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Affordability: Family Incomes and Net Prices At Highly Selective Private Colleges and Universities

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Discussion Paper No. 66r

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Affordability: Family Incomes and Net Prices

At Highly Selective Private Colleges and Universities

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DP-66r

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Abstract

College tuition is frequently compared, in press and politics, to the US median family income. That is, however, a highly misleading benchmark since schools with need-based financial aid rarely charge students from median income families the reported sticker price.

Working from the financial aid records of individual students at twenty-eight highly selective private colleges and universities (COFHE schools), we addressed two questions: what do the highly able low income students at these schools actually pay, net of financial aid grants, for a year's education and how do these schools differentiate their prices in recognition of the different family incomes of their students – the concrete evidence of their dedication to equality of opportunity? The answer to the first question is that while there is considerable variety in net prices, many of these expensive schools charge their low income students very little (one, less than $800 a year for the average student in the bottom income quintile), making it quite reasonable for a highly able student to aspire to go to a very selective private college or university regardless of family income. The second answer also reveals considerable variety among schools. Virtually all of them charge students in the bottom income quintile a lower net price, on average, than they do their wealthier students, but at some, net price as a share of family income rises as incomes increase while at others it falls. Most, however, follow pricing policies that embody rough proportionality between net price and family income over the whole range of the student incomes, including those paying the full sticker price. The net prices that remain to be paid by aided students are covered, of course, by direct payment and "self-help" – loans and student jobs.

In these data, the error in the popular representation of tuition and income is clear: the average sticker price is 66% of median US family income but the average student at that level pays just 23% of family income.

I. Introduction

With nearly 240,000 individual financial aid decisions from 28 highly selective colleges and universities, we address two questions: "What are the tuition and financial aid policies with respect to family incomes at the nation's premier private colleges?" and "To what extent do those policies make that kind of education affordable to a highly talented low income student?" Not many students meet the admission standards of selective schools, but affordability for those who do goes to the heart of the time-honored American ideal of equality of opportunity – *can* a hard working and highly able poor kid realistically afford to go to Harvard or Swarthmore or Stanford?

The schools in this study all give need-based financial aid and many of them combine it with need-blind admissions. It's important that this practice – in which an institution sets its prices individually in order that 'customers' at different income levels can afford to buy the product – is highly unusual, embodying a "distributional objective" (Steinberg and Weisbrod 2002) that appears to be confined to the non-profit-charity sector. Of course, business firms with some monopolistic market power often set different prices for different customers, but they do it in order to maximize profits through price discrimination so both their incentives and the relation of their price differences to customers' incomes are very different from these schools'. In this paper, we consider only the charitable pricing implicit in need-based financial aid grants, not the competitive pricing of merit aid price discounts or price discrimination.

II. Pricing and Need-based Financial Aid

The procedures by which need-based financial aid is awarded are quite straightforward, if not easy of accomplishment. The school examines a family's economic circumstances – including income, wealth, number of children in school, regional cost of living, unusual medical or retirement demands, etc. – to determine how

much it can afford to pay for the student's year of education. Subtracting that from the sticker price (plus an allowance for some other costs) establishes the size of the financial aid award which is then "packaged" in some combination of grants, loans, and job. So the first step is determination of a family's need ("need analysis"); the second step is determining how that need will be packaged; a school's financial aid (and pricing) policies[1] are embedded in both of these decisions.

This study focuses on schools' pricing (grant) policies within financial aid that determine *how much they charge their students at different levels of family income.* While we recognize the other side of financial aid policy and practice – *how schools help students to pay the resulting net price* – and the potential significance that those non-price measures may have for student equity and behavior, pricing, *per se*, remains the more fundamental aspect of financial aid policy and the subject of this paper. Pricing is, what's more, the aspect on which the press, the public and politicians focus[2] so it seems important to view it separately. So, too, with family income. While the description of the financial aid award process above makes clear that income is only one of a host of family characteristics on which aid awards and their packaging – hence net prices – are based, it remains the most basic to evaluating need-based aid policies. Pricing policy is embedded in both stages of the financial aid procedure – the evaluation of a family's need and the packaging of the resulting financial aid award.

Important economic differences that lurk within "a financial aid award" are clear in a more ordinary transaction. If one were sold a $30,000 car for $20,000, that price discount would be equivalent to grant aid. With a loan, the car would be sold for $30,000, but the buyer would be allowed to pay off, say, $10,000 of it over a few years' time. With job aid, the car would still cost $30,000 but he'd pay only part up front, then wash newly delivered cars until it was fully paid off. So the separation of financial aid into net price, on the one hand, and self-help, on the other, is pretty basic.

[1] These policies may or may not be the result of conscious decision; they describe a school's behavior.
[2] Studies of student response to (net) price by income level have played a central role in evaluating student aid policies (Kane, McPherson, Baum, and Ehrenberg).

While this study concentrates on pricing policies, self-help – loan and job – raises important questions for need-based financial aid policy, too. The effects on graduate education or occupational choice of accumulated loan burden are of wide concern as, with less intensity, are the hours for work that can divert a student's energies from education (Baum and Saunders 1997). And while both loans and work are often praised as requiring a beneficial personal commitment by the student – "sweat equity" through the job and an investment in their future income through the loan – it is less clear why a school's pricing and aid policies should restrict that benefit to low income students.

Affordability, then, is judged by the net price (net tuition[3]) that students actually pay for a year of college, relative to their family incomes. It's been popular in the press to report schools' sticker prices – the maximum price they charge – relative to US median family income, implying that a family at that level will spend a significant fraction of its total income to send one child to college – 66% at the typical school in this study. But that's highly misleading because a student from a median income family won't pay the sticker price at a school with need-based financial aid – his average *net* price at these selective schools in 2001-02, in fact, was $11,556, which is just 34% of their average sticker price and 23% of the US median family income. (At one school, indeed, the average student from the bottom quintile of the family income distribution paid $796, about 2.5% of the sticker price.) Our data, then, allow us to compare the price each student actually paid, net of financial aid grants, with his family's income. So, on the one hand, we can report the net prices paid by low income students and how they compare with their families' incomes and, on the other, we can describe schools' pricing policies across the range of family incomes as the prices charged their students differ for different incomes.

II. Schools, Students and Data

We have data from the financial aid records of matriculated students at twenty-

[3] These schools are primarily residential, so "tuition" or "price" means the sum of tuition, room, board and fees or total student charges.

eight of the thirty-one COFHE colleges and universities.[4] The COFHE schools are: *Coeducational colleges*: Amherst, Carleton, Oberlin, Pomona, Swarthmore, Trinity, Wesleyan, and Williams; W*omen's colleges*: Barnard, Bryn Mawr, Mount Holyoke, Smith, and Wellesley; *Ivy League universities*: Brown, Columbia, Cornell, Dartmouth, Harvard, Penn, Princeton, and Yale; *Non-Ivy universities*: Chicago, Duke, Georgetown, Johns Hopkins, MIT, Northwestern, Rice, Rochester, Stanford, and Washington University. And while we have data for some of these schools over as many as eleven years, we focus on the academic year 2001-02 since that gives the most current picture that is informed by the largest number of schools. It was a condition of our access to these data that individual schools' results not be identified, so in what follows, we'll report averages for the whole population and for the four COFHE school types along with, frequently, some sense of range or distribution of results and some regrouping of schools according to their policies and performance, but in no case is an individual school's behavior evident (where individual school results are reported or pictured, the schools are not identifiable). For 2001-02, we had 41,401 usable financial aid records in a population of 108,721 matriculated US undergraduates at these twenty-eight schools. Putting data from the records of twenty-eight separate institutions into a comparable form was, predictably, a formidable job that inevitably involved some arbitrary decisions and left a few loose ends; these are described in the Appendix.

Our two questions – of low income affordability and of schools' pricing policies with respect to incomes – focus on the fact that "student access to college" has two parts: getting in and being able to pay.[5] A student has to satisfy a school's admission standards and he has to be able to pay the price it charges him: admission and affordability. In these schools, the admission standards are among the most demanding in the country and not many students – rich or poor – are able to satisfy them, so we're dealing with a small and entirely atypical population. But it is an important population, quite out of proportion to its numbers, both because COFHE schools are highly visible – to the

[4] "COFHE" is the Consortium on the Financing of Higher Education that includes the 31 private colleges and universities listed above. Three COFHE schools did not participate in the study, leaving us with data for 28 schools for 2001-02.

[5] Matriculation adds the third element of student awareness and choice of application and attendance.

public, policy makers, and other schools – and because of the social importance of low income access to these schools.[6] Given the high correlation between family income and academic preparation, most of the students at these schools are from high income families – only a handful of low income students will have passed the first, admissions, hurdle. So it becomes of particular importance to find out whether those few high achieving low income students who *do* make it past the admissions barrier are then blocked by a price barrier. Hence, "What does a poor kid pay to go to a high priced college?"

Table 1
Distribution of Students by Family Income
(2001-02)

	Family Incomes of Aided Students					Total Aided Students	Full Pay* Students	Total Enrollment
Income	**Low**	**Lower Middle**	**Middle**	**Upper Middle**	**High**		**95th % tile**	
Lower Bound	-	$24,001	$41,001	$61,379	$91,701		$160,250	
Quintile Median	$15,347	$32,416	$50,890	$74,418	$113,689			
Number of Students								
COFHE Schools	5,086	5,956	8,053	12,086	15,868	48,786	59,935	108,721
Coed Colleges	698	958	1,242	1,951	2,211	7,181	8,290	15,471
Women's Colleges	532	641	752	962	884	3,989	4,631	8,620
Ivy League Universities	2,079	2,290	3,130	4,747	7,020	19,759	25,850	45,609
Non-Ivy Universities	1,777	2,067	2,929	4,426	5,753	17,857	21,165	39,022
Percent of Total Enrollment								
COFHE Schools	5%	5%	7%	11%	15%	45%	55%	100%
Coed Colleges	5%	6%	8%	13%	14%	46%	54%	100%
Women's Colleges	6%	7%	9%	11%	10%	46%	54%	100%
Ivy League Universities	5%	5%	7%	10%	15%	43%	57%	100%
Non-Ivy Universities	5%	5%	8%	11%	15%	46%	54%	100%

No foreign students are included.
**Full Pay Students = Total Enrollment less Aided Students*

Table 1 describes the population of undergraduate students at these schools and its distribution by family income, aggregated over all schools together, and over the four COFHE school types, separately. Foreign students, it's important to note, are excluded

[6] See Carnevale and Rose for discussion of both the existence of low income students who can qualify for these schools and why we should care about whether they can and do attend (Carnevale and Rose 2003).

from the data analysis – the issue is access and pricing for American students. The panel at the top of the table reports the numbers of aided students in each income quintile, along with Total Aided Students,[7] Full Pay Students, and Total Enrollment. The second panel reports these as percentages of total enrollment – the distribution of students over family incomes. We don't, unfortunately, have information about family income for those students who didn't get financial aid, but given the strongly need-based financial aid policies of these schools, we assume throughout that those who did not apply for aid have family incomes that put them in the top quintile where they pay the full sticker price. Family incomes are divided into quintiles based on US census data, so the divisions used here represent the national distribution of pretax family income. The ranges that define those quintiles are reported in Table 1 along with the median income of each quintile – the median for the third quintile is, of course, the national median family income.

Of the 108,721 American undergraduate students who matriculated at these schools in 2001-02, most of them, by far, were at the eight Ivy League schools (42%) and the eight non-Ivy universities (36%). The four women's (with 8%) and eight liberal arts colleges (14%) have considerably smaller shares of this population. But what comes through most clearly in Table 1 is simply the high levels of family income typical of these student bodies. Over the whole of this population, only 45% of the students were on financial aid [8] and only 10% came from families in the low and lower-middle income quintiles – the bottom 40% of the national family population. Most of these students have high incomes and most paid a sticker price that averaged $33,831. That pattern is replicated for the four school groups taken separately (see Figure 1), though the coed and women's colleges have, on average, slightly larger shares of lower income students than the others (combining the bottom two quintiles). Behind these figures, individual schools show more variation in student incomes as indicated in Figure 2 where the enrollment shares by family income of the 28 schools are pictured individually, ordered by the share

[7] Because of ambiguous income data on a few of the aided students, the quintile columns don't add up to the "Total Aided Students" – 1,737 students, 2%, were involved. See the Appendix.
[8] These figures on the number of financial aid students include those getting only loans or jobs along with those getting grants.

of lower income (quintiles one and two) students. They vary from 3% to 8% while the share of high income students (quintile five plus non-aided students, together) varies (almost inversely) from 55% to 77%.

Figure 1
Distribution of Students by Family Income
COFHE Groups
(2001-02)

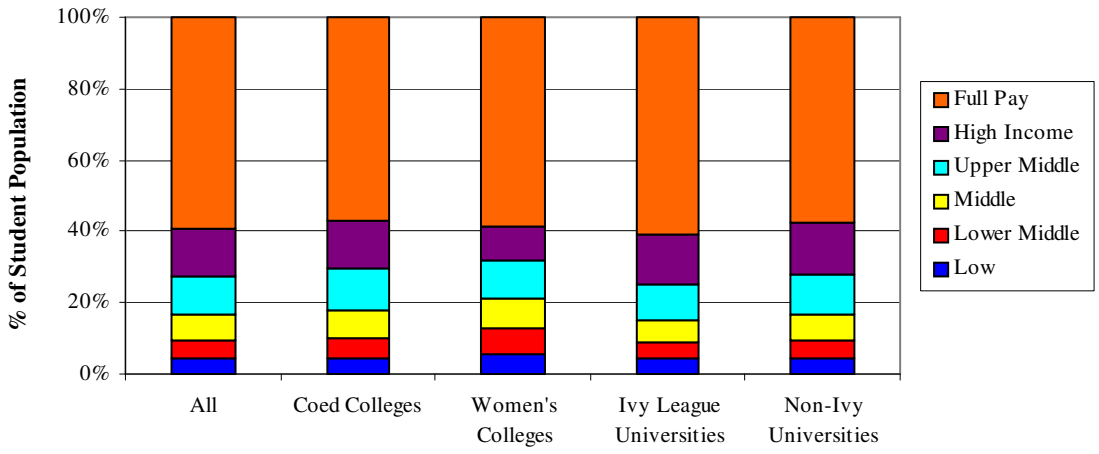
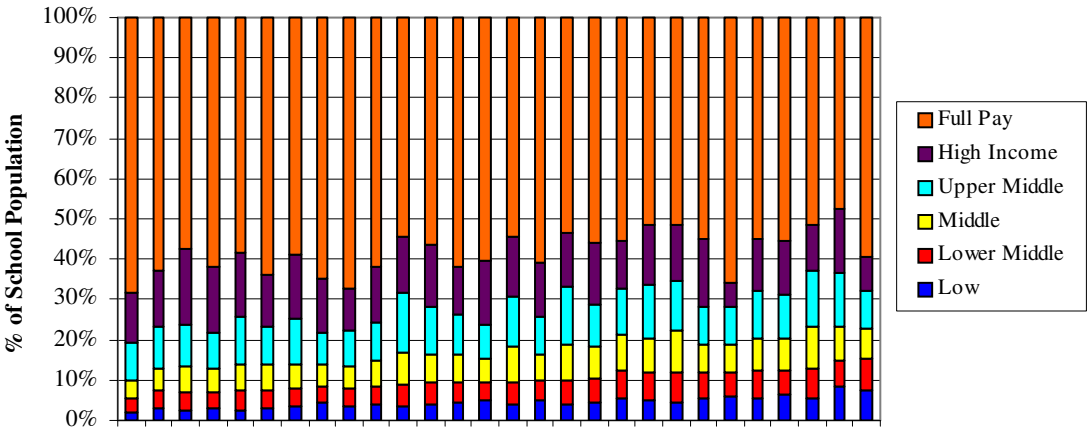


Figure 2
Distribution of Students by Family Income
Individual Schools
(2001-02)



III. Findings

Table 2 summarizes the facts that emerge from these data relevant to both of our questions about pricing and affordability. Across the columns are the family income quintiles for the aided students with average net price (p_n) in the first panel, net price as a share of sticker price (p_n/p_s) in the second, and net price relative to quintile median family income (p_n/qmi) in the third panel.[9, 10]

Table 2
Distribution of Average Net Prices by Family Income
(2001-02)

	Family Incomes of Aided Students						Full Pay
Income	**Low**	**Lower Middle**	**Middle**	**Upper Middle**	**High**	**Average Aided Student**	**95th %tile**
Lower Bound	-	$24,001	$41,001	$61,379	$91,701		$160,250
Quintile Median	$15,347	$32,416	$50,890	$74,418	$113,689		
Average Net Price							**Sticker Price**
COFHE Schools	$7,552	$8,547	$11,557	$16,365	$23,690	$16,058	$33,831
Coed Colleges	$5,487	$7,280	$10,374	$15,259	$22,738	$14,726	$33,403
Women's Colleges	$7,863	$9,676	$13,134	$18,297	$25,663	$16,010	$33,708
Ivy League Universities	$8,169	$9,200	$11,893	$16,499	$23,949	$16,667	$34,508
Non-Ivy Universities	$7,495	$7,956	$11,238	$16,249	$23,399	$15,889	$33,167
Net Price/Sticker Price							
COFHE Schools	22%	25%	34%	48%	70%	47%	100%
Coed Colleges	17%	22%	31%	46%	68%	44%	100%
Women's Colleges	23%	29%	39%	54%	76%	47%	100%
Ivy League Universities	24%	27%	34%	48%	69%	48%	100%
Non-Ivy Universities	22%	24%	34%	49%	70%	48%	100%
Net Price/Quintile Median Family Income							
COFHE Schools	49%	26%	23%	22%	21%	28%	21%
Coed Colleges	36%	22%	20%	21%	20%	24%	21%
Women's Colleges	51%	30%	26%	25%	23%	31%	21%
Ivy League Universities	53%	28%	23%	22%	21%	30%	22%
Non-Ivy Universities	49%	25%	22%	22%	21%	28%	21%

Full pay students have, of course, a wide range of family incomes, but it's useful to illustrate their (sticker) price relative to income at the lower bound of the 95th

[9] Net price as a proportion of sticker price – the second panel – can be seen as the complement of the familiar average "price discount" for aided students: $p_n/p_s = 1 - (p_s - p_n)/p_s$.
[10] The 2% of enrolled aided students for whom we have no reliable family income data are omitted from the analysis of prices and pricing policies.

percentile of the US family income distribution ($160,250). So in the last column, their average net price is shown as the full sticker price. Note that all averages in Table 2 are student-weighted to describe what faces the typical student.[11] So the rows of Table 2 reveal the schools' pricing policies – our second question – while the first two columns describe affordability for low and lower-middle income students, the net prices they pay and how those prices compare both to sticker price and to family income – our first question. Average prices are reported for all 28 schools together and separately for the four school types used by COFHE: coed, women's colleges, Ivies, and non-Ivy universities.

Clearly, in the top panel, lower net prices are charged of low and lower-middle income students that (in the next panel) imply larger discounts for them from sticker price; looking across the table, over increasing incomes, higher income quintiles pay higher net prices in consequence of smaller price discounts (grants). Over all 28 schools, a low income student pays, on average, $7,552 or 22% of the sticker price while an aided high income student pays $23,690 or 70% and a full pay student, 100%. In these data, the average sticker price – which is the average maximum price – is $33,831.

But more revealing of both affordability and pricing policies are the data in the bottom panel of Table 2 that show the proportions of income that these net prices represent – as shares of quintile median family income – and they drop markedly and almost monotonically as incomes increase. The low income student pays 49% of his quintile median family income on average while the aided student from a high income family pays 21%, as does the full pay student at the 95th income percentile. But it's useful to put that issue of general pricing policy aside for now to focus, in Section IV that follows, on affordability – the prices paid by low and lower-middle income students, what's happening within columns 1 and 2. So we'll turn to that in the next section and return to the question of schools' pricing policies across the whole range of incomes in Section V.

[11] For simplicity, we will stick to student weighting even when we turn, below, to the question of college policy where college-weighted averages might be used. The differences between them are minimal.

IV. Low Income Affordability: What does a poor kid pay to go to a high priced college?

Even in the aggregates of Table 2 and even restricting attention to the low and lower-middle income students, there's quite marked variety in the net prices charged. Low income students pay average net prices that range from $5,487 at the coed colleges to $8,169 at the Ivy universities – almost 50% more. And it appears that that lower net price at coed colleges is not a function simply of lower sticker prices there since those schools have by far the lowest net price relative to their sticker prices, at 17%, and they charge their low income students 36% of quintile median family income compared to the 53% charged by Ivy universities. The treatment of lower-middle income students (the second column in Table 2) is not as varied across these school types. From the lowest net price ($7,280) to the highest ($9,676) is an increase of about a third, this time from the coed to the women's colleges. It's obvious from Table 2 – even when focusing only on the bottom two family income quintiles – that the price as a share of family income falls sharply as we move up to lower-middle incomes, away from the lowest income families: overall, that share drops from 49% to 26% and for the Ivy universities from 53% to 28%. But differences in price over income levels are the subject of the next section that examines schools' overall pricing policies.

Figure 3 shows the institutional variety that lies behind the aggregated prices reported in the table for students from the low income families of quintile one (those earning between 0 and $24,001 a year). In Figure 3, the average net prices for those students at each of the 28 schools are shown with schools arranged by increasing net price. (These are net price comparisons over students in the same income quintile so differences in the ratio of net price to family income can be read directly from differences in net prices, *per se*.) The range of average net prices among these schools is substantial. The school with the lowest average price for low income students, as noted earlier, charged less than $800 for a year while the school with the highest average net price charged $11,390, nearly fifteen times as much.

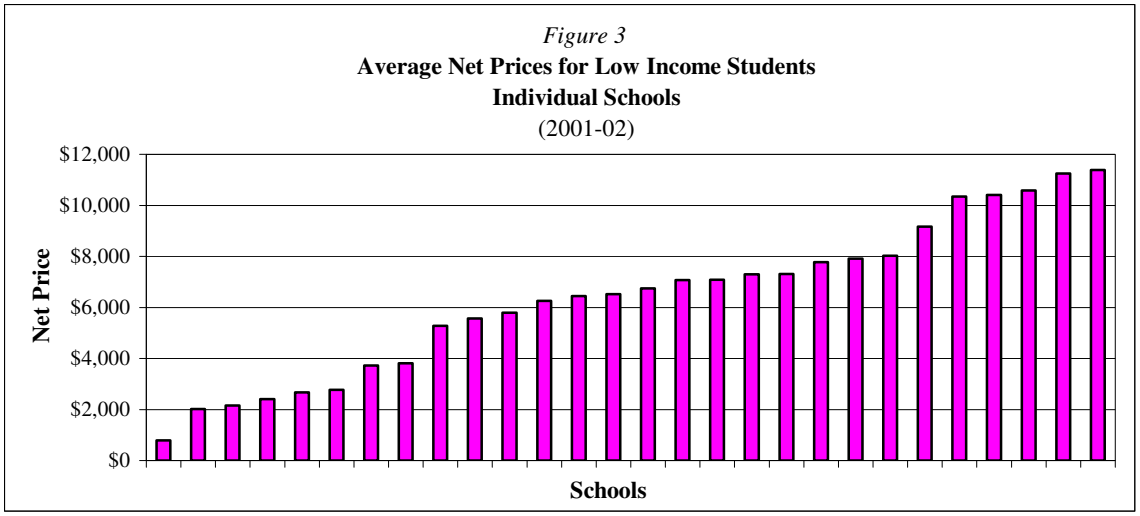
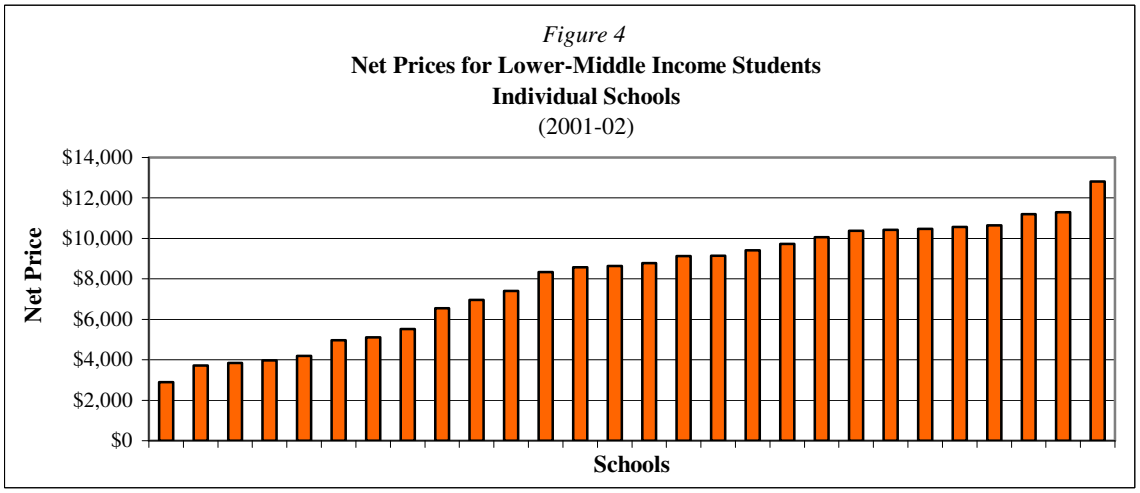


Figure 4 gives the same kind of picture of net prices for the lower-middle income students of the second income quintile – those whose family incomes lie between $24,002 and $41,001 a year. Figure 4, again, shows schools arranged by increasing net price. (Note that the ordering of schools is not the same as in Figures 2 or 3.) Aside from the obvious fact that schools' treatment of these lower-middle income students is much less varied than their treatment of low income students, not a lot is added. Among the individual schools of Figure 4, net prices for these lower-middle income students range from $2,891 to $12,817 and range from 8% to 37% of sticker price. The schools' net prices in Figure 4 gently rise to the right – slight discontinuities appear only with the first and last schools.



To summarize, the picture of pricing for low income students – affordability – at these schools appears to be this: for students from the lowest income families, the average net price they pay varies a great deal between schools with one setting its average net price for low income students below $800 a year and others charging more than $11,000; measured as a share of median family income for this quintile ($15,347), prices range from 5% to 74%. So institutional variety among these schools is a major fact but a fact that includes some very low net prices for low income students. It's important that even the school charging the highest net price is still giving a substantial price reduction with a ratio of net to sticker price (p_n/p_s) of 35%, implying an average price discount of 65%. The answer to our rhetorical question, then, "What does a poor kid have to pay to go to one of these expensive schools?" has to be "It depends…." Most students would appear able to pay the yearly price of the lowest priced schools out of pocket but would have to turn to large loans and jobs to pay the net price at the most expensive. The student with a slightly higher income – in the second quintile – will experience both more consistency in pricing among schools and a lower proportional drain on family income. Again, the coed liberal arts colleges will, on average, be the most affordable.

V. Schools' Pricing Policies With Respect to Family Incomes

This section turns to the second question: How do schools differentiate their net prices among families with different incomes? Looking across Table 2 addresses that question as it shows average net prices for aided students in the five income quintiles (low (0 - $24,001), lower-middle ($24,002 to $41,001), middle ($41,002 to $61,379), upper-middle ($61,380 to $91,701) and high income ($91,702 and above)) as well as the sticker price for full pay students where those at the 95th income percentile ($160,250) are taken as representative.[12] The low income affordability question we've just discussed – our first issue – is described by the first two columns. The schools' pricing policies over

[12] In the earlier study of Williams' pricing (Hill and Winston 2001), we considered, too, family incomes at the 99th percentile. The results added little, however, except to confirm the predictable fact that with incomes that high (about $400,000 for 2001-02), even the sticker price is a much smaller fraction of family income than the share paid by aided students or those in the 95th percentile who also pay the sticker price.

the full range of students' incomes are described across the table's *rows*. They report mean values for all COFHE schools together and the four separate groups of coed and women's colleges, Ivies, and universities.

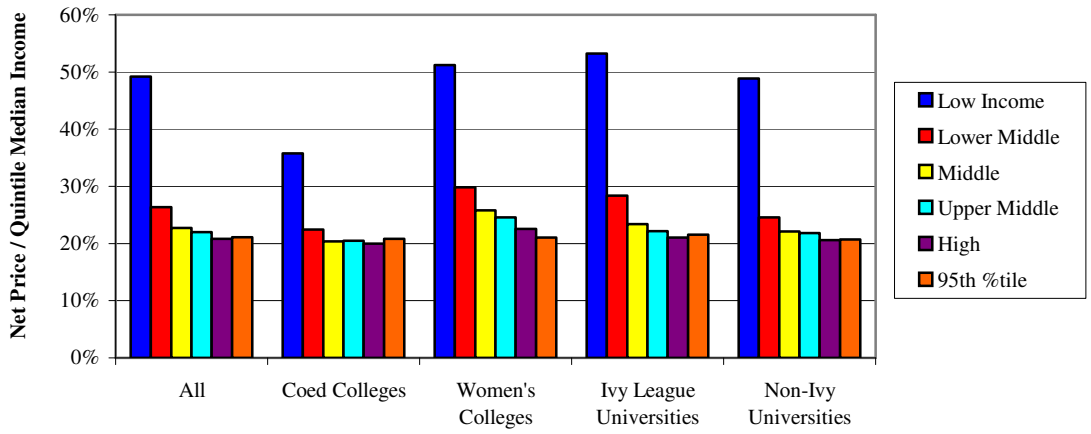
Looking across the top panel of Table 2, average net prices rise with rising income (or, to put it the other way around – reading to the left – lower income families pay a lower net price). And net prices change monotonically. Aided low income students, averaged over all these schools, pay a net price of $7,552 while aided high income students pay $23,690 – a difference of 214%. Average net prices over all students, including full pay (high income students), varied over different incomes by 348%. For COFHE school groups, the range of prices over income varied from 509% for the coed colleges to 322% for the Ivies (the universities at 343% and women's colleges at 329% are in between).[13] That picture of apparent progressivity remains intact when we look, instead, at the middle panel with its average net price relative to sticker price across family incomes – over all schools, net price as a share of sticker price (the complement of the price discount) rises monotonically with family income from 22% to 100%.

But the implication that these schools, on average, succeed in setting prices that accommodate low income families is weakened when we look across Table 2's third panel at the share of family income those net prices represent. Looking at price as a share of income, the picture is reversed; the lowest income students pay the largest share of their family incomes – 49% on average – and that share declines monotonically as incomes rise – to 26%, 23%, 22%, and 21%, among aided students, and finally, 21% for full pay students at the 95th income percentile. In terms familiar from the income tax literature, pricing on average appears to be regressive – as incomes are lower (reading to the left), families pay a lower net tuition, but it doesn't decline as fast as do their incomes. So price as a share of income is higher for low income students. And this pattern holds not only for all schools grouped together – the top row of the panel in Table

[13] These are, as noted earlier, student-weighted averages so the large universities have more influence on the overall pattern than the small coed and women's colleges.

2 – but also for each of the four groups considered alone.[14] This is reflected in Figure 5 where average net price is shown as a share of median family income for each quintile and for the 95th percentile over all four COFHE school types.

Figure 5
Average Net Price as a Share of Family Income
COFHE Groups
(2001-02)



The other important fact revealed across Table 2 is that most of the increase in the income share of net prices appears between the low income and lower-middle income students – between those with a $15,347 quintile median family income and those with a median income of $32,416. Moving from the bottom income quintile to the next one up shows that tuition's share of income goes from 49% for low income students to 26% for lower-middle income students then it pretty much stays there, dropping to 21% for the aided high income students and 21% even for full pay students in the 95th income percentile. The least severe increase in income share with rising income is at the coed colleges but even there, low income students pay 36% of their family incomes, on average, while lower-middle income students pay 22% and that share persists to the highest incomes.

[14] The decline in share with rising incomes breaks with monotonicity (by one percentage point) in coed schools for upper-middle income families and for the 95th percentile in the Ivy League and coed colleges; otherwise, all shares decrease monotonically with increasing income.

It's useful, again, to look at a graph of the pricing behavior of the individual schools. They are represented by the very crowded Figure 6 where schools are shown with, for each, a bar for net tuition as a share of quintile median family income over the five income quintiles and the 95th percentile.[15] So for each of the twenty-eight schools, six bars describe net tuition as a share of family income across all students – for each, in other words, the pattern of its price/income bars describes its pricing policies for students with respect to their family incomes.

Figure 6
Net Prices as a Share of Family Income
Individual Schools
(2000-01)

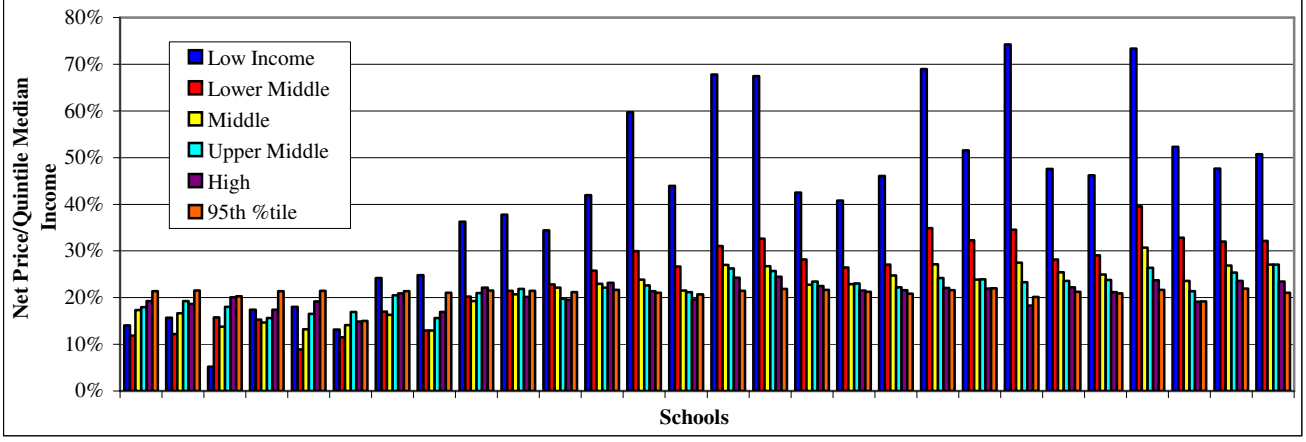
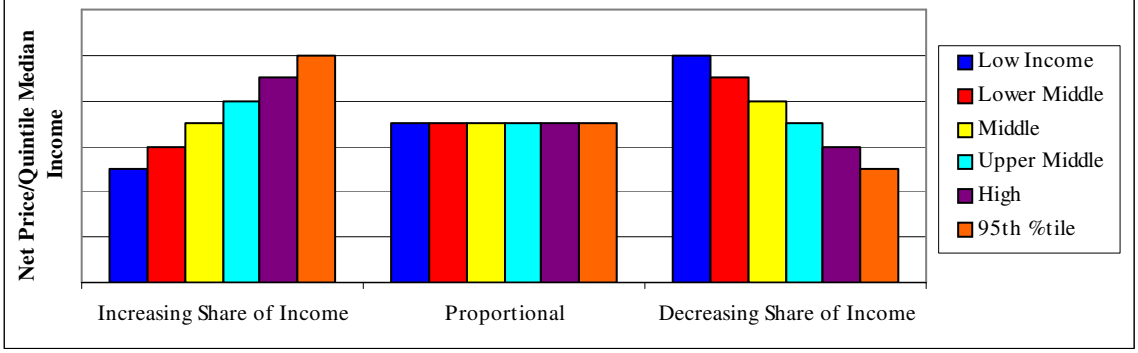


Figure 6 effectively conveys the fact that we found a wide variety of pricing patterns over student incomes among these twenty-eight schools, but trying to make much sense out of a graph with 168 bars is daunting. One thing, though, is apparent even here – a school whose six bars are of the same height is charging its students the same share of family income, regardless of income level, a pricing policy in which net prices are set so that, on average, all families pay a price that represents the same share of income. A school whose six price/income bars *fall* with income has a pricing policy in which higher income students pay a smaller share of their incomes. And a school with the bars rising with increasing income has a policy in which low income students not only pay a lower tuition, *per se*, but they pay a smaller share of family income than do

[15] At the 95th percentile, throughout, net price is sticker price and family income is the lower bound for that percentile.

students from families with higher incomes. Three stylized graphs in Figure 7 illustrate these alternatives.

Figure 7
Generic Pricing Policies
Stylized Illustration



To say something more precise about an individual school's pricing – to sort out Figure 6 – we sought a measure that would both describe its overall pricing policy with respect to family income and allow meaningful comparison among schools. The solution was to run a simple linear regression of each school's average net price/income ratios on median incomes over the five quintiles and the 95th percentile and treat the t-statistic on the income coefficient as an indicator – an index – of proportionality. It's like drawing the best linear fit over a school's Figure 6 bar graph and then taking the significance of the slope seriously: a slope that's not significantly different from zero describes a proportional pricing policy; a significantly negative slope describes price as an income share that's falling with higher incomes and a significantly positive slope describes a policy with net price a rising share of income.[16] Using this classification, seven schools have decreasing-share pricing policies, most don't differ significantly from proportionality while four charge prices that represent increasing shares of income, all as single-tailed t-tests at the 95% level.[17]

[16] We tried to adapt a Suits index of progressivity, but it describes the distribution of taxes internally while it was important that our comparisons be with the society at large and not just within a school (Suits 1977).
[17] The aggregation of individual schools in Figure 5 paints a more regressive picture as statistical significance is neglected. Furthermore, given the (slight) progressivity of the US tax system in toto (Pechman 1983), our use of pre-tax family incomes makes all our estimates less progressive than they would be on an after tax basis.

From here, the discussion can go in two directions: What can be said about the determinants of these pricing policies – what seems to lead schools to choose one or another pricing pattern? And if a school considers a proportional policy more desirable than one with price as a share that falls with income, what can it do to achieve such a change and what will it cost to alter its pricing policies?

VI. What Influences Schools' Pricing Policies

While it could be a paper to itself (and should be), at least one plausible story appears to help understand what lies behind these schools' quite different net price policies for students from different family incomes. It's simple. Schools differ markedly in the wealth that supports each of their students. There are huge differences in institutional wealth across higher education[18] but large differences appear even among these relatively wealthy schools; endowment per student goes from $51,259 at one end to $1,264,000 at the other.[19] A school's per student wealth translates directly into its ability to subsidize its students – to set an average net price below production costs. So between two schools with the same educational costs per student, the one with the greater wealth can charge its students the lower average net price (or a school can provide a more expensive education at the same price). The most direct effect of wealth on pricing, then, is simply that the wealthier school can set a lower average net price and, other things being equal, offer the lowest prices to its low income students. That's the direct connection between institutional wealth and net price.

But there's an indirect and possibly more important connection between a school's wealth and its pricing policy. More wealth supports large student subsidies and those subsidies act, in turn, much like a wage payment to students for their peer quality: very high subsidy payments will generate long queues of students from which a school

[18] Winston, Carbone *et al.* 2001.
[19] http://www.nacubo.org/accounting_finance/endowment_study/. Note that these numbers describe only endowment wealth, so only part of even their financial wealth, and leave out a large component of institutional wealth accounted for by physical capital (Winston 1997).

can choose those who bring it the highest peer quality.[20] That student selection process, of course, is reflected in a school's admission standards – the one with the most wealth will pay the largest student subsidies and be able to set the highest standards for admission. But, finally, the well-known positive correlation between applicants' academic qualifications and family incomes (Carnevale and Rose 2003) means that the schools with the most demanding admission standards will accept a student body with the highest share of high income students – the fewest low income students.

It's no accident, then, that in these generally very wealthy and selective schools, the proportion of their students from low and middle income families in Table 1 is overwhelmed by those from high income families. Overall, most of the students who can pass these admissions criteria are wealthy – recall that only 45% of the students in these schools qualify for financial aid relief from an average sticker price of $33,831 a year, and even some of these aided students are in the highest income quintile.

But, clearly, among the twenty-eight schools, a lot of variation in the income distribution of their student populations was shown in Figure 2 and those variations translate directly into the cost of a given pricing policy. In the extreme, a school with only a few low and lower-middle income students can afford to be very generous to them, giving them low net prices, while a school with a higher proportion of low income students could be so generous only at a higher cost. A high share of high income students cuts the cost of a progressive pricing policy not so much by providing more revenues, but more importantly by reducing the draw by low income students on limited non-tuition resources. (Note that what looks like subsidizing low income students from the revenues provided by high income students – "RobinHooding" – neglects the central fact that all students, rich and poor, are being heavily subsidized. At these schools, the 'general' subsidy for even the students paying the full sticker price is in the order of $50,000 a year.)[21]

[20] All this is developed less cryptically in Winston 2003 and Winston and Zimmerman Forthcoming.
[21] Educational costs include the cost of capital services (Winston 1995).

A crude test of the relationship between institutional wealth and schools' pricing policies can be got with regressions of schools' pricing policies (reflected in the progressivity index) on their wealth (per student) and, more indirectly, of their shares of low income students on their wealth. In the first, wealth is significantly (positively) related to the progressivity of the pricing structure ($t = 3.09$)[22] and in the second, it is significantly (negatively) related to the proportion of students in the bottom two income quintiles ($t = -2.48$).

So the indirect story is this: lower institutional wealth per student gives a school the ability to pay only a smaller subsidy to its students on average and that leads to a shorter queue of applicants and consequently lower admission standards which in turn means fewer high income students and therefore a higher cost for any progressive pricing policy. Put it the other way around: the wealthiest schools pay the highest student subsidies so they can impose the high admissions criteria that are disproportionately satisfied by high income students, leaving a smaller share of the student body to make demands on a progressive pricing policy. And, of course, while we concentrate on differences among these wealthy schools, even the poorest among them is quite wealthy relative to most US schools, allowing them, as a group, to pursue need-based financial aid policies with far greater ease – for reasons both direct and indirect – than can most schools.

VII. Changing Pricing Policy – Routes to Proportionality

Discussion in the last section suggests that progressivity is not all that easy to accomplish: the apparently central role played by institutional wealth – and the difficulty of significantly changing that wealth – make it hard at best for a school to make its prices more affordable for low income students. So in this section, we consider the four ways a school can better accommodate low income students and achieve proportionality: two that reduce net prices for poor students through increased grants, one that limits the

[22] We get similar results whether we use the t-statistic or the coefficient on income as the measure of progressivity.

numbers of low income students by controlling admission and the last – what is done now – that charges them a price that represents a larger part of their family incomes but then makes available to them ways to pay that price – jobs and loans. While we'll discuss them in sequence, these measures clearly can be combined in many ways.

The first two options reduce net prices for low income students to bring their price-income ratios in line with other students'. The first does it simply by giving up more revenues through price reductions – giving more grant aid – while the second does it by reallocating an unchanged revenue reduction (grant-aid budget) among students. The first carries a clear budgetary opportunity cost in dollars while the cost of the second takes the form of raising net prices for some students – the aided students with the highest incomes – with potential effects on demand. In both, we can illustrate the cost if we take a proportional pricing policy as the target – one where the quintile average net price represents the same share of family income over all aided students.

A school can compute its cost of moving from a regressive to a proportional pricing policy by any of these policy changes based on its own population and current net price pattern. The raw materials for that computation are simply its average quintile net prices, the distribution of its student population by family income and – common to all schools – national quintile median family incomes. Illustrative results are shown in Table 3 for a typical regressive school.

The first policy is the simplest. Additional funds are devoted to the grant aid budget (additional revenues are sacrificed by increased price reductions) so average net prices can be made the same share of quintile median incomes over all aided students. If the benchmark is the share paid by the aided students with the highest incomes, who pay the lowest share of net price in a regressive school, no price needs to be raised and proportionality is achieved simply by spending more. Policy One in Table 3 shows the dollar cost per enrolled student of that policy for the typical regressive school.

Table 3
Costs of Achieving Proportional Pricing
(2001-02)

Parameters Common to All Schools:	**Parameters Specific to School:**
Quintile Median Incomes (Table 1)	Average Net Prices (Quintiles 1-5) Sticker Price Number of Students by Income (Quintiles 1-5)
Policy One: Proportionality Through Increased Grant Aid Budget	
$1399 decrease in net price per enrolled student	
19% increase in Grant Aid Budget	
Policy Two: Redistribution of Fixed Grant Aid Budget Among Aided Students	
$4911 increase in High Income net price	
18% increase in High Income net price	
Policy Three: Proportionality through need-aware admission	
84% reduction in Low Income students	
6% reduction in Total Enrollment	

The second policy route to a proportional price structure doesn't increase overall price discounting – increasing the grant aid budget – instead, it sticks with an unchanged total budget but redistributes price discounts by income quintile to make average income shares equal across all aided students. This option avoids the cost of increased price discounting, of course, but it incurs the potentially greater disadvantage of having to raise net prices for aided high income students with potential consequences for competition with other schools for those students and/or for student quality. Net price increases would, of course, be concentrated among the higher income students whose academic characteristics would, on average, be better. A variant that we don't evaluate would raise the sticker price, redistributing the additional revenues to lower prices for aided low income students.[23] In the second panel of Table 3, the effect of the policy change is measured by the percent increase in net price in quintile five required to reach proportionality through redistribution.

[23] Of course, those additional revenues need not go to low income aided students but could be used instead to bid for student quality with merit aid regardless of student need, but here we focus on need-based aid.

The third pricing policy increases neither the grant aid budget nor net prices for high income students; instead, it reduces the number of low income students – hence the drain on a fixed grant budget – by simply refusing to admit them. The resources freed up, then, by such need-aware admissions are used to equalize price as a share of income for all other aided students. The cost of this policy is illustrated in Table 3 as the proportion of low income students who can't be admitted because they're too expensive to support on a fixed aid budget with proportional pricing. Again, this cost is expressed in Table 3 as the needed reduction in low income enrollment both as a percent of total low income enrollment and, alternatively, as a percent of the student body. In terms of low income access to these schools, of course, this need-aware admission policy would shift from restricting low income access by limited affordability to restricting it through limited admission.

The last option is not really a policy change to achieve proportionality of the price structure but a policy, instead, that makes it easier for students to pay under a price structure that continues to charge low income students a higher share of income. By providing loans[24] and jobs, schools can leave in place prices that represent high shares of low family incomes while making it possible for such students still to attend. For the school with a regressive pricing policy, of course, this will generate financial aid that achieves an immediate appearance of equality of opportunity but in a very different way from actual price adjustments. Our data on the net prices that low income students actually pay make it clear that the lowest income students will be the most dependent relative to their incomes on these mechanisms that enable them to pay their relatively high net prices.

[24] Subsidized, but we've ignored that.

VIII. Trends

Pricing policies in these schools have been changing. In 1998, Princeton announced that it would shift all loans to grants – from loans to net price reductions – for students whose family incomes were below the national median (the third quintile median) and Harvard, Amherst, Swarthmore, and Yale – among others – followed with policy modifications affecting their net prices.[25] The earlier study of Williams' prices that initiated this current work[26] described a thirteen year history of falling relative net prices for the lowest income students – Williams' pricing policy started with considerable regressivity in 1988-89 but ended, in 2001-02, with a decidedly progressive price structure. So it would be useful to be able to trace the pricing policies of the rest of these 28 schools through an equally long period to see if the Williams pattern of movement toward progressivity is, as we suspect, typical. We can't, though, because we don't have sufficient longitudinal data.

What we do have is ten schools for which we have five years' financial aid records, from 1998-99 to 2002-03[27] and while they are not necessarily representative of the population, their data are revealing. In Table 4, net prices over the five years for the average of these ten schools are reported in the first panel along with the average sticker price; their shares of sticker price and quintile median family income for the five years and five income quintiles are reported in the next two panels.

[25] Brownstein, Andrew. "Upping the Ante for Student Aid." The Chronicle of Higher Education. Volume 47, Issue 23. February 16, 2001.
[26] Hill and Winston 2001.
[27] Amherst, Barnard, Cornell, Mt. Holyoke, Pennsylvania, Pomona, Princeton, Stanford, Wellesley, and Williams. Some of these schools provided more than five years' data, and 2002-03 numbers are preliminary.

Table 4
Trends in Average Net Prices
(10 Schools*, 5 Years)

Quintile Median	Family Incomes of Aided Students: Low	Lower Middle	Middle	Upper Middle	High	Full Pay 95th % tile
1998-99	$13,891	$30,656	$48,266	$71,201	$109,647	$148,452
1999-00	$14,026	$30,970	$49,194	$71,939	$110,006	$152,832
2000-01	$14,554	$31,660	$49,816	$73,030	$110,674	$157,785
2001-02	$15,347	$32,416	$50,890	$74,418	$113,689	$160,250
2002-03	$16,392	$33,722	$52,830	$77,076	$118,630	$165,460
Net Price						**Sticker Price**
1998-99	$9,520	$9,989	$12,805	$17,084	$24,217	$32,798
1999-00	$8,882	$9,292	$12,439	$17,048	$24,121	$33,066
2000-01	$7,865	$8,486	$11,830	$16,654	$23,565	$33,259
2001-02	$8,027	$8,793	$12,056	$16,489	$23,870	$34,222
2002-03	$8,013	$8,989	$11,986	$16,773	$24,405	$35,750
Net Price/Sticker Price						
1998-99	29%	30%	39%	52%	74%	100%
1999-00	27%	28%	38%	52%	73%	100%
2000-01	24%	25%	36%	50%	71%	100%
2001-02	23%	26%	35%	48%	70%	100%
2002-03	22%	25%	33%	47%	68%	100%
Net Price/Quintile Median Family Income						
1998-99	69%	33%	27%	24%	22%	22%
1999-00	63%	30%	25%	24%	22%	22%
2000-01	54%	27%	24%	23%	21%	21%
2001-02	52%	27%	24%	22%	21%	21%
2002-03	49%	27%	23%	22%	21%	22%

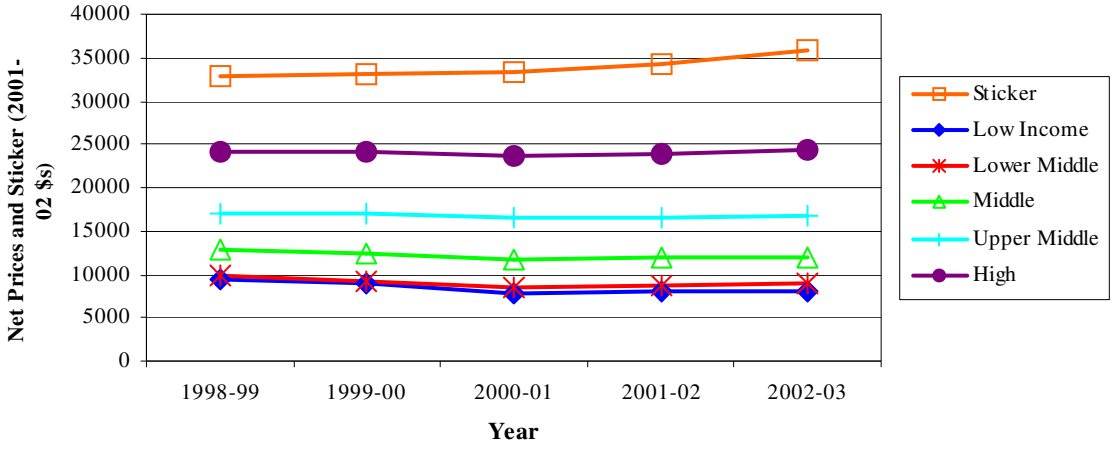
*Schools include Amherst, Barnard, Cornell, Mount Holyoke, Pennsylvania, Pomona, Princeton, Stanford, Wellesley and Williams.

The trends in pricing for these schools are more apparent in Figure 8 where average net price for each quintile is plotted in constant 2001-02 dollars, along with the sticker price over the period and in Figures 9 and 10 where those quintile net prices are expressed as shares of sticker price and of family income, respectively. Though it doesn't leap off the page, the most interesting fact in Figure 8 is the contrast between the (gentle) increase in sticker price, on the one hand, and the fall in constant dollar net prices, on the other. For four of the five quintiles, real net prices fall over these five years, and for the fifth (the high income quintile), average net price rises by only $188 (on a $24,217 base). The increase in sticker price that captures the public imagination, in contrast, was $2,991. So while sticker price went up by nine percent in real terms over five years for these ten schools, the net prices they charged their aided students went down, with one exception, and that exception saw a rise of 0.8%.

Figure 8

Average Net Prices

(10 Schools, 5 Years)

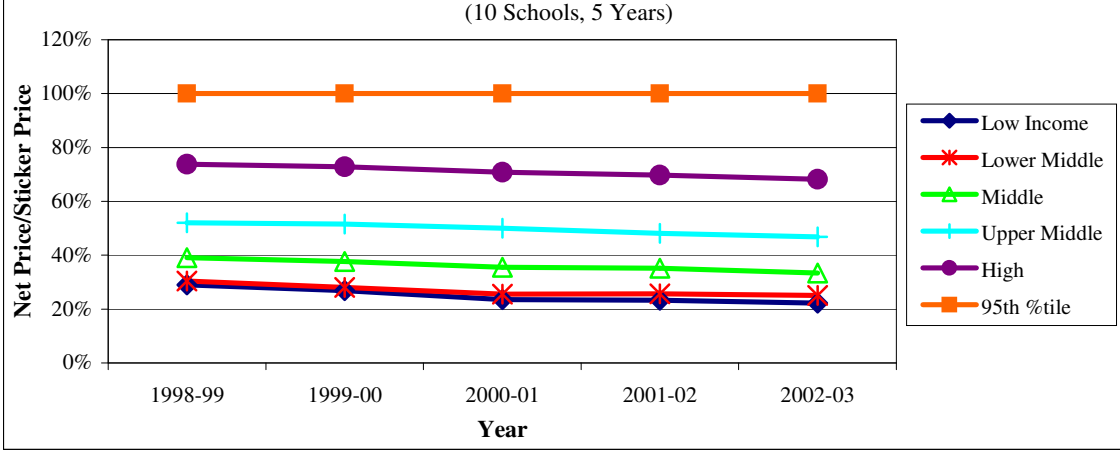


These real price trends are more evident in the next two figures where quintile net prices are expressed as shares of sticker price (Figure 9) and of quintile median family income (Figure 10). Figure 9 confirms what's implied by the differential growth rates of prices shown in Figure 8 – since sticker price grew faster than any of the net prices, their share of sticker price declined over the five years. Indeed, the average net price for low income students fell (monotonically) from 29% of sticker price to 22% – roughly a 25 percent decline – and that becomes more dramatic in Figure 10 where that maximum price is shown relative to family income that was growing, too.

Figure 9

Average Net Price as a Share of Sticker Price

(10 Schools, 5 Years)



The net price for low income students at these schools fell from 69% of quintile median family income to 49% – nearly a 30% drop. And while it's clear from the graph that the most dramatic decline in net price relative to quintile family income was at that low income level, all the others fell, too. Even the sticker price declined relative to a rising family income at the 95th percentile, though almost imperceptibly (from 22.08% to 21.66%). Finally, Figure 11 shows average net prices relative to income for low income students for each of these schools separately with the result that for no school does that price rise over the period. And it's clear that the dispersion of low income net prices has increased.

Figure 10

Average Net Price as a Share of Family Income by Quintile

(10 Schools, 5 Years)

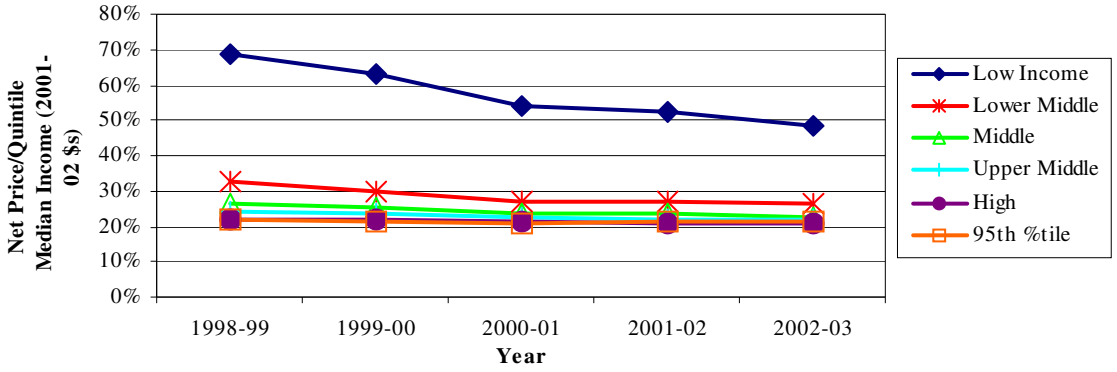
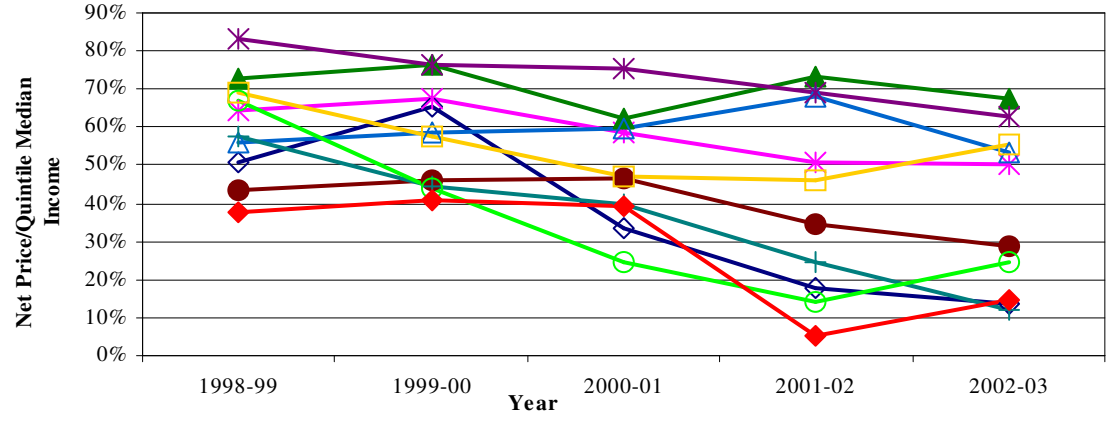


Figure 11

Average Net Price as a Share of Family Income

Low Income Students

(10 Schools, 5 Years)



IX. Conclusions

We've addressed two questions. Are the nation's most expensive and selective private colleges and universities accessible – affordable – to highly able low income students? And how do these schools set prices with respect to the incomes of their students – in public finance terms, are their pricing strategies progressive, proportional, or regressive? We had almost 250,000 individual financial aid records from twenty-eight COFHE schools from which the 41,401 from 2001-02 proved most useful in describing current pricing policies. The emphasis was on the net prices that students actually pay relative to their family incomes – loans and jobs make it easier for them to pay those prices, but our focus was on the prices themselves as a most basic component of access.

On the first question – affordability for low income kids – the main finding is one of optimism and wide variety. Some of these twenty-eight schools charge their low income students very little for a year's tuition-room-board-and-fees – at one, that price was less than $800 and for the lowest priced 25% of these schools, it averaged $2,365. There are also schools that charge a good deal more. The highest net price for low income students here is more than $11,000 and the average of the top 25% is $10,169. Except for a few of the lowest priced schools, of course, students turn to loans, campus jobs or other sources with which to pay the price, while high net prices remain. For comparison (with these highly selective private schools), the average price at a four-year public college was $9,008 (for tuition, room and board).[28]

So can a highly able low income student reasonably aspire to go to these schools? The answer is surely "yes," but prices will vary a great deal among schools and with them, the need for supplemental loans and jobs will vary as well.

The answer to the second question – how do these schools adjust prices in recognition of different family incomes – reflects a similar degree of variety. Four

[28] College Board: www.collegeboard.com/press/cost01/html/TrendsCP01.pdf

schools' pricing behavior shows that low income students pay the smallest share of family income to go to college with, generally, the share increasing with increasing family incomes. Most schools have broadly proportional prices in which aided students, on average, pay about the same share of family income (and it's about the same for full pay students from all but the wealthiest families). Seven charge net prices such that low income students pay a larger part of family income to the college than do high income students, pushing them disproportionately to loans and jobs. And while such pricing policies can be changed, doing so is likely to be expensive in lost revenues, competitive pricing, or ideals of need-blind admission. The fact appears to be that, at base, a school's wealth goes far to determine the shape of its pricing policy and wealth is not easily changed.

We feel that this study has something important to say both to low income students, themselves, and to those setting pricing policies in schools like these. Its findings should be highly encouraging to ambitious low income students, telling them that efforts of many of these schools to achieve equality of opportunity have been successful – as a student, if you're good enough to get in, you'll almost certainly be able to afford it, often through price reductions alone. And the findings should be very useful in informing college pricing policies in framing an effective way both to understand and to monitor those policies and in providing benchmarks in the form of other schools' behavior.

REFERENCES

Avery, C. and C. Hoxby (2003). "Do and Should Financial Aid Packages Affect Students' College Choices?" Cambridge, NBER Working Paper 9482.

Baum, S. (1991). "The Distribution of Subsidies to Postsecondary Students." Eastern Economic Journal 22(2).

Baum, S. and D. Saunders. (1997). "Life After Debt: Summary Results of the National Student Loan Survey." Washington DC, Proceedings from a National Symposium: 94-113.

Breneman, D., L. Lapovsky, *et al.* (1999). "Private College Pricing: Are Current Policies Sustainable?" Futures Forum: 22-25.

Carnevale, A. P. and S. J. Rose (2003). "Socioeconomic Status, Race/Ethnicity, and Selective College Admissions." Washington DC: The Century Foundation, Inc.

Ehrenberg, R. G. (1984). "Optimal Financial Aid Policies For a Selective University." Journal of Human Resources 9(Spring): 202-230.

Heller, D. (1997). "Student Price Response in Higher Education." Journal of Higher Education 68(6).

Heller, D., Ed. (2002). Condition of Access: Higher Education for Lower Income Students. Praeger Series. Westport, Praeger Publishers.

Hill, C.B. and Gordon C. Winston (2001). "Access: Net Prices, Affordability, and Equity at a Highly Selective College." Williamstown, MA. Williams Project on the Economics of Higher Education, Discussion Paper 62.

Jackson, G. A. (1978). "Financial Aid and Student Enrollment." Journal of Higher Education 49(6): 548-74.

Kane, T. (1995). "Rising Public College Tuition and College Entry: How Well Do Public Subsidies Promote Access to College?" Cambridge, NBER Working Paper 5164.

Leslie, L. L. and P. T. Brinkman (1987). "Student Price Response in Higher Education: The Demand Studies." Journal of Higher Education 58(2): 181-204.

McPherson, M. S. and M. O. Schapiro (1991). Keeping College Affordable. Washington DC, Brookings Institution Press.

McPherson, M. S. and M. O. Schapiro (1998). The Student Aid Game. Princeton, Princeton University Press.

Pechman, J. A. (1987). Federal Tax Policy. Washington DC, Brookings Institution Press.

Steinberg, R. and B. A. Weisbrod (2002). "Give it Away or Make Them Pay? Price Discrimination and Rationing by Nonprofit Organizations with Distributional Objectives." Evanston, IL. Economics Department, Northwestern University.

Terenzini, P. T., A. F. Cabrera, *et al.* (2001). "Swimming Against the Tide: The Poor in American Higher Education." The College Board: Report No. 2001-1.

Winston, G. C. (2003). "Toward A Theory of Tuition: Prices, Peer Wages, and Competition in Higher Education." Williamstown, MA. Williams Project on the Economics of Higher Education, Discussion Paper 65.

Winston, G. C. and Ethan G. Lewis (1997). "Physical Capital and Capital Service Costs in U.S. Colleges and Universities: 1993." Eastern Economic Journal 23 (2): 165-89.

Winston, G. C. and Ivan C. Yen (1995). "Costs, Prices, Subsidies, and Aid in U.S. Higher Education." Williamstown, MA. Williams Project on the Economics of Higher Education, Discussion Paper 32.

Winston, G. C., J. C. Carbone, *et al.* (2001). "Saving, Wealth, Performance, and Revenues in U.S. Colleges and Universities." Williamstown, MA. Williams Project on the Economics of Higher Education. Review of Higher Education Journal Forthcoming.

Winston, G. C. and D. J. Zimmerman (Forthcoming). "Peer Effects in Higher Education." College Decisions: How Students Actually Make Them and How They Could. C. Hoxby. Chicago, University of Chicago Press, for the NBER.

APPENDIX

Data

A detailed description of the data used in this study, "The Affordability Study Documentation" by Stephanie Boyd, is available upon request from the Williams Project on the Economics of Higher Education (contact information is on the cover page). This appendix summarizes the sources of those data.

Broadly, the study involved comparing the prices that students paid, net of financial aid grants, with their reported pre-tax family incomes in order to describe the relationship between price and income across schools and across income levels. Three kinds of data were used: (a) those on national family incomes reported by the US Census that were common to all schools and students, (b) those on variables specific to individual schools like sticker price, undergraduate enrollments and foreign students, and (c) those on students' family incomes and financial aid decisions that were taken from the individual student aid records provided to us by the schools.

1. National Family Incomes – the context

In order to use a common measure across all schools – and to tie to the 'US Median Family Income' used as reference by the press and public – we based the analysis on the distribution of pre-tax family income by quintiles as reported each year by the US Census. The upper and lower bounds of those reported quintile ranges are taken from the Census data; extrapolation from those boundaries gave us estimates of the median income appropriate to each quintile. Details of the extrapolation are described in our discussion paper (Hill and Winston 2001). All intertemporal income comparisons are adjusted to 2001-02 dollars. In order to include the whole of the student population in the analysis of pricing policies relative to family incomes, we assumed that family income at the lower

bound of the 95th percentile was representative of un-aided students who pay the full sticker price. In earlier analyses, we also considered families at the lower bound of the 99th percentile, but that income was so high ($400,000 in 2001) that little of interest was added.

2. Individual School Data

Information on each school's sticker price was requested for each year for which the schools provided student financial aid records (2001-02 and 2002-03 were requested from all schools with more years encouraged if it was easy to do), along with total Fall enrollment of dependent undergraduates. Again, all money values are expressed in year 2001-02 constant dollars. Data on total undergraduate enrollment and enrollment of foreign students were provided for each school by COFHE: their difference is reported as total enrollment of dependent American undergraduates in Table 1. Two schools provided data on only one or two classes, so their enrollment figures were simply multiplied by four and two, respectively, to approximate total enrollment.

3. Individual Financial Aid Records

Schools were asked to provide data from all individual records of undergraduate American (or permanent resident) dependent financial aid applicants to include the student's family income, grant, academic year, aid status (whether awarded aid or not) and, if possible, to indicate if the student studied abroad, attended the school only part time or part year, and if the reported parental income was not the basis for the financial aid award. Other data were reported at the discretion of each school: students' job and loan amounts, parent and family contributions and net worth.

Concentrating on the academic year 2001-02, which gave us the largest number of most recent decisions, 56,018 records were submitted which produced 41,401 to be used in the calculation of net price and income relationships, after the adjustments enumerated in Table A-1.

Bringing together data from the financial aid records of individual students from 28 schools' institutional records was a formidable task that left some inevitable incomparabilities, but they do not cast serious doubt on the conclusions of the study. The dimensions and magnitudes of these adjustments are described in Table A-1. Individual schools, examining their own data, should be attentive to unusual departures from these norms.

In a study of family income and price, it is predictable that the two major data problems will involve income and price.

Family Income. Schools were asked to provide the family incomes on which their grant aid decisions were based. Three kinds of problems appeared: the income of a non-custodial parent, in cases of divorce, was (i) sometimes reported along with that of the custodial parent (ii) sometimes not reported but the student's record indicated that it had been considered in setting his net price and (iii) sometimes neither reported nor identified in the student record as having played a role in pricing. Furthermore, some family incomes were reported as negative or were simply left blank in the records we were sent.

Records with unreliable family incomes were not used in describing the distribution of students by income in Table 1 in the text. They were included in "total aided students" (where appropriate) but they were not assigned to an income quintile – so the figures under "Total Aided Students" are larger than the sum of the numbers in the quintile columns. Overall, 2% of the enrolled students fell into this ambiguous income category. For individual schools, between 0% and 9% of their aided students' records were eliminated from the study on this account. Records that utilized non-custodial income but neither reported it nor indicated that it had been used could not, of course, be separated from the rest nor was it possible to estimate the difference these omissions might make in the distribution of students or prices, though it appears to be minimal.

Net Prices. Net prices were calculated as a school's published sticker price, less the grant aid awarded a student – the price he actually paid for a year of education. The grants reported by the schools were to be those based on need, not 'merit'. Two problems intruded on the calculation of a student's net price: those studying abroad were often charged a different price from the sticker price of on-campus students and those studying part time or for only part of the year paid less than the full price (and often received less than the full grant). So students in both of these categories were eliminated from the price calculations of Table 2 in the text – The Distribution of Average Net Prices by Family Income – but included in the figures in Table 1 – The Distribution of Students by Family Income.

The steps that take the total population from the 56,048 records of financial aid applicants in 2001-02 through the elimination of foreign students, those who were denied financial aid, and those with problems in calculating income or price produced the 41,401 records used in the price analysis of Table 2. They are described in Appendix Table A-1. Despite their imperfections, these data appear to serve our purposes well. It should be noted, though, that the confidence we feel in these aggregated numbers does not extend to all of the individual school results where participating schools using those data should look with care on the ambiguities evident in their own numbers.

Table A-1 shows the numbers of individual financial aid applicants' records in each category. Since some schools did not include student records of some categories of students (e.g. included only full time students) or did not indicate a particular data issue (e.g. did not indicate that there was a use of non-custodial income), the percentages should be interpreted with care. For example, the table shows that 4% of records received were those of study abroad students, but this should not be interpreted as showing that 4% of all aided students were studying abroad.

Table A-1

Student Data Records[29]

Financial Aid Applicants

(2001-02)

COFHE Group	Total Aid Applicants	Students Not Aided	Foreign Students	Non Foreign Aided Students	Income Issues: Non-Custodial Income	Income Issues: Blank Income	Income Issues: Negative Income	Price Issues: Study Abroad	Price Issues: Part Time	Non-Foreign Students with No Income or Price Issues
All	**56,048**	7,102	2,432	**46,514**	1,507	103	40	1,900	1,563	**41,401**
Coed Colleges	**8,404**	778	445	**7,181**	85	31	5	432	266	**6,362**
Women's Colleges	**5,050**	686	375	**3,989**	151	64	3	192	100	**3,479**
Ivy League Universities	**23,657**	2,571	1,327	**19,759**	492	-	1	731	554	**17,981**
Non-Ivy Universities	**18,937**	3,067	285	**15,585**	779	8	31	545	643	**13,579**

COFHE Group	Share of Total Aid Applicants				Share of Non-Foreign Aided Students					
All	100%	13%	4%	**83%**	3%	0%	0%	4%	3%	**89%**
Coed Colleges	100%	9%	5%	**85%**	1%	0%	0%	6%	4%	**89%**
Women's Colleges	100%	14%	7%	**79%**	4%	2%	0%	5%	3%	**87%**
Ivy League Universities	100%	11%	6%	**84%**	2%	0%	0%	4%	3%	**91%**
Non-Ivy Universities	100%	16%	2%	**82%**	5%	0%	0%	3%	4%	**87%**

[29] These data describe the aided students' records submitted to the study without incorporating estimates, for instance, of total enrollment where only one or two classes' data were reported.