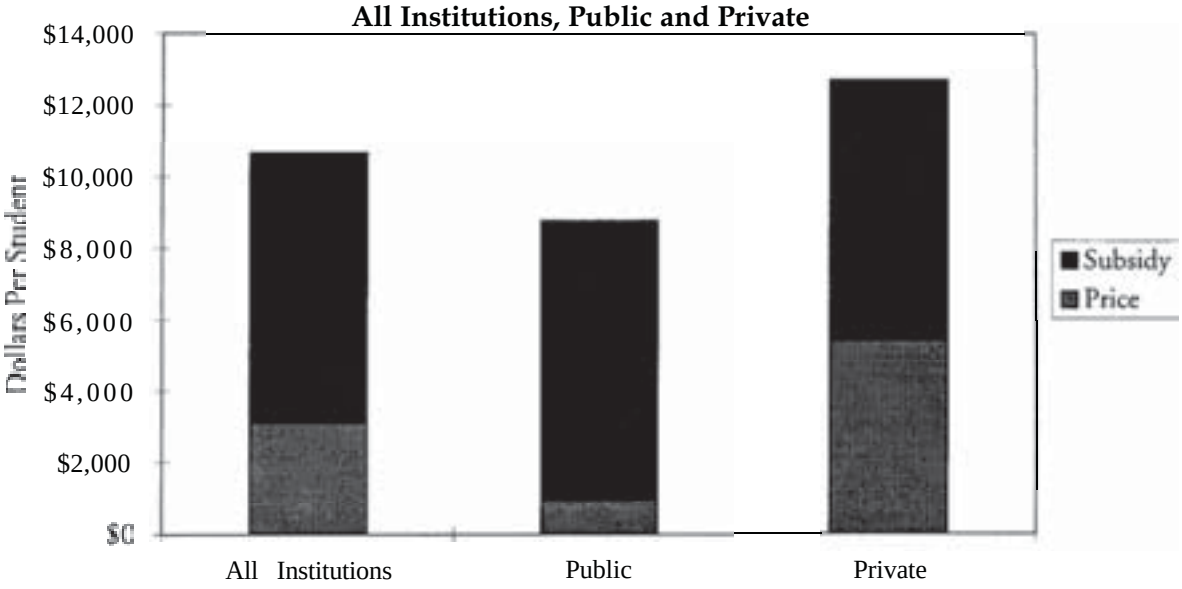
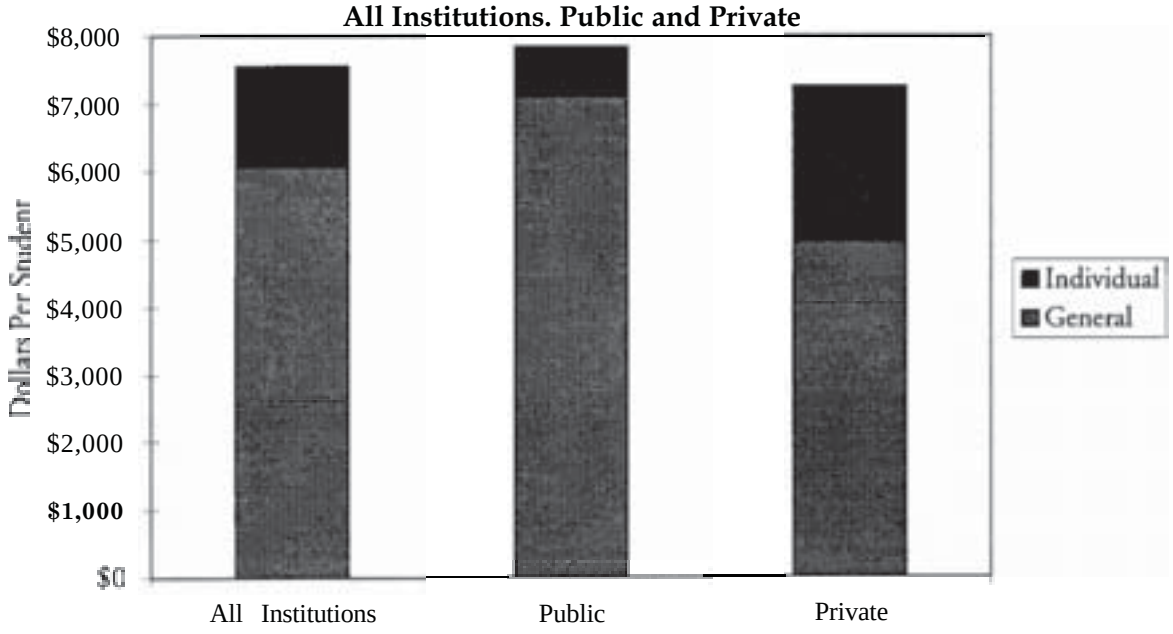


Figure 10

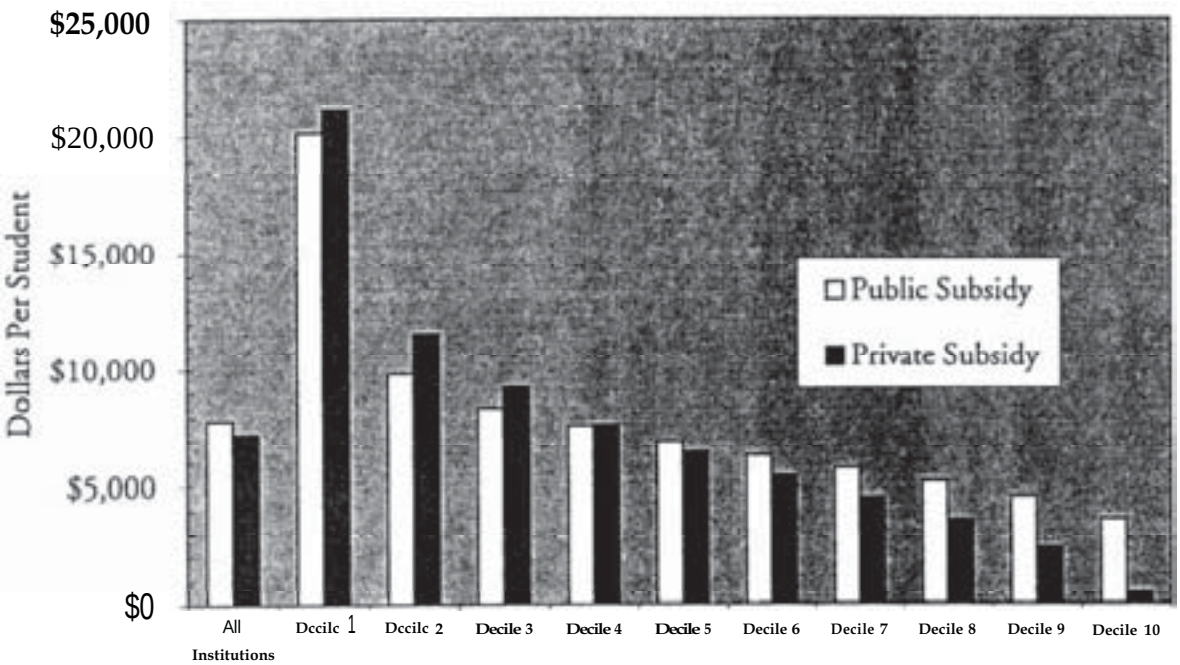
General and Individual Subsidies:
All Institutions. Public and Private



in public and private cost-price strategies. These are in the second and third sections of Table 6.

As in the aggregated data, subsidies and costs move together for both public and private institutions -- higher cost education goes with higher per student subsidies. But that said, it's clear from Table 6 and corresponding Figure 11 that not only the levels, but also the ranges of subsidy and cost differ between public and private institutions. In the public sector, the range of average subsidy from bottom to top decile is from $3,597 to $20,149 -- a factor of almost six -- while in the private sector, the range from bottom to top is from $488 to $21,135 -- a factor of more than forty. What is more, subsidies at public institutions are smaller than those at private institutions over the top part of the decile distribution and larger over the bottom part. Instructional costs, in contrast, are higher at private than public institutions over the whole range, from top to bottom decile, and their spread is less differentiated between the two sectors -- instructional costs at public institutions range from $4,689 to $21,321 -- a factor of 4.5 -- while in the private sector they range from $5,826 to $28,061 -- a factor of 4.8. This is apparent in Figure 12. So there is simply a far greater difference from top to bottom between public and private colleges in the subsidies they provide their students than in the resources they use in producing a year of education. The low subsidies are lower and the high are higher in the private than in the public sector.

Figure 11
Average **Subsidy: Public and Private Institutions**



There are also differences in what students pay for all this. Not only do they pay much less on average in the public sector, as noted above -- both in absolute dollar terms and as a share of the costs of their education -- but as subsidies and educational quality decline, students in both sectors at first pay less. In the public sector, they then pay more for the lowest cost schools; in the private sector, no strong pattern of dollar prices is apparent in the bottom half. This is column 4 in Table 6 and Figure 12. In both sectors, the highest quality-high subsidy schools charge the highest price -- net tuition and fees -- but in both sectors, students at lower quality-lower subsidy schools don't pay a whole lot less -- indeed, in the public sector, the second highest prices are charged by schools in the *bottom* decile and in private schools, four higher decile charge lower prices than the schools in the bottom decile.

Once again, it may be more meaningful to express this in terms of what the student has to pay for a dollar's worth of educational expenditure -- a price/cost ratio. That's done in Column 7 of Table 6 and in Figure 13. In both sectors, that relationship increases nearly monotonically as the value of the student subsidy declines; in other words, in both public and private schools, as students get smaller and smaller dollar subsidies, they pay a larger and larger share of their educational costs. The lowest share of their costs is born by students at the high cost/ high subsidy public institutions, where they pay about 5% of their educational costs, and the highest share is born by students at the low cost/ low subsidy private schools, where they pay almost all (92%) of those costs.

The difference between public and private sectors in this important aspect of cost and price is probably most dramatic in the fact that with no exceptions, public colleges and universities at all decile levels give their students more for their money than do private colleges and universities at any level. The least advantaged students at public institutions -- those in the bottom decile -- pay 23% of their educational costs while the most advantaged students in private institutions -- those in the top decile -- pay 25%. This is a useful fact to keep in mind in thinking about the competition for students between public and private institutions. To the extent that quality is represented by dollars of instructional costs, public institutions are simply a whole lot better bargain than private ones.

While the average data for each sector confirm what we'd expect in the distribution of subsidies among students, in both sectors the balance shifts from general toward individual aid as subsidies and costs decline. That shift, though, is quite different between the two sectors, which is evident in Figure 14. In the highest cost public institutions, 95% of the subsidy is in general aid while in the lowest cost public institutions, 86% is in general aid. The range is less than 9 percentage points. In the private sector, in sharp contrast, even the schools with the largest distribution of subsidy as general aid -- those in the top decile -- grant only 83% in that form while in those schools at the bottom with the smallest subsidies actually grant individually targeted aid in excess of their subsidy. So the negative figures for 'general subsidy' mean, quite simply, that the sticker price more than covers instructional costs, allowing these schools to grant individual aid in excess of their average subsidy. In that tenth decile of private schools, the average student gets a subsidy of only $488 while the average of individual

Figure 12

Average Costs & Prices: Public and Private Institutions

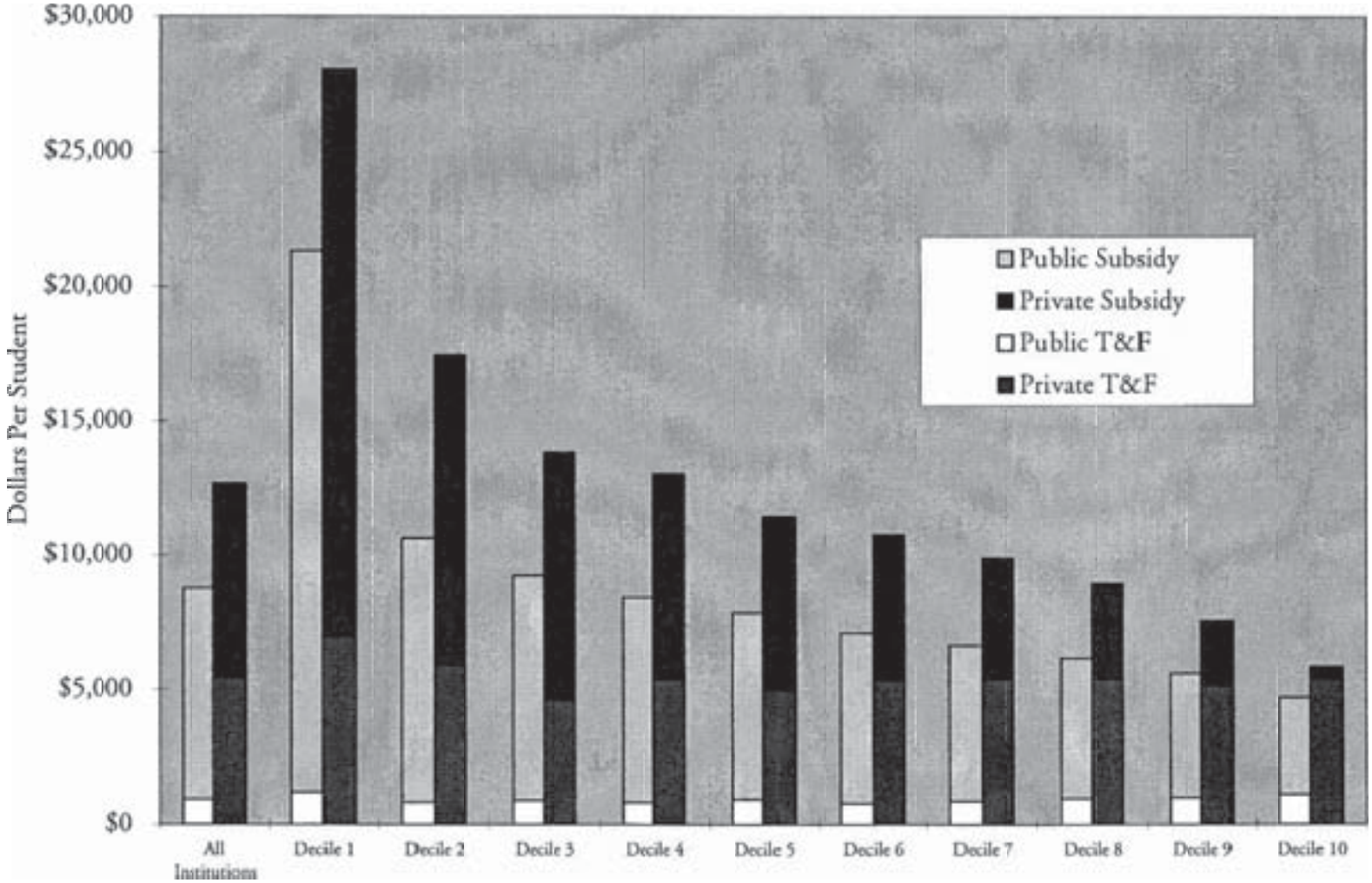


Figure 13
Price-Cost Ratios: Public and Private Institutions

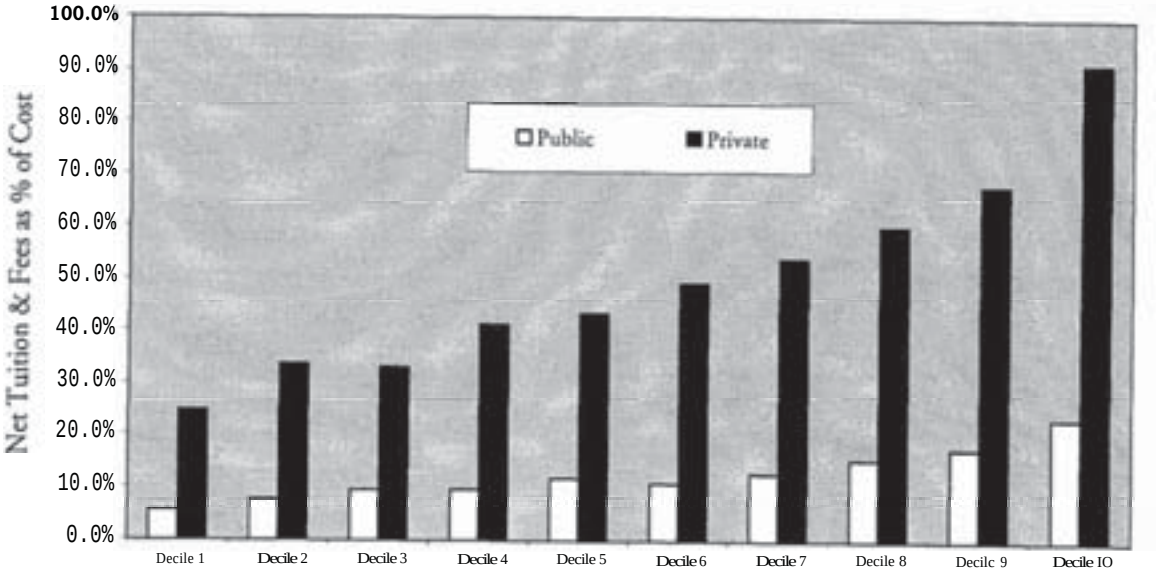
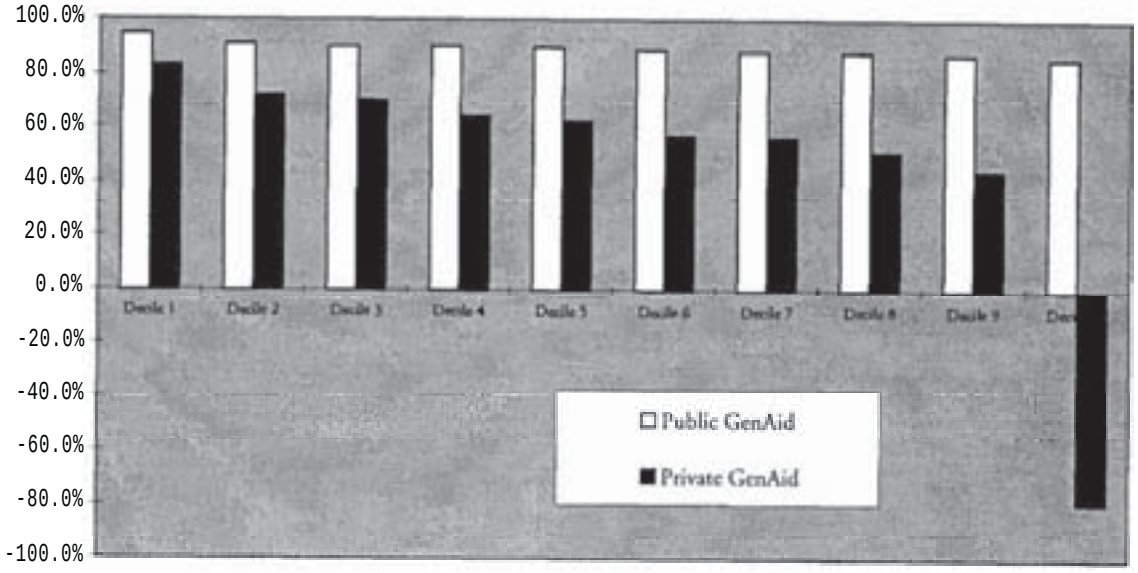


Figure 14
Shares of Subsidy as General Aid:
Public and Private Institutions



aid is $874 leaving a general subsidy of a negative $386. The sticker price, at $5,338, has to be large enough to make up the difference.[18]

To put all this somewhat more conventionally, in public institutions, sticker prices are set low enough to give virtually all students the same share of the subsidy -- with little left over for individual aid -- while at private institutions sticker prices are set much higher, allowing more price discrimination among students. In both sectors, as subsidies and educational resources fall, schools use a larger part of their subsidies for individual price differentiation until, finally, in the lowest subsidy private schools, all of the subsidy and more is given in the form of individually targeted aid. As noted earlier, these data don't let us make the further important discrimination between need- and merit-based aid _ whether the increased individual aid in private institutions and at lower levels of cost and subsidy is used to increase demand from those "willing but unable" to pay or the "able but unwilling." But it's not hard to guess.

In the search for differences between the public and private sectors that may have got hidden in our initial aggregation over all institutions, the one that emerges most clearly in Table 6 is institutional size. In the aggregates of Table 1, there appeared to be no marked trend in size in moving from high cost-high subsidy schools down to the lowest cost-lowest subsidy schools. A regression might have given significance to an inverted U-shape, but it would have had a small coefficient -- the average school across the deciles had about 3,500 FTE students. But Table 6 reveals differences between sectors. On average, public institutions are much bigger than private -- 5,128 students versus 1,688. But it seems likely that these different patterns of institutional size may be explained by differences in the source of their subsidies and selection for student quality. To the extent that the subsidies of private institutions are supported by endowment wealth or other sources of income that are unresponsive to enrollment, the school can husband its per-student wealth and continue to grant generous subsidies -- as noted above -- by restricting enrollment. The subsidies of public institutions, in contrast, are more likely to have rested on capitation -- on appropriations that are sensitive to enrollment -- so that resources to support subsidies have increased along with enrollment. In the top decile, it appears, the private schools include enough of the largest and the wealthiest to offset this tendency to husband per-student wealth by controlling size -- many are wealthy enough to have size, subsidies, and student quality together.

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18 So we find evidence of "Robinhooding" here -- charging full-pay students a price that more than covers cost so that aided students can be given reduced prices that don't cover cost. What is out of place, though, is that the accusation of Robinhooding has typically been leveled at schools like Harvard and Williams and Stanford and their policy of admitting low income students without regard to their financial aid needs. In those schools in the top decile, of course, all students get a handsome subsidy so aid policies simply decide who gets the biggest subsidies. Down here in the bottom decile where the Robinhooding actually exists, subsidies are small and it seems likely that most financial aid is given as a price discount to induce attendance.

V. NEED-BASED AND NON-NEED FINANCIAL AID

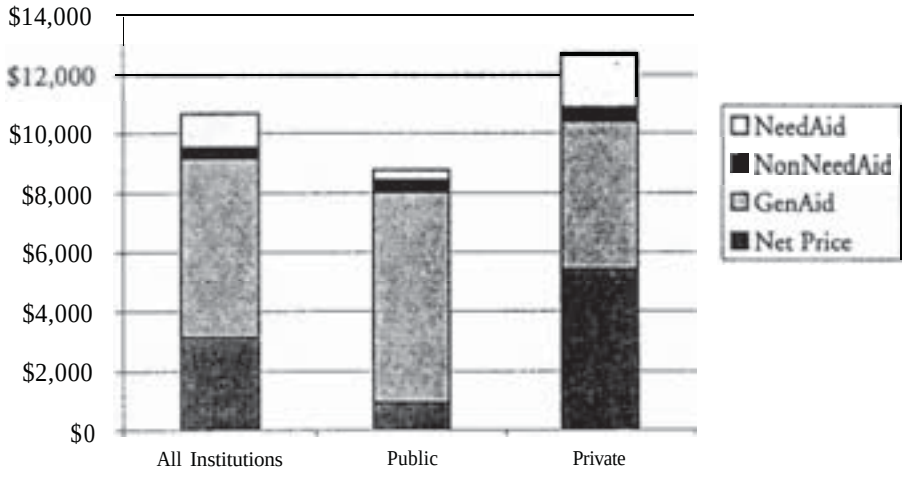
The last step in the description of student subsidies and aid -- the last bar in Figure 1 -- further divides the individually targeted financial aid component of the subsidy into its merit- and need-based parts. While that kind of information is not available from IPEDS data, the breakdown can be filled in by borrowing from a recent study by McPherson and Schapiro who analyzed Peterson's data on freshman financial aid awards at four-year schools from 379 institutions, both public and private, for the academic year, 1991-92.

Table 7 uses the proportions of non-need (merit) and need-based aid reported by McPherson and Schapiro to disaggregate the individually targeted subsidies -- total financial aid -- from our larger population. Table 7, then, can show -- for public and private sectors separately and for all institutions together -- how the total cost of a student's education was divided into four parts:

a - the part the student pays at the average institution -- his or her net price,
b - the general subsidy granted equally to all students by a sticker price set below costs,
c - the part of the subsidy targeted to students on the basis of merit,[19] and
d - the part targeted on the basis of their need.

Figure 15 presents the same information graphically, from per student costs through general subsidies to need- and merit-based financial aid.

Figure 15
Need-Based and Merit Aid, Costs, Prices, and Subsidies:
Public and Private Institutions



19 Note that McPherson and Schapiro omitted athletic scholarships from their definition of merit aid.

Table 7

Need-Based & Merit Aid, Costs, Prices, and Subsidies
Average Per FTE Student

	Average Enrollment (FTE)	costs: Instructional E&G&K	Price: Net Tuition & Fees	Subsidy: Cost-Price	General Aid	Non-Need Aid	Need-Based Aid
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
All Institutions	3,462	10,653	$3,101	7,551	6,063	$357	$1,131
Public	5,128	8,760	$921	7,839	7,099	$415	$326
Private	1,688	12,669	$5,424	7,244	4,960	$480	$1,805

The Distribution of Costs

	Net Price/ cost	Subsidy/ cost	General/ cost	Non-Need/ cost	Need-Based/ cost
	(1)	(2)	(3)	(4)	(5)
AU Institutions	***29.1%***	***70.9%***	***56.9%***	***3.4%***	***10.6%***
Public	***10.5%***	***89.5%***	***81.0%***	***4.7%***	***3.7%***
Private	***42.8%***	***57.2%***	***39.2%***	***3.8%***	***14.2%***

The Distribution of Subsidies

	Gen. Aid/ Subsidy	Non-Need Aid/ Subsidy	Need-Based Aid/ Subsidy	Non-Need Aid/ Targeted Aid	Need-Based Aid/ Targeted Aid
	(1)	(2)	(3)	(4)	(5)
All Institutions	***80.3%***	***4.7%***	***15.0%***	***24.0%***	***76.0%***
Public	***90.6%***	***5.3%***	***4.2%***	***56.0%***	***44.0%***
Private	***68.5%***	***6.6%***	***24.9%***	***21.0%***	***79.0%***

Source: McPherson and Schapiro, Merit Aid: Students Institutions, and Society, WPEHE, DP-28 (1994).

What is most striking when these two often-separate issues are joined -- when need- and merit-based aid are viewed in the same context as the general institutional subsidy and costs -- is how very differently public and private institutions divide the quite similar levels of per-student subsidy. The difference of $595 between public and private sector subsidies breaks down into a much larger, $2,139, excess of public over private *general* subsidies with, again, almost no difference, $65, in per-student *merit aid,* but then a whopping $1,479 difference in per student *need-based aid.*

The center section of Table 7 shows the distribution of average per-student costs in percentage terms while the bottom section shows the distribution of the total subsidy. Less than 11% of the cost of public education is paid for by the student while nearly 43% of the cost of private education is reflected in its net price. 81% of the cost of public education covered by a general subsidy with very little met by either need-based (3.7%) or merit-based (4.7%) financial aid. The very different strategy of the average private institution sees only 57% of costs covered by a general subsidy but more than 14% offset by need-based aid. Public and private schools, on average, subsidize just about the same (small) proportion of costs through no-need or merit aid -- 3.8% for private schools and 4.7% for publics. The bottom section of Table 7 shows the proportional distribution of the subsidy between general, need- and merit-based aid.

With their very similar levels of per-student subsidy, then, the characteristic patterns -- in costs, prices, and aid -- see public institutions producing an education that costs about 2/3rds what a private education does and pricing it to give all students a very large subsidy with negligible shares supporting financial aid, either merit or need-based. What financial breaks any student gets at a public institution, every student gets. Private institutions, in contrast, ask students to pay a much larger share of their higher cost education in the direct form of the net price, so educational costs are much less subsidized. But what subsidies there are are far more biased toward students with demonstrated financial need.

It would be interesting and useful to be able to say something about how much of his total educational costs are born by the typical financial aid student, but the data we have describe the institution's total "spending" on financial aid -- discounting from the sticker price. Without information on the number of need- and no-need financial aid students who get those discounts, we can't know their impact on the average aided student. We can, though, see that the "full pay" student who gets only the subsidy implicit in the sticker price will pay $4,590 or about 43% of his costs. In the average public institution, he'll pay $1,661 or 19% of his costs and in the average private institution, he'll pay $7,709 or 62% of his costs.[20]

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20 These figures don't appear in the tables -- they are got simply by subtracting the general subsidy from total costs.

VI. WHAT DO WE LEARN FROM ALL THIS?

All of these tables and graphs and facts serve, we think, two primary purposes. They describe the outlines of a hierarchy of institutions in US higher education differentiated by their economic circumstances and economic behavior -- their cost, pricing, and aid strategies -- rather than primarily by type or control or region or function. They stress a neglected dimension of the deep heterogeneity of higher education -- the fact that even in these crude aggregations, we find students in one category paying six cents on the dollar for a $2 1,000 a year education and students in another paying ninety-two cents on the dollar for a $5,800 education. These data must, we think, reinforce the use of extreme caution in generalizing about the economics of US higher education.

The other purpose that these data serve is related. They provide the raw materials for better understanding the economic character of higher education and the strategic decisions that lie behind these numbers -- what facts inform price and cost decisions of institutions; the role of institutional wealth; competition among schools that face very different cost-price margins because they have very different subsidy resources; the relation of both institutional and student quality to prices and subsidies; the strategies of sticker pricing that allocate a subsidy between general and individually targeted aid.

But both of these purposes imply more studies and further analysis of the data. What patterns, more modestly and more immediately, have been revealed in these data, themselves? We think the following adequately summarize these numbers:

- in US higher education, students typically pay a price, net tuition and fees, that covers about 30% of the costs of their education -- 70% of that cost is subsidized.
- in 199 1, the average school provided a $10,650 education at a net price to its students of $3,100, thereby granting each of them a yearly subsidy of $7,550.
- subsidies are distributed predominantly (80%) in the form of “general aid,” given equally to all students at a college by setting the sticker price well below educational costs; so only a smaller amount of the subsidy (20%) can be distributed on the basis of individual students’ characteristics.
- borrowing from McPherson and Schapiro, it appears that among all institutions, about 15% of the subsidy takes the form of need-based financial aid while less than 5% is in merit aid.
- because the costs of capital services represent about one-third of instructional costs, their conventional neglect seriously understates student subsidies.
- students at public and private institutions get quite similar yearly subsidies: $7,839 at public and $7,244 at private colleges and universities.

- student subsidies differ markedly between public and private sectors in the proportion of educational costs they cover -- subsidies are nearly 90% of the student's cost in public colleges and universities and less than 60% in private schools.

- schools in the public and private sectors differ in how they distribute subsidies: more than 90% of public subsidies are in general aid set by low sticker prices while less than 70% of private subsidies are distributed that way. So 30% of private and 10% of public subsidies are distributed as individually targeted student aid.

- public and private sector schools differ, too, in their financial aid policies with 25% of private subsidies given as need-based aid but only a bit more than 4% of public subsidies given on the basis of need. Merit-based aid makes up almost 7% of private subsidies and a bit more than 5% of public subsidies.

- public and private institutions spend very different amounts on their students' education: on average, private institutions spend half again as much as public institutions ($12,669 versus $8,760).

- so students at private institutions pay about $4,500 more in net tuition and fees for that education -- compared to students at public institutions, they get more (by 50%) but they pay more (by 400%).

- across all schools, subsidies increase faster than educational costs so the share of instructional cost that a student pays is markedly lower for high cost-high subsidy schools (18%) than for low cost-low subsidy schools (78%). This is a measure of what the student pays for a dollar's worth of education.

- students in the bottom ten percent of these schools pay more, in actual dollars, than do students in the top ten percent -- though those in the top schools get a $25,500 a year education while those at the bottom get one that costs $6,500.

- so students get more at high-cost schools -- they get larger subsidies in terms of both dollars and share of educational costs.

- since net tuition and fees are higher at high-cost schools than at those in the middle, however, some students may be 'liquidity constrained' from taking advantage of the bargain they represent.

- at high cost-high subsidy schools, a smaller fraction of the subsidy is given in the form of individual aid -- more is given through a low sticker price as general aid. More takes the form of individually targeted aid at low cost-low subsidy schools. This is true for both public and private sectors.

- public institutions, on average, are much larger (5,128) than private institutions (1,688).

APPENDIX ON CAPITAL AND CAPITAL SERVICE COSTS

This appendix describes our procedures for estimating capital service costs for the 2687 schools in this study. The immediate purpose was simply to derive reasonable estimates of the value of the capital services that are used in instruction in each of these institutions in order that our subsidy calculations -- the cost of the average student's education less the net price he pays -- would adequately reflect all costs.

IPEDS asked schools to report, for all of the capital used in their activities: book values of buildings (B_b), equipment (E_b), and land (Lb), along with replacement values for buildings (B,) and equipment (E,). Reported values include capital stocks *used* by the institution as well as those rented or (as in a case like the SUNY system, inter alia) those provided by a separate agency without explicit charge.

If all five of these aspects of capital value were reported with accuracy by all schools, calculation of their yearly capital service costs would be straightforward: a defensible estimate of yearly real economic depreciation, d, would be joined with a defensible estimate of the opportunity cost of capital, r, to generate a yearly rental rate, $(d+r)P_kK$ where P_k is the current replacement price of a capital stock of size K so P_kK is the replacement value of that capital stock. For depreciation, we have used the 2.5% suggested by campus physical planners [see Dunn or Probasco] and for opportunity cost we have used the long term Federal bond rate which was 8.55% in 1991. We assigned a zero value to the depreciation of land (so we ignored improvements) and expressed land in current replacement values. So the rental rate we use is $d(B_r+E_r) + r(B_r+E_r+L_r)$.

But in fact, of course, things are more complicated than that. The primary problems with actual IPEDS data are the frequently missing data and the possibility of double counting.

1. Missing Data

Not all schools reported all live of the figures requested by IPEDS. What is more, the CASPAR financial data from IPEDS do not allow us to distinguish between 0 entries and blanks -- so we can't tell the difference between a genuine value of 0 and the simple absence, *per se*, of information. Dealing with capital values this is a less severe problem than it can be for other variables since we can safely assume that educational services cannot be produced without capital, fact that allows to interpret all such zero-blank entries as blanks and proceed to estimate their missing values. Since IPEDS asked for the value of all capital used whether owned or not, it seems highly unlikely that zero could be the correct value for any functioning school's capital stock.

To estimate missing entries, we used relationships among these five dimensions of the capital stock (and a measure of 'output') that appeared in the reported data to fill in the blanks. The first broad step involved getting replacement values for all components of the capital stock for each school, the second involved estimating the yearly cost of their

capital service flows, a third allocated capital costs -- like other joint costs -- to instruction.

- 1,929 schools reported both book (B_b) and replacement values (B,) for buildings.

- 404 schools reported book value of their buildings (B_b) but not replacement value (B,). To estimate these, we ran a simple zero-intercept linear regression of replacement value on book value, using the 1,929 reported values, and used that coefficient, $B_r = 2.138B_b$ to fill in building replacement values for those 404 schools .

- 1,763 schools reported both book (E_b) and replacement values (E,) for equipment.

- for the 620 schools that reported a book value of equipment but not its replacement value, we again used a linear regression on the 1,763 reported values to fill in the blanks. The coefficient was $E_r = 1.364E_b$.

- there were 2,331 schools with reported or estimated replacement value of buildings (B,) and equipment (E,).

- for 11 schools that reported the value of buildings but not that of equipment, we used reported replacement and estimated values of buildings and equipment to establish the coefficient, $E_r = 0.323B_r$. Note that this coefficient is substantially larger than Brinkman's reported in Duc-Le To.

- 290 schools did not report either book or replacement values for either buildings or equipment. To fill in these blanks, we estimated a capital-output ratio from the 2,342 schools for which we had either reported or estimated capital values. We used as output,

  Q = Adjusted E&G plus Auxiliary and Hospital and Independent Operation expenditures (less all Scholarships and Fellowships and Transfers, Mandatory and Non-mandatory).

  The result was a coefficient, Kr = $B_r + E_r = 2.202Q$.

- this coefficient was used, too, to estimate the replacement value of the capital stock for those 55 schools that reported the value of equipment but not buildings -- the alternative of simply using the relationship in step 6 above was dismissed as amplifying, unacceptably, any noise in reported equipment values -- going in the other direction, from building to equipment values, such noise is damped.

- for the 424 schools that did not report a book value of land, we estimated it on the basis of the relationship between reported and estimated building and equipment replacement values and the book value of land so $L_b = 0.028(B_r + E_r)$.

- although IPEDS asked schools to report only book values of land, its replacement value in current dollars is clearly more relevant to current capital costs so we estimated the replacement value of land as 2.138 of its reported book value, using the coefficient reported above that our data produced between replacement and book value of buildings. This assumes that land has appreciated with inflation at the same rate, on average, as buildings. This adjustment to replacement value of land was done for all schools.

The result of these steps is a set of reported estimates of current replacement values for buildings, equipment, and land for each of the 2678 schools in our population. From these data on current replacement values of physical capital, the yearly costs of total capital services for each school, i, were estimated as:

Capital service cost for the ith school = $2.5 * (B_i + E_i) + 8.55 * (B_i + E_i + L_i)$

using the depreciation and opportunity cost rates described above. These total capital service costs for each institution were then allocated to instruction in proportion to the role of instructional costs in total current costs:

Instructional $costs_i/(E\&G_i + Auxiliary_i + Hospital_i$ + Independent Operationsi - Scholarships & $Fellowships_i$ - Mandatory and Non-Mandatory Transfersi).

2. Capital Ownership, Double Counting, and Deferred Maintenance

Since IPEDS appropriately asks schools to report the value of all of the buildings, equipment, and land used in their activities, we were able to generate a measure of the total yearly cost of capital services for each institution, as just described. But there is the potential for overstating capital costs for two reasons. Our method will (a) double count to the extent that all or part of these capital service costs are already included in reported current costs and (b) simply overstate capital costs to the extent that replacement values overstate the current value of the capital stock by ignoring accumulated deferred maintenance, thereby overstating opportunity cost.

One source of potential double counting was eliminated when we subtracted from E&G (and Auxiliary and Hospital and Independent Operations expenditures) the mandatory and non-mandatory transfers that are sometimes a device for reflecting capital services in current costs. Our procedure, in effect, replaces a highly idiosyncratic, even quixotic, recognition of capital costs with a systematic one.[21]

But variations in the ownership of the capital stock -- hence the source of the capital service flows -- could also produce double counting in our procedures. Our method is appropriate for a school that owns its capital stock outright (whether or not it is

21 Whether these transfers will or won't acknowledge capital costs in excess of legally obligated debt service is entirely at the discretion of the institution, therefore the subject of considerable inconsistency.

used as collateral on indebtedness) -- once mandatory and non-mandatory transfers are got rid of, no other part of the current accounts will include capital costs. But to the extent that a school rents its capital services, those rental charges will show up in current spending but *not* in a way that can be identified as rental payments so that we could avoid counting them twice. Finally, when capital services are provided, as such, by another agency, our method won't distort the measure of total capital costs. When we turn, in a later phase of this study, though, to examine the sources of subsidy resources, it will be difficult to attribute these services, as is appropriate, to gifts in kind. We doubt that double counting of costs in the presence of rented capital is of real practical moment, but we can't be sure.

The potential for overstating the true value of resources tied up in a capital stock -- hence the opportunity cost of that capital -- by using replacement values without an adjustment for accumulated deferred maintenance is best seen by analogy with the value of an institution's financial capital.[22] Assets represent the gross value of its financial holdings. Financial wealth, or "net worth," recognizes any offset to those financial assets in the form of financial liabilities. So *net* worth is assets less liabilities. A school (or firm or family) with $100 million in assets and $40 million in outstanding debt has a net worth of $60 million. To ignore debt and act as if all assets were unencumbered would be highly misleading. The same relationships hold with respect to physical capital only here the value of 'assets' is the replacement value of the plant and equipment while the 'liabilities' are accumulated deferred maintenance. Their difference is 'net physical worth,' the measure of wealth held in the form of physical capital. So a school that owns land, buildings, and equipment with a replacement value of $100 million on which it has accumulated $40 million in deferred maintenance has a net physical worth of only $60 million.[23]

The opportunity cost of owning physical capital recognizes the yearly cost incurred because resources are tied up in a physical form that yields no explicit return rather than in the financial form that does. If a school has accumulated no deferred maintenance, the replacement value of its physical capital is the appropriate base for reckoning its opportunity cost. This is the opportunity cost we've used. But when a school defers maintenance spending, it effectively 'liquidates' or converts that portion of its physical wealth to cash, releasing it for other uses, including investment in financial assets. So it eliminates, to that extent, some of the opportunity cost of holding its physical capital. If the school with that $100 million capital stock incurs $2.5 million of real depreciation each year and spends that much to offset it, deferred maintenance is zero and (ignoring inflation) the capital stock is worth $100 million at the end of the year, just as it was at the beginning of the year. An opportunity cost is incurred by the full $100 million in resources -- all of them are tied up at the end of the year as they were at the beginning. But if, instead, the school spends nothing on required maintenance during the year and the full $2.5 million of maintenance is deferred, only $97.5 million of resources

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22 See Winston, *Planning.*

23 In a set of stable competitive markets with perfect information, net physical worth would describe the market price of the capital stock.

will incur an opportunity cost -- the $2.5 million not spent on maintenance can be spent, inter alia, on financial assets that do earn a return. After, say, ten (inflation-free) years of deferring all maintenance, a quarter of the replacement value of the capital stock will have been thereby 'liquidated' so an opportunity cost will be incurred only by the remaining $75 million -- the school's 'net physical worth' -- even though its replacement value remains unchanged at $100 million.

There is, unfortunately, no way to estimate accumulated deferred maintenance for the individual schools of this study -- indeed, it is a difficult and controversial task to estimate it for a single institution. So it must remain a source of potential overstatement of capital costs. To put it in perspective, if a school had accumulated deferred maintenance equal to 25% of the replacement value of its capital stock -- a considerable amount -- our method would overstate its capital costs by 20%. Again, we doubt that this is a problem of importance, but we can't be sure.

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