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# What's "Up" with the Price of Two-year Colleges?

Benjamin P. Scafidi
Assistant Professor
Andrew Young School of Policy Studies
Georgia State University
bscafidi@gsu.edu

Amy Ellen Schwartz
Associate Professor
Wagner School of Public Service
New York University
amy.schwartz@nyu.edu

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> We must make the 13th and 14th years of education – at least two years of college -- just as universal in America by the 21st Century as a high school education is today, and we must open the doors of college to all Americans.
>
> President William Jefferson Clinton
> State of the Union Address
> February 4, 1997

## I. Introduction

While public attention is frequently focused on the plight of parents of college bound seniors and the increasing difficulty of affording four years at a residential college, considerably less attention has been paid to the affordability and price of two-year colleges. As described by Kane and Rouse (1999), two-year colleges play an important role in providing educational opportunities for students, particularly low-income students, who are unlikely (or unable) to attend four-year colleges. Two-year colleges are considerably less expensive than four-year colleges. In 1996-97, for example, the average of $1,283 in tuition and fees for full time study at a public two-year college is less than half of the $2,986 paid at public four-year colleges (p.64). Nonetheless, these sums represent significant amounts of money and thus, efforts aimed at increasing or maintaining educational opportunities need to consider changes in the price of two-year colleges. It is also well known, however, that the cost of attending a four-year college has risen rapidly potentially increasing the importance of two-year colleges in educating disadvantaged youth. Has the affordability of two-year colleges changed with the affordability of four-year colleges? Or has it followed a different pattern?

As in the case of four-year colleges, it is critical to evaluate not the 'sticker price' of two-year colleges – that is, the published amounts of tuition and required fees – but to focus attention on the 'net price' of college – tuition and fees *less the amount of financial aid.* The net price is what the student actually pays. In a study of four-year colleges,

Schwartz and Scafidi (2002) find that the net and sticker prices differ significantly from one another and, most important, they may grow at different rates.

This paper investigates changes in the sticker price and affordability of two-year colleges. That is, we analyze changes in sticker and net prices of attending two-year colleges. Two-year colleges are particularly interesting in their financial aid provision, however. Many two-year colleges charge tuition and fees that fall short of the financial aid (grants) given to the student. That is, the net price of attendance is negative. Thus, this paper includes separate analyses of the 'net cost' and 'net subsidy' schools and examines the differences between their features and price trends.

Notice that this information is likely to be 'news' to many people who ought to – who need to - know more. Although having good information on prices is critical to good decision making, the American Council on Education (1998) indicates students and parents grossly overestimate college costs. According to Kane (2002) Boston-area high school students estimated the sticker price of Bunker Hill Community College to be over $6,000, while the true sticker price was $3,140. Further, this survey provides some evidence that students from disadvantaged backgrounds – for whom college may be particularly important - have worse information about the price of college than their suburban counterparts. Thus, academic decisions regarding curriculum track and work effort in high school and college attendance may be inefficient. Unfortunately, while the popular press reports annually the existence of large increases in the sticker price of college as reported in the CPI, most students, especially low-income students, do not pay the sticker price of college about which so much is written. It is, perhaps, unsurprising that survey evidence suggests that high school students dramatically overstate the cost of

attending college.

A second goal of this paper is to examine the extent to which observed price changes reflect changes in the quality or attributes of two-year colleges. Since characteristics of colleges change over time, to some extent observed price differences may reflect these changes in quality. To what extent has quality changed and how has the constant-quality price changed?

Building upon the work in Schwartz and Scafidi (2002), we develop and estimate a hedonic model of the price of two-year colleges – which links the price of college to its characteristics - to provide answers to these questions. Further, we examine the importance of 'brand effects' in explaining the prices of two-year colleges. While the importance of 'reputation' to four-year colleges has long been recognized, and confirmed by our previous work, it is less clear whether reputation plays the same role for two-year colleges, which may be chosen more for reasons of convenience, access or proximity. (See Kane and Rouse (1999) for more on this.)

## II. The Two-year College Market

*Some Economics of Two-year Colleges*

To begin, we should define two-year colleges to include both 'Community Colleges' and 'Junior Colleges'; some provide an academic program that prepares students to enter four-year colleges, others focus on remediation, vocational or professional training.

Developing a fully satisfying model of the production processes, costs, and objectives of colleges is difficult - colleges provide multiple, differentiated products, are largely not-for-profit or public organizations; receive significant donated resources; face

imperfect competition, and heterogeneous consumers. [1] (See McPherson, Schapiro and Winston (1993) or Clotfelter (1999) for more on this.) While such a model is not crucial to the hedonic analyses below, some understanding of the market, and the nature of the goods 'sold' by two-year colleges, and purchased by college students is helpful.

Colleges may be viewed as multi-product firms, producing goods beyond the 'Education' goods that are their hallmark -- teaching, the transmission of knowledge, and so on. These include: food, accommodations, and amusements; minor league "professional" athletics (that is, amateur spectator sports where the athletes compensated for participation in the form of scholarships); investment management (that is, management of their endowment and other financial resources); and, perhaps general social services, which might include all pecuniary and non-pecuniary benefits that accrue to others. (See Verry and Davies (1976), for example, for more.)

Clearly, some of those "products" are more likely to be of central importance to two-year colleges than others. Research, for example, which is critical to the mission of research universities, is typically less of a priority for two-year colleges. At the same time, far fewer two-year colleges enjoy large endowments that require careful investment management than four-year colleges. How important is college athletics as a spectator sport in this market? While far fewer of the athletic events played by two-year colleges are televised than those of four-year colleges, these services may well be important to students, alumni and communities. In the end, disentangling the relative importance of these is an empirical matter, which we take up below.

[1] See Clotfelter and Winston and others in a Symposium on the Economics of Higher Education in the Winter 1999 Journal of Economic Perspectives. Kane and Rouse in the same issue focus on community colleges in particular. This section draws on Schwartz and Scafidi (2002), which provides a fuller discussion of the model of choice of institutions by students.

How should the objectives of two-year colleges be modeled? Well over 80 percent of two-year colleges are public, and public colleges serve over 97 percent of students who attend a two-year college.[2] Like four-year colleges, the typical two-year college, whether public or private, may perhaps best be viewed as acting to maximize some combination of 'prestige,' or 'reputation', or 'human or social capital produced' or even 'endowment' or budget or 'number of graduates' rather than profits.

How do they determine tuition and aid? Interestingly, while there has been considerable discussion in the academic literature regarding the pricing behavior of four-year colleges – and, specifically, selective four-year colleges which ration admission rather than raising prices – there is relatively little specific treatment of the pricing behavior of two-year colleges. One possibility is that prices and aid are set in such a way as to allow them to cover costs, while filling their available space – prices, then, will reflect some variation on an average cost pricing rule. Alternatively, they may act as perfectly competitive firms and charge market clearing prices. Or, as Rothschild and White (1993, 1996) have argued, colleges may set prices below the market clearing level because of the value of some students as 'inputs' to their production.[3] Of course, these latter explanations may be less relevant to two year colleges, many of which have excess capacity. Further, while many four-year colleges offer some set of students generous stipend and scholarship packages, some two-year colleges go even farther. A significant group of colleges charges, on average, *negative net prices* for attendance.[4] We explore

[2] All figures were computed from the College Board's Annual Survey of College data files. For these calculations and for the purposes of this paper, we have excluded proprietary institutions.
[3] While these explain individual subsidies we know of no previous work that discusses the phenomenon we observe for this set of two-year colleges – the *average* student receives a net subsidy for attendance.
[4] Interestingly, Schwartz and Scafidi (2002) identified four year colleges with zero sticker prices (Military Academies, etc.) but none had students who paid, on average, a negative net price.

this phenomenon below, but for the purpose of the hedonic analyses, we will assume that the supply curve for the college attributes is upward sloping – providing better attributes costs more and colleges face capacity constraints that suggest increasing costs at some student body size.

The financing of the typical two-year college differs significantly from that of profit maximizing firms – revenues are derived from tuition and fees paid by students, donations and grants, both from private (including individual, corporate and philanthropic) sources and public (governmental) sources (Winston, 1997). Donors provide subsidies directly to institutions and to students (in scholarships, stipends, etc.) – and public and private institutions differ in their reliance upon these various sources.

*What do students buy with their tuition?*

Understanding what tuition buys is critical to specifying the hedonic equation. College students might be best viewed as purchasing educational services in particular, among the array of services produced by colleges. Research outputs, for example, can be enjoyed without paying tuition, although there may be other fees for consumers of these products. Whether or not these goods are important to society or some other group, the hedonic price equations should only include characteristics of outputs to the extent they enhance the *undergraduate college experience.* Thus, hedonic equations include characteristics of the teaching staff (i.e., percentage with a Ph.D.), the student body (their peers, such as percentage part-time), location, and so on.

In addition to the specific characteristics that students pay for, college admissions officers like to say that students pay for the school 'reputation' or 'brand'. While there is

a strong consensus that brand matters for four year colleges, how important is this brand effect in the two-year college market in particular? Kane and Rouse (1999) and others have suggested that students' choice of two-year college is determined in large part by convenience and proximity. Thus it is possible that the 'brand' is not as important here as it is in for four-year colleges. In the extreme, two-year colleges may be 'generic'.

While intriguing, empirical work is not, at this point, able to fully evaluate the extent to which two-year colleges are generic, because we cannot interpret estimates of college-specific fixed effects as solely a brand effect. Our limited set of characteristic variables suffice for estimating the price indexes precisely because the college fixed effects serve to capture the impact of the myriad omitted variables that are either time invariant or slow changing, but is insufficiently rich to disentangle the brand effect from, say, a location effect.

*Net Prices or Sticker Prices*

While it is common practice in popular discussions to focus on trends and changes in sticker prices, student's choice among colleges, in contrast, are likely determined by net prices of attendance. As with cars or frozen pizza, it is likely that the consumer believes the *net price*, after discounts or subsidies, and not the sticker or list price matters. Further, Manski and Wise's (1983) analysis of the college choices of 4000 students finds coefficients on tuition and financial aid that are almost equal and of opposite sign. Thus, net and not sticker prices should be used in the hedonic analysis.

## III. Hedonic Model

Our analyses of the price of two-year college proceeds with a hedonic analysis of the price of college based, conceptually, on the work in Rosen (1974). The average net price of a year of school at the jth college at time t ($P_{jt}$) is a function of it characteristics:

(1) $$P_{jt} = \alpha + \beta_Z Z_j + \beta_X X_{jt} + \beta_S S_{jt} + \rho_t I_t + C_j + \varepsilon_{jt;} \qquad j=1,\ldots,J; \; t=1,\ldots,T$$

where $Z_j$ is a vector of time invariant characteristics of college j, i.e., location, etc; $X_{jt}$ is a vector of time varying characteristics of college j at time t, i.e., size of the undergraduate student body, student/faculty ratio, availability of dorms, course offerings, quality of the faculty; $S_{jt}$ is a vector of time varying characteristics of the student body attending college j in time t, $I_t$ is a vector of year dummies that take a value of one in year t for t=1,…, T; and $C_j$ is a dummy that takes on a value of one for college j (a college fixed effect). Notice (1) is not estimable as written because it includes both time invariant variables and college fixed effects – which will be perfectly collinear. We can include either time-invariant variables or the college fixed effects, but not both.

As described above, we define $P_{jt}$ as the 'net' or discounted price, $P_{jt} = T_{jt} - A_{jt}$, where $T_{jt}$ is the tuition (plus fees) price for one year for one undergraduate student (full-time) at college j in time t, (the 'sticker price' or list price) and $A_{jt}$ is average financial aid for one year at college j in time t.[5] Financial aid was restricted to grants only. Thus, student loans and work-study income were not included.[6] All public and

[5] While an individual level model might be desirable, appropriate student-level data are not available on a sufficiently broad scale for this. Publicly available data sets typically include only a sample of students nationwide, with only a small number of students at each school surveyed. Notice that in a linear model such as (1) using college-level data should yield the same parameter estimates as would a model based upon individual level data, although standard errors may differ. Intuitively, this is because the college level model can be easily derived by aggregating from the individual level model.

[6] ASC data include average student loans and average income from work-study jobs. We did not include these variables in the financial aid measure. Ideally, we would include measures of the value of student loan terms and the value of work-study jobs that are better than could be obtained in private capital or labor

institutional grants to students are included in the IPEDS data: Pell grants, other federal grants such as grants from the GI Bill, state merit and need-based grants, grants to students from institutions themselves, etc. Any private grants to students not reported to a university, such as an employer writing a check to an employee to offset a tuition payment for the employee's child, would not be included in the IPEDS grants data.

Before proceeding, an important caveat is in order. If college were a typical consumer good, each $\beta$ could be viewed as an estimate of the shadow price to consumers of a particular attribute of college or, put differently, the $\beta$s interpreted as capturing the willingness to pay of the marginal consumer for an incremental increase in the value of the attribute, ceteris paribus. Unfortunately, college is hardly a typical good and the $\beta$'s should be interpreted with caution. It is not clear that the price of college we observe is, in any sense, the market-clearing price and the estimates of the shadow prices may lie below the willingness to pay of the marginal consumer at the market clearing net price.[7]

In this paper, we are particularly interested in the $\rho$'s, which capture changes in prices over time and can be used to form a price index. The average rate of inflation between t and t+1 can be computed as $(\rho_{t+1} + \alpha + \beta_X \mathbf{X_{t+1}} + \beta_S \mathbf{S_{t+1}})/(\rho_t + \alpha + \beta_X \mathbf{X_t} + \beta_S \mathbf{S_t})$ where the bold indicates averages over all colleges in that year. Normalizing the level of the quality adjusted college price index to 100 in t, estimates of the price index for the following years can be created based upon the ratio of the $\rho$'s over subsequent years.

A final econometric note. Since the model includes a set of college fixed effects, the time-invariant variables $Z_j$ are eliminated and so, too, is concern about bias due to the

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markets—the aid component of loans and work study income. If one of these forms of financial aid has increased (decreased) over time in terms of its scope and/or generosity, then our methodology will overstate (understate) increases in the net price of college.

omission of unobserved time-invariant characteristics. The disadvantage is that the coefficients are identified only by the variation within each college across years. Thus, each observation is weighted by full-time equivalent undergraduate enrollment in the first year of our sample to minimize the impact of substitution bias and to allow the estimates to better reflect the actual distribution of spending in the market. Note that unweighted results would capture the prices of the average college - giving equal weight to small colleges and large. Weighting by 1989-90 enrollment allows us to compute an index based upon a fixed market basket of college, analogous to methods used in computing the Consumer Price Index. Using varying weights over time (annual enrollment) would confound changes in prices and changes in college choices and enrollment patterns.

While the econometric strategy is relatively straightforward, estimation presents a host of conceptual and practical questions. What are the relevant characteristics? Does the net price of college change uniformly across different segments of the market? To some extent, the answers depend upon the availability of data.

Note an important caveat about the price indices worth stressing. The indices that we estimate reflect only the change in net price of college services to students/consumers – and *not* the full set of services and outputs produced by colleges. Thus, we cannot use our price indices to deflate total college expenditures to get a measure of college "output." For example, the benefits of technical assistance or community services—which may be an important function of two-year colleges valued by non-students—may be only partially valued by students and therefore only partially reflected in the net price of a two-year college education.

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[7] If colleges charged net prices above market clearing prices, the estimates of the shadow prices would lie above the willingness to pay of the marginal consumer at the market-clearing price.

## IV. Data

We use five years of data from the College Board's Annual Survey of Colleges (ASC) and the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS) for academic years 1989-90 to 1993-94 to estimate hedonic models following (1).[8]

In principle, a long list of characteristics would be necessary to fully describe the services provided by a college in exchange for a year's (discounted) tuition. These generally fall into four categories – characteristics of the instructional program and student body (peers), physical characteristics of the school and other non-academic amenities, institutional/organizational characteristics, and value-added to each student's human capital, including human capital that could lead to pecuniary and non-pecuniary returns. We use a relatively parsimonious specification due, in part, to the college fixed effects specification, which excludes all variables time-invariant either in principle or in practice – some variables are excluded that could vary across time but are unchanging in our sample and study period. We also estimate employ a state fixed effects specification as a robustness check in which we include time invariant attributes of college.

The ASC data includes information on: (1) institutional aspects of colleges, for example, source of control (i.e., private vs. public), Carnegie classification, religious affiliation or accreditation; (2) environment (i.e., urban vs. rural) (3) facilities such as library holdings, availability of dorms (3) enrollment (part time, full time, etc.) (4) academic offerings and policies (5) fields of study (6) placement and credit policies (7)

[8] For reasons unknown to us, the rate of reporting grants to students by 2-year colleges experienced a sharp decline following the 1993-94 academic year. In the post-study years, both the IPEDS and College Board data sets have valid data for this item for only about one-quarter of 2-year colleges. In the years under study in this paper, about 75% of two-year colleges report grants to students each year.

freshman admissions/profile (8) transfer student policies (9) Student life (sororities, intercollegiate sports, etc) and (10) financial aid. Given the high rate of missing data on financial aid and number of students in the ASC data, we obtain the information on grants to students and number of students from IPEDS.[9]

*The Sample*

Our analysis focuses on "Two-year Colleges and Institutes" including only those with Carnegie classification code 90 during the study period, reporting non-zero enrollment and expenditures, with a student body composed entirely of undergraduates, and located in the 50 states or Washington DC. Proprietary institutions were excluded.[10]

For the 1989-90 academic year, the first time year of our study period, there were 1,322 institutions classified as "Two-year Colleges and Institutes" by Carnegie. Among these, 73 (5.5 percent) reported offering a bachelor's degree, 17 (1.3 percent) reported offering a Masters' degree, and 3 (0.2 percent) reported offering a Ph.D. degree. Further, 169 (12.8 percent) were proprietary. All of these institutions were excluded from the analysis. Of the remaining 1,079 institutions, 889 were included in our balanced panel of two-year colleges. Institutions were excluded due to missing data on tuition and fees, financial aid, or number of students.

Data may be missing for a particular school in a particular year for a variety of reasons. Most straightforward is that a college may have failed to provide the data in

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[9] IPEDS reports total grants to students for each institution. This figure would include grants to undergraduate and graduate students. For this study IPEDS provides a clean measure of grants to students, as the sample includes two-year colleges that only have undergraduates.

[10] Colleges with a Carnegie classification of "Two-year colleges and Institutes" that reported offering a bachelor's or higher degree were dropped from the sample as were the roughly 13 percent of "Two-year Colleges and Institutes" that were proprietary.

that year. While colleges have an incentive to do so since the College Board provides that data to high school seniors shopping for schools, that incentive is likely to be more important for some schools than others. This incentive may, in fact, be fairly unimportant to two-year institutions – if students choosing these schools rely primarily on other information sources (word-of-mouth, local newspapers, etc.) in making their decisions.

Alternatively, a school may 'enter' or 'exit' the two-year college market during our analysis period. New schools may have been created after the start of our sample period. Schools offering only a two-year degree in the early part of the study period may have offered a four-year degree at the end, thus 'exiting' the sample. Or, schools may have exited the two-year market altogether. This "entry" and "exit" is infrequent in terms of the number of schools and the number of students served by these schools. These entry and exit schools were not included in the sample. Given the missing data and entry and exit, we estimate the hedonic model with a "balanced panel" of 889 two-year colleges.

We interpolated missing explanatory variables for colleges that are missing particular data elements for one or two of the years. Results from our estimates based upon an unbalanced panel (without interpolated data) were, on the whole, qualitatively similar to the results from the balanced panel. For two of the variables, percent of faculty with Ph.D. degrees and average age of entering freshman, there were many colleges missing data for more than two of the years. For these two variables we include dummy variables indicating missing data as regressors in the hedonic models.

Table 1 provides data definitions for the model variables. Although the regressions use data from 1989-90 to 1993-94, for ease of exposition, we report weighted summary statistics for only the midpoint of the sample period (1991-92) for public

colleges and private colleges in tables 2a and 2b, and four year colleges for comparison..

For two-year colleges, public schools tend to be larger, on average, than private – enrollment of both full-time and part-time students is larger – and the composition of their student body differs. Private colleges have over four times as many full-time as part-time students; public colleges tend to serve more part-time than full-time students. Further, public colleges tend to have more minority and older students, lower proportions of faculty with Ph.D. degrees, higher proportions of part-time faculty, slightly larger fractions of students in fraternities and sororities, and are more likely to have NJCAA membership (the two-year college equivalent to the NCAA). Public colleges tend to be commuter schools while private colleges are largely residential. Unsurprisingly, public colleges have much lower mean sticker prices, aid per student, and net prices than private colleges. Finally, public colleges are much more likely to have average negative net prices.

Two-year and four-year colleges different markedly from each other. Among public colleges, two-year colleges have lower sticker prices, aid, and net prices. Among private colleges, two-year colleges have lower sticker prices and net prices. Interestingly, since the amount of aid per pupil is roughly similar, the sticker price of four-year colleges is roughly twice that of two-year colleges, while the net price suggests that four-year colleges are more than three times more expensive than two-year colleges. Relative to four-year colleges, two-year colleges also have far lower proportions of faculty with Ph.D. degrees, more part-time faculty, fewer full-time students, a larger proportion of part-time students, more minority and older students, and fewer non-academic amenities such as intramurals, varsity sports, social clubs, and dorms. (Of course, there may be

other amenities we do not capture in these data.)

As shown in table 3a, the sticker price of public colleges, tuition plus fees, increased by $232 over the five-year period, and the net price (again, tuition plus fees less aid) ***decreased by about $19*** over those five years. Increases in sticker prices were outpaced by increases in financial aid per student. At the same time, the percentage of public colleges with average negative net prices increased from 16 to 23 percent, NCAA membership, minority enrollments, percent part-time faculty, and the offering of intramurals increased, and pupil-teacher ratios fell substantially, while the number of students, after rising for a couple of years, tended to decrease.[11]

Turning to private colleges in table 3b, although sticker prices of private colleges increased by $736 over the sample period, ***net prices fell by an average of $288***. After rising very slowly, the percent of private colleges with negative net prices increased from less than 4 percent to almost 9 percent between 1992-93 and 1993-94. For private colleges, the percent of faculty with a Ph.D., the fraction of minority students, and the existence of social clubs and varsity men's basketball tended to increase over the sample period. Albeit a smaller decrease than public colleges, private colleges also experienced a drop in pupil teacher ratios. Contrary to public colleges, NJCAA membership declined for private colleges over the sample period.

**Results for Baseline and Hedonic Models of the Price of Two-year Colleges**

*Baseline (Sticker) Price Indices*

Table 4 reports estimated baseline price indices, along with the CPI for college tuition and fees which is based upon prices for four year colleges only, for comparison

[11] The years of enrollment increases correspond with the 1990-91 recession; the decreases correspond to the economic recovery that followed.

purposes. Henceforth, all estimated price indices are in real terms. We deflate each nominal sticker and net price by the CPI-U, and we do the same for the CPI for college tuition and fees (column 1). The estimated price indices are derived from "unadjusted" regressions explaining the price of two-year college. Each unadjusted regression is weighted by first period enrollments and includes only college fixed effects and year effects– no college characteristics. We estimate analogous regressions for the sticker and net prices for all schools, and for public and private colleges separately. All, but one, of the estimated coefficients on the year effects variables in the sticker price regressions are significant. In the net price regressions about one-half of the coefficients are statistically significant.

*Baseline (Net Price) Indices with College Fixed Effects*

As shown in table 4, the real sticker price (tuition plus fees) of *four-year* colleges increased by 37 percent between 1990 and 1994 according to the CPI index (column 2). In Schwartz and Scafidi (2002) we use a similar methodology to form price indices for four-year colleges. The resulting sticker price estimates were quite similar to estimates from the CPI (column 3). There was a different trend for two-year colleges over this time period. Using the balanced panel, we estimate that the real sticker price of two-year colleges increased at roughly the same rate over the first four years of the sample period, then rising a bit slower in the fifth year. As shown in column 4, between 1990 and 1994, the real sticker price of two-year colleges increased by 22.6 percent.

Although there was a substantial increase, the unadjusted net price of four year colleges did not go up as fast as the sticker price over this time period (column 5 versus

column 3). As shown in column (6), the unadjusted net price of two-year college displays a dramatically different pattern over this time period – ***net prices of two-year colleges decreased in real terms***.

Turning to public colleges (table 4a), real sticker prices increased by 23.9 percent for public two-year colleges (column 4), while the real sticker price of public four-year colleges increased by 40.2 percent (column 3) according to Schwartz and Scafidi (2002). Net prices of public two-year colleges showed a modest absolute *decline* (column 6), while net prices of four-year public colleges increased by 31.4 percent over the five year period (column 5).

Although the magnitudes differ, the same pattern holds for private institutions. As shown in table 4b, the sticker price of two-year private colleges increased by only 14 percent over the sample period (column 4), while the sticker price of four-year private colleges increased 33.3 percent (column 3). The net price for four-year private colleges rose substantially less than the sticker price. The net price of two-year private colleges experienced an absolute decrease (column 6).

For four-year colleges, Winston (1997, 1999) suggests that different rates of increase in sticker and net prices between public and private institutions may be due to differential changes across sectors in donor subsidies—for example declining state appropriations for public colleges. This paper shows an analogous relationship between sticker and net price changes in public and private two-year colleges with one striking observation: Net prices actually decreased during the sample period for both public and private two-year colleges. Net prices fell about 4 percent for public colleges and about 8 percent for private colleges.

*Hedonic (Quality-Adjusted) Net Price Indices with College Fixed Effects*

Table 5 contains full sample, public college, and private college estimates of hedonic models of the net price of college. Each regression contains college fixed effects and is weighted by the number of FTE students in 1989-90. The college fixed effects are statistically significant at the one percent level in each regression.

Although the college fixed effects have a high degree of statistical significance, most of the attributes of college are not statistically significant. Since the results for the full sample and the sample of public colleges are so similar, we discuss only the latter.

*Public Colleges*

For public colleges, the percentage of faculty with a Ph.D., the percentage part-time faculty, the presence of social clubs, and majority residential campuses had a positive impact on net prices. NJCAA membership, percent minority students, full-time students, and having 10 to 49.99 percent of students living in dorms are estimated to have a negative effect on net prices. Surprisingly, the coefficients suggest that, ceteris paribus, schools with higher pupil-teacher ratios have higher net prices.

*Private Colleges*

Turning to the hedonic results for private colleges, the net price of private colleges is positively related to social clubs, minority students, and older freshman. Percent Ph.D. faculty, NJCAA membership, and a high percentage of students in dorms lead to lower net prices of private colleges. As in the case with public colleges, pupil-teacher ratio has a positive effect on net price. Schwartz and Scafidi (2002) found the

same effect of pupil-teacher ratio on the net price of four-year colleges.

*Price Indices*

Using the estimated coefficients on the year dummy variables from the hedonic models, we constructed the net price indices listed in table 5b. Over the sample period we estimate that net prices, when adjusted for changes in quality, experienced only a 4.1 percent real increase. This overall real price increase was caused by the 6.1 percent increase in the real net price of public colleges. The quality-adjusted net prices of private colleges fell by over 6 percent during the sample period.

*Quality Changes*

Comparing the estimated net price indices in tables 4 and 5b, we can make an inference about changes in college quality over the sample period. From column 5 of table 4, we see that the unadjusted net price of public colleges decreased by 4 percent over the sample period. From column 2 of table 5b, the *quality-adjusted* net price of public colleges increased by 6.1 percent. Holding quality constant, prices rose faster for public two-year colleges than in table 4, which suggests that the quality of public four-year colleges decreased a bit over the sample period.

From column 7 of table 4, the unadjusted net price of private colleges decreased by 7.9 percent over the sample period. The quality-adjusted net price of private colleges is estimated to have fallen just 6.2 percent over the sample period. This suggests that the quality of private two-year colleges decreased over the sample period as well. In the near future, we will investigate which variables are causing this estimated decrease in the

quality of two-year colleges.

*Hedonic Equations with State Fixed Effects*

As a robustness check, we estimated hedonic models using state fixed effects, rather than college fixed effects, which allowed us to include some time invariant attributes of college as explanatory variables. As shown in table 6, the state fixed effects were jointly significant in all models, nevertheless, the fit of the overall regressions drops considerably. Although not reported here, the estimated price indices obtained from table 6 are qualitatively and quantitatively very similar to the price indices reported in table 5. Thus, our estimated price indices are robust to using college or state fixed effects. In addition, the state fixed effects models yield leads to more intuitive hedonic estimates on the attributes of college, especially for private colleges.

## VI. Negative Net Prices

As indicated above, it is quite common for students at particular two-year colleges to pay, on average, negative net prices, where the definition of net price remains tuition plus fees minus financial aid. Virtually all two-year colleges that have negative net prices are public, although a few private colleges have negative net prices as well.[12] Negative net prices are possible, as only a small portion of student financial aid at public colleges comes is funded by the institutions themselves (McPherson and Shapiro, 1998). Virtually all financial aid to public college students is funded by third parties such as the

[12] Only one private two-year college has a negative net price for more than three of the five years in the sample period. Concordia College in Selma, Alabama has a negative net price for each of the five years. Concordia is affiliated with the Lutheran Church–Missouri Synod. This institution has low sticker prices and an average net price of about negative $1,100 over the sample period.

federal government (e.g. Pell Grants) and state governments (e.g. Georgia's HOPE scholarships and HOPE Grants).

Given the low sticker prices of public two-year colleges, as shown in table 2a, students who receive maximum Pell Grant awards would pay a negative net price at most public two-year colleges. The amount of the grant provided under Pell depends on the student's need, up to a prescribed limit. Need, in turn, is a function of the student's family income and the sticker price of the college they attend. Lower family income and higher tuition constitute more need. Since 1980, nominal appropriations for the Pell program have increased from $2.16 billion to $8.76 billion in FY 2001 (U.S. Department of Education, 2001). Students may receive Pell awards that exceed sticker prices to use the awards, in theory, to defray the costs of books, other educational expenses, and living expenses.

Table 7 reports the prevalence of negative average net prices in the two-year college market. As shown in the top panel of table 7, 18 percent of the colleges in our sample had students who paid on average a negative net price in 1989-90. This increased to 23 percent by 1993-94. As a proportion of students, 16 percent of the students who attended a college in our sample were at an institution with negative net prices on average. This proportion increased to 22 percent by the end of the sample period. Thus, in our sample, almost 550,000 students attend a college with, on average, a negative net price in 1993-94.

We categorize the 889 two-year colleges in the sample into three groups: those consistently charging aver negative net prices during the sample period (106), which we will refer to as 'net subsidy' schools; colleges that consistently charge average positive

net prices, (601), which we will refer to as 'net cost' schools; and colleges that have average negative net prices that are sometimes positive and sometimes negative, (172), which we will refer to as 'switchers.' Weighted summary statistics for each of these three categories are listed in table 8. Compared to the net cost colleges, the net subsidy colleges are larger, but have smaller pupil-teacher ratios. Net subsidy colleges are more residential—with larger proportions of students living on campus. Although the net subsidy schools have fewer non-academic amenities such as social clubs and intramurals, they are more likely to have a varsity football team.

To analyze whether colleges in these three categories have seen different price changes, or have different hedonic coefficients, we estimated separate regressions for each group, estimated using college fixed effects. As shown in table 9, the estimated coefficients differ across the three categories in both sign and magnitude. The most striking finding is the difference in the price path. For the net subsidy schools, the quality-adjusted net price of college fell in real terms almost monotonically over the sample period. There is a similar pattern for the switcher schools, suggesting the increase in real net prices of two-year colleges found in earlier regressions derives from increases among net cost - colleges. Neither the switchers nor the net subsidy schools experienced real (constant-quality) price increases over the sample period. As shown in table 10, the estimated real net price increase for the whole sample was 4.1 percent (reported previously in table 5b), while the real net price increase for the net cost colleges was 7.8 percent over the sample period.

## VII. Concluding Remarks

This paper represents an effort to fill a gap in our understanding of the economics of

colleges and, in particular, of trends in the price and affordability of college, by investigating the prices of two-year colleges. Building upon previous work of ours and others, we estimate price indices for two-year colleges for both the 'sticker price' (tuition plus fees) and, what is likely more important to college students the 'net price' (tuition plus fees less financial aid). Because the characteristics of colleges change over time, we also use hedonic regression analyses to estimate quality-adjusted price indices, which, unfortunately, suggest that the quality of two year colleges declined during our sample period - the first half of the 1990's.

Our analyses revealed an interesting phenomenon in the two year college market: a significant number of two year colleges have students who receive sufficiently generous financial aid such that the total amount of aid exceeds the cost of tuition and fees for the average student. At these institutions, then, the average student receives subsidies that may be used to offset living expenses, or used for other purposes. Further, our work provides evidence that the cost of these schools did not, in fact, increase over our study period, but the increase in net prices found in our full sample analyses are driven by the increasing cost of attending schools in which, on average, financial aid falls short of the cost of tuition and fees.

What do we know about these 'net subsidy' schools? Our work provides little in the way of an answer to this beyond describing their different features and noting the apparent importance of state governments in determining whether a school is a 'net cost' or 'net subsidy' school in a particular year.

The work described in this paper, while preliminary and exploratory, provides a foundation and suggests some important directions for future work. In general, more

attention needs to be paid to understanding the economics of the two-year college market. What determines the pricing of two-year colleges? How does it differ from that of four-year colleges? What characteristics of two-year colleges matter to consumers? How are they different from those that matter to students at four-year colleges? How can some colleges garner such generous financial aid for their students, while others are less successful? What role does state policy toward institutions play and how important is student-based financial aid? These are among the questions we anticipate investigating in future work.

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## Table 1
## Variable Definitions

| Variable* | Definition |
|---|---|
| **Tuition + Fees** | Undergraduate tuition plus fees |
| **Aid Per Student** | Average grants per student |
| **Tuition+Fees-Aid per student** | Undergraduate tuition plus fees minus average grants per student |
| **Pupil-Teacher ratio** | (# FTE undergrads + grads) / (# FTE Faculty) |
| **Faculty with PhD** | fraction of faculty with PhD degree |
| **Part-time Faculty** | fraction of faculty who are part-time |
| **Full-time Students/100** | Number of full-time undergraduates divided by 100 |
| **Part-time Students/100** | Number of part-time undergraduates divided by 100 |
| **NJCAA Member** | =1, if institution is a member of the National Jr. College Athletic Association |
| **Fraternities and/or Sororities** | =1, if institution has fraternity and/or sororities; 0 otherwise |
| **Minority Students** | fraction of undergraduates who are racial or ethnic minorities |
| **Over 50% Reside in Dorms** | =1, if over 50% of students reside in on-campus dorms |
| **10-49% Reside in Dorms** | =1, if over 10% and less than 50% of students reside in on-campus dorms |
| **Average Age of Entering Freshman** | average age of entering freshman |
| **Metro Area > 500,000 residents** | =1, if metro area has more than 500K residents |
| **Metro Area 250K-500K residents** | =1, if metro area has more than 250K and less than 500K residents |
| **Metro Area 50K-249K residents** | =1, if metro area has more than 50K and less than 250K residents |
| **Religious Affiliation** | =1, if college has a religious affiliation |
| **Middle Atlantic Region** | =1, if college located in middle Atlantic region of U.S. |
| **Southeastern Region** | =1, if college located in Southeastern region of U.S. |
| **Midwest Region** | =1, if college located in Midwest region of U.S. |
| **Southwest Region** | =1, if college located in Southwest region of U.S. |
| **West Region** | =1, if college located in West region of U.S. |
| **Age of College in 1989** | 1989 - year college was founded |
| **Varsity Football Team** | =1. If college has a varsity football team |
| **Varsity Men's Basketball Team** | =1, if college has a varsity men's basketball team |
| **Intramurals Offered** | =1, if college offers intramural sports |
| **Number of Intramural Sports** | number of intramural sports offered by college |
| **Weight** | Number of FTE undergraduates in 1989-90 |

* All variables except tuition plus fees comes from the College Board. Tuition and Fees comes from the U.S. Department of Education's Integrated Postsecondary Education Database System (IPEDS)

## Table 2a

## Summary Statistics for 1991-92
## Public Two- and Four-Year Colleges

| | Two-Year Public Colleges | | Four-Year Public Colleges | |
|---|---|---|---|---|
| | **Mean** | **Std. Dev.** | **Mean** | **Std. Dev.** |
| **Tuition + Fees** | 1,135 | 819 | 2,324 | 821 |
| **Aid Per Student** | 439 | 681 | 904 | 336 |
| **Tuition+Fees-Aid per student** | 753 | 535 | 1,420 | 765 |
| **Pupil-Teacher ratio** | 18.76 | 15.94 | 22.19 | 3.80 |
| **Faculty with PhD*** | 0.09 | 0.07 | 0.75 | 0.15 |
| **Part-time Faculty** | 0.59 | 0.17 | 0.23 | 0.13 |
| **Full-time Students/100** | 37.51 | 32.41 | 116.30 | 69.08 |
| **Part-time Students/100** | 61.19 | 69.72 | 26.03 | 21.04 |
| **NJCAA or NCAA Member** | 0.61 | 0.49 | 0.94 | 0.23 |
| **Fraternities and/or Sororities** | 0.13 | 0.34 | 0.96 | 0.19 |
| **Minority Students** | 0.23 | 0.21 | 0.16 | 0.14 |
| **Over 50% Reside in Dorms** | 0.01 | 0.10 | 0.14 | 0.35 |
| **10-49% Reside in Dorms** | 0.14 | 0.35 | 0.70 | 0.46 |
| **Average Age of Entering Freshman*** | 23.13 | 3.61 | 18.76 | 1.07 |
| **Metro Area > 500,000 residents** | 0.13 | 0.33 | 0.04 | 0.19 |
| **Metro Area 250K-500K residents** | 0.10 | 0.29 | 0.08 | 0.28 |
| **Metro Area 50K-249K residents** | 0.35 | 0.48 | 0.42 | 0.49 |
| **Middle Atlantic Region** | 0.15 | 0.36 | 0.15 | 0.35 |
| **Southeastern Region** | 0.22 | 0.41 | 0.20 | 0.40 |
| **Midwest Region** | 0.23 | 0.42 | 0.38 | 0.49 |
| **Southwest Region** | 0.09 | 0.29 | 0.06 | 0.24 |
| **West Region** | 0.27 | 0.45 | 0.16 | 0.36 |
| **Age of College in 1990** | 37.44 | 22.24 | 101.32 | 44.84 |
| **Varsity Football Team** | 0.21 | 0.41 | 0.78 | 0.41 |
| **Varsity Men's Basketball Team** | 0.74 | 0.44 | 0.93 | 0.25 |
| **Intramurals Offered** | 0.77 | 0.42 | 1.00 | 0.06 |
| **Number of Intramural Sports** | 10.01 | 8.65 | 28.66 | 11.00 |

**Source: 1989-94 College Board Data; 1989-94 IPEDS data.**
**All variables weighted by FTE in 1989-90.**

*** summary statistics calculated only for colleges without missing data.**

## Table 2b

## Summary Statistics for 1991-92
## Private Two- and Four-Year Colleges

| | Two-Year Private Colleges | | Four-Year Private Colleges | |
|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. |
| Tuition + Fees | 5,601 | 2,584 | 10,809 | 3,439 |
| Aid Per Student | 3,390 | 2,527 | 3,199 | 1,349 |
| Tuition+Fees-Aid per student | 2,391 | 1,345 | 7,704 | 2,830 |
| Pupil-Teacher ratio | 20.21 | 13.20 | 18.12 | 5.63 |
| Faculty with PhD* | 0.17 | 0.13 | 0.76 | 0.17 |
| Part-time Faculty | 0.45 | 0.23 | 0.33 | 0.16 |
| Full-time Students/100 | 17.82 | 27.38 | 30.21 | 27.69 |
| Part-time Students/100 | 4.06 | 8.10 | 4.89 | 5.86 |
| NJCAA Member | 0.55 | 0.50 | 0.78 | 0.42 |
| Fraternities and/or Sororities | 0.12 | 0.33 | 0.62 | 0.49 |
| Minority Students | 0.17 | 0.20 | 0.15 | 0.17 |
| Over 50% Reside in Dorms | 0.38 | 0.49 | 0.76 | 0.43 |
| 10-49% Reside in Dorms | 0.46 | 0.50 | 0.22 | 0.41 |
| Average Age of Entering Freshman* | 19.20 | 2.24 | 18.26 | 0.78 |
| Metro Area > 500,000 residents | 0.11 | 0.31 | 0.12 | 0.33 |
| Metro Area 250K-500K residents | 0.03 | 0.18 | 0.13 | 0.34 |
| Metro Area 50K-249K residents | 0.21 | 0.41 | 0.33 | 0.47 |
| Religious Affiliation | 0.48 | 0.50 | 0.61 | 0.49 |
| Middle Atlantic Region | 0.18 | 0.39 | 0.31 | 0.46 |
| Southeastern Region | 0.25 | 0.43 | 0.17 | 0.37 |
| Midwest Region | 0.23 | 0.42 | 0.31 | 0.46 |
| Southwest Region | 0.02 | 0.15 | 0.03 | 0.18 |
| West Region | 0.15 | 0.36 | 0.08 | 0.27 |
| Age of College in 1990 | 80.57 | 37.89 | 114.58 | 45.93 |
| Varsity Football Team | 0.17 | 0.38 | 0.52 | 0.50 |
| Varsity Men's Basketball Team | 0.55 | 0.50 | 0.74 | 0.44 |
| Intramurals Offered | 0.87 | 0.34 | 0.99 | 0.08 |
| Number of Intramural Sports | 12.43 | 9.16 | 21.60 | 9.74 |

**Source: 1989-94 College Board Data; 1989-94 IPEDS data.**
**All variables weighted by FTE in 1989-90.**

*** summary statistics calculated only for colleges without missing data.**

## Table 3a

## Means by Year
## Public Two-Year Colleges

| Variable | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|
| Tuition + Fees | 971.21 | 1044.82 | 1115.96 | 1187.92 | 1202.90 |
| Aid Per Student | 500.29 | 634.57 | 742.74 | 807.42 | 858.77 |
| Tuition+Fees - Aid per student | 470.92 | 440.76 | 429.24 | 464.78 | 452.06 |
| Negative Net Price | 0.16 | 0.20 | 0.22 | 0.19 | 0.23 |
| Pupil-Teacher ratio | 19.91 | 19.54 | 18.60 | 17.93 | 17.65 |
| Faculty with PhD | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| Part-time Faculty | 0.58 | 0.59 | 0.59 | 0.60 | 0.60 |
| LN Full-time Students | 6.40 | 6.57 | 6.59 | 6.30 | 5.83 |
| LN Part-time Students | 6.77 | 6.96 | 6.95 | 6.62 | 6.13 |
| NJCAA Member | 0.57 | 0.59 | 0.60 | 0.61 | 0.61 |
| Fraternities and/or Sororities | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Minority Students | 0.22 | 0.23 | 0.24 | 0.24 | 0.25 |
| Over 50% Reside in Dorms | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| 10-49% Reside in Dorms | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 |
| Average Age of Entering Freshman | 23.17 | 23.13 | 23.15 | 23.09 | 23.06 |
| Varsity Football Team | 0.24 | 0.24 | 0.23 | 0.23 | 0.22 |
| Varsity Men's Basketball Team | 0.74 | 0.74 | 0.74 | 0.74 | 0.73 |
| Intramurals Offered | 0.76 | 0.76 | 0.77 | 0.77 | 0.78 |
| Number of Intramural Sports | 9.86 | 9.94 | 9.92 | 9.84 | 9.82 |
| Number of Colleges | 779 | 779 | 779 | 779 | 779 |

**Source: 1989-94 College Board Data; 1989-94 IPEDS data.**
**All variables weighted by FTE in 1989-90.**

*** summary statistics calculated only for colleges without missing data.**

## Table 3b

## Means by Year
## Private Two-Year Colleges

| Variable | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|
| Tuition + Fees | 5,273 | 5,387 | 5,591 | 5,791 | 6,010 |
| Aid Per Student | 1,639 | 2,038 | 2,439 | 2,754 | 3,045 |
| Tuition+Fees - Aid per student | 3,635 | 3,447 | 3,336 | 3,325 | 3,347 |
| Negative Net Price | 0.02 | 0.03 | 0.03 | 0.03 | 0.09 |
| Pupil-Teacher ratio | 18.80 | 19.69 | 19.27 | 18.80 | 17.79 |
| Faculty with PhD* | 0.15 | 0.18 | 0.17 | 0.18 | 0.18 |
| Part-time Faculty | 0.45 | 0.44 | 0.44 | 0.45 | 0.44 |
| LN Full-time Students | 5.85 | 5.93 | 5.81 | 5.88 | 5.92 |
| LN Part-time Students | 4.06 | 4.09 | 3.94 | 4.10 | 3.98 |
| NJCAA Member | 0.54 | 0.53 | 0.56 | 0.50 | 0.49 |
| Fraternities and/or Sororities | 0.13 | 0.13 | 0.12 | 0.15 | 0.15 |
| Minority Students | 0.16 | 0.18 | 0.17 | 0.17 | 0.18 |
| Over 50% Reside in Dorms | 0.44 | 0.43 | 0.39 | 0.36 | 0.34 |
| 10-49% Reside in Dorms | 0.40 | 0.41 | 0.46 | 0.49 | 0.50 |
| Average Age of Entering Freshman* | 19.09 | 19.02 | 19.19 | 19.33 | 19.33 |
| Varsity Football Team | 0.17 | 0.17 | 0.17 | 0.18 | 0.17 |
| Varsity Men's Basketball Team | 0.55 | 0.57 | 0.56 | 0.58 | 0.62 |
| Intramurals Offered | 0.85 | 0.85 | 0.88 | 0.88 | 0.85 |
| Number of Intramural Sports | 12.43 | 12.75 | 12.64 | 12.59 | 12.44 |
| Number of Colleges | 100 | 100 | 100 | 100 | 100 |

**Source: 1989-94 College Board Data; 1989-94 IPEDS data.**
**All variables weighted by FTE in 1989-90.**

*** summary statistics calculated only for colleges without missing data.**

**Table 4**

**Comparison of CPI and Unadjusted Real Price Indices**

**ALL COLLEGES**

| Year | (1) CPI-U | (2) CPI: College Tuition and Fees | (3) All 4-Year Tuition+Fees* | (4) All 2-Year Colleges Tuition+Fees* | (5) All 4-Year Colleges Net Price* | (6) All 2-Year Colleges Net Price* |
|---|---|---|---|---|---|---|
| 1990 | 100.0 | 100.0 | 100.0 | 100.0 | 100 | 100.0 |
| 1991 | 103.0 | 105.7 | 108.3 | 106.9 | 105.7 | 93.8 |
| 1992 | 106.1 | 117.1 | 119.2 | 113.7 | 118.8 | 91.3 |
| 1993 | 108.8 | 128.0 | 129.5 | 120.7 | 127.3 | 97.4 |
| 1994 | 111.9 | 137.0 | 138.0 | 122.6 | 129.2 | 95.3 |

* These real price indices were created using estimates from weighted fixed effects regressions of the sticker or net price of college on year dummy variables. All regression coefficients are significant at the 1 percent level.

## Table 4a

## Comparison of CPI and Unadjusted Real Price Indices

## PUBLIC COLLEGES

| Year | (1) CPI-U | (2) CPI: College Tuition and Fees | (3) 4-Year Public Tuition+Fees* | (4) 2-Year Public Tuition+Fees* | (5) 4-Year Public Net Price* | (6) 2-Year Public Net Price* |
|---|---|---|---|---|---|---|
| 1990 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1991 | 103.0 | 105.7 | 106.8 | 107.6 | 101.7 | 93.6 |
| 1992 | 106.1 | 117.1 | 120.3 | 114.9 | 118.2 | 91.1 |
| 1993 | 108.8 | 128.0 | 130.9 | 122.3 | 128.6 | 98.7 |
| 1994 | 111.9 | 137.0 | 140.2 | 123.9 | 131.4 | 96.0 |

* These real price indices were created using estimates from weighted fixed effects regressions of the sticker or net price of college on year dummy variables. All regression coefficients are significant at the 1 percent level.

## Table 4b

## Comparison of CPI and Unadjusted Real Price Indices

## PRIVATE COLLEGES

| Year | (1) CPI-U | (2) CPI: College Tuition and Fees | (3) 4-Year Private Tuition+Fees* | (4) 2-Year Private Tuition+Fees* | (5) 4-Year Private Net Price* | (6) 2-Year Private Net Price* |
|---|---|---|---|---|---|---|
| 1990 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1991 | 103.0 | 105.7 | 109.1 | 102.2 | 108.0 | 94.8 |
| 1992 | 106.1 | 117.1 | 117.8 | 106.0 | 114.3 | 91.8 |
| 1993 | 108.8 | 128.0 | 125.7 | 109.8 | 119.4 | 91.5 |
| 1994 | 111.9 | 137.0 | 133.3 | 114.0 | 119.8 | 92.1 |

* These real price indices were created using estimates from weighted fixed effects regressions of the sticker or net price of college on year dummy variables. All regression coefficients are significant at the 1 percent level.

## Table 5a

## Hedonic Equations with College Fixed Effects*

| | Full Sample | | Public | | Private | |
|---|---|---|---|---|---|---|
| | **Estimate** | **Std. Error** | **Estimate** | **Std. Error** | **Estimate** | **Std. Error** |
| **p91** | -29.26 | 10.87 | -25.54 | 9.94 | -208.56 | 96.20 |
| **p92** | -30.42 | 11.22 | -25.53 | 10.28 | -278.53 | 98.26 |
| **p93** | 11.31 | 11.69 | 16.89 | 10.72 | -338.26 | 105.42 |
| **p94** | 3.44 | 12.17 | 7.05 | 11.17 | -209.95 | 109.95 |
| **Pupil-Teacher ratio** | 15.45 | 1.98 | 13.63 | 1.85 | 93.18 | 22.26 |
| **Pupil-Teacher ratio squared** | -0.03 | 0.01 | -0.03 | 0.01 | -0.87 | 0.30 |
| **Faculty with PhD** | -88.71 | 167.78 | 73.55 | 164.00 | -557.59 | 643.77 |
| **Faculty with PhD missing** | 21.92 | 42.87 | 22.08 | 39.47 | 1257.99 | 396.14 |
| **Part-time Faculty** | 263.74 | 85.60 | 266.70 | 79.86 | -79.69 | 515.51 |
| **Full-time Students** | -0.48 | 0.23 | -0.47 | 0.21 | -54.26 | 25.69 |
| **Full-time Students squared** | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.05 |
| **Part-time Students** | -4.59 | 6.67 | -5.78 | 6.02 | -1001.66 | 529.21 |
| **Part-time Students squared** | 0.10 | 0.17 | 0.12 | 0.15 | 215.17 | 91.99 |
| **NJCAA Member** | -97.97 | 31.22 | -83.24 | 29.28 | -116.61 | 198.11 |
| **Fraternities and/or Sororities** | 118.14 | 33.67 | 48.50 | 31.52 | 1430.85 | 212.57 |
| **Minority Students** | -5.25 | 138.86 | -40.69 | 128.26 | 1145.81 | 1023.54 |
| **Over 50% Reside in Dorms** | 21.76 | 106.09 | 26.09 | 112.56 | -479.94 | 228.72 |
| **10-49% Reside in Dorms** | -38.76 | 64.09 | -38.45 | 57.80 | | |
| **Average Age of Entering Freshman** | 0.08 | 4.04 | -0.74 | 3.68 | 96.11 | 43.85 |
| **Age missing** | -12.55 | 96.58 | -32.98 | 87.97 | 6337.04 | 1483.46 |
| **Constant** | 231.91 | 132.73 | 198.83 | 123.03 | 1375.69 | 1063.30 |
| **N** | **4,395** | | **3,895** | | **500** | |
| **R**2** | **0.95** | | **0.94** | | **0.95** | |
| **F(college attributes)** | | | | | | |
| **F(college fixed effects)** | **63.56** | **p<.000** | **50.21** | **p<.000** | **47.02** | **p<.000** |

*** Dependent variable equals Net_price. Weighted by the number of FTE students in 1989-90. Each regression is estimated via fixed effects.**

## Table 5b

## Quality-Adjusted Real Net Price Indices*

| Year | CPI: College Tuition and Fees | (1) All Colleges | (2) Public Colleges | (3) Private Colleges |
|---|---|---|---|---|
| 1990 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1991 | 105.7 | 96.1 | 96.5 | 93.3 |
| 1992 | 113.6 | 97.1 | 98.1 | 90.8 |
| 1993 | 120.7 | 104.6 | 106.9 | 89.1 |
| 1994 | 125.9 | 104.1 | 106.1 | 93.8 |

* Price indices in columns 1 through 3 are created using regression coefficients reported in table 5a.

## Table 6

## Hedonic Equations with State Fixed Effects*

| | Full Sample | | Public | | Private | |
|---|---|---|---|---|---|---|
| | Estimate | Std. Error | Estimate | Std. Error | Estimate | Std. Error |
| **p91** | -23.11 | 28.69 | -18.14 | 26.14 | -249.47 | 160.45 |
| **p92** | -17.13 | 28.81 | -9.93 | 26.26 | -341.13 | 161.51 |
| **p93** | 27.41 | 28.94 | 35.87 | 26.39 | -402.52 | 165.35 |
| **p94** | 24.46 | 29.07 | 32.09 | 26.51 | -230.15 | 167.72 |
| **Pupil-Teacher ratio** | 18.77 | 2.08 | 20.91 | 1.98 | 42.29 | 24.07 |
| **Pupil-Teacher ratio squared** | -0.070 | 0.008 | -0.076 | 0.008 | -0.211 | 0.288 |
| **Faculty with PhD** | 864.80 | 156.89 | 810.55 | 151.22 | 1900.11 | 760.67 |
| **Faculty with PhD missing** | 324.14 | 33.26 | 286.74 | 30.39 | 1333.97 | 281.48 |
| **Part-time Faculty** | 61.95 | 74.82 | 195.66 | 69.85 | -1370.25 | 470.96 |
| **Full-time Students** | 0.10 | 0.06 | 0.09 | 0.05 | 22.04 | 15.42 |
| **Full-time Students squared** | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.05 |
| **Part-time Students** | 11.32 | 4.92 | 5.37 | 4.47 | -141.16 | 330.42 |
| **Part-time Students squared** | -0.12 | 0.15 | 0.00 | 0.14 | 128.13 | 79.83 |
| **NJCAA Member** | -62.28 | 29.25 | -73.07 | 26.76 | -738.96 | 211.45 |
| **Fraternities and/or Sororities** | -62.44 | 31.15 | -17.86 | 28.65 | -21.24 | 222.08 |
| **Minority Students** | -896.90 | 62.66 | -842.63 | 57.61 | -2256.93 | 492.10 |
| **Over 50% Reside in Dorms** | 816.89 | 80.76 | 333.00 | 90.43 | 1408.91 | 325.64 |
| **10-49% Reside in Dorms** | 220.17 | 35.63 | 135.83 | 32.87 | 667.96 | 297.96 |
| **Average Age of Entering Freshman** | -20.81 | 3.44 | -21.93 | 3.12 | -50.44 | 38.23 |
| **Age missing** | -488.01 | 82.77 | -520.48 | 75.23 | -702.52 | 1066.98 |
| **Private** | 3190.85 | 89.75 | | | | |
| **Religious Affiliation** | -1846.58 | 124.18 | | | -613.40 | 258.65 |
| **Metro Area > 500,000 residents** | 99.38 | 39.71 | 59.74 | 36.27 | 1399.76 | 377.40 |
| **Metro Area 250K-500K residents** | 220.81 | 40.41 | 220.72 | 36.72 | -202.45 | 416.84 |
| **Metro Area 50K-249K residents** | 94.41 | 24.00 | 103.59 | 21.79 | -37.67 | 269.81 |
| **Age of College in 1990** | 1.71 | 1.33 | 1.61 | 1.28 | -49.45 | 9.38 |
| **Age of College in 1990 squared** | 0.00 | 0.01 | 0.01 | 0.01 | 0.21 | 0.04 |
| **Varsity Football Team** | 9.74 | 35.99 | 7.66 | 33.12 | 629.49 | 328.29 |
| **Varsity Men's Basketball Team** | -197.54 | 33.57 | -208.63 | 30.92 | -64.22 | 213.90 |
| **Intramurals Offered** | -66.15 | 31.00 | -83.65 | 28.27 | 971.33 | 295.04 |
| **Number of Intramural Sports** | -0.65 | 1.57 | -1.27 | 1.44 | 45.54 | 17.33 |
| **N** | **4,395** | | **3,895** | | **500** | |
| **R**2** | **0.60** | | **0.47** | | **0.83** | |
| **F(college attributes)** | | | | | | |
| **F(state fixed effects)** | **35.29** | **p<.000** | **38.57** | **p<.000** | **13.71** | **p<.000** |

*** Dependent variable equals Net_price. Weighted by the number of FTE students in 1989-90. Each regression is estimated via fixed effects.**

## Table 7

## Colleges with Negative Net Prices, by year

| Year | # of schools with positive net price | # of schools with negative net price | % of schools negative net price |
|---|---|---|---|
| **1990** | 720 | 159 | 18 |
| **1991** | 697 | 182 | 21 |
| **1992** | 682 | 197 | 22 |
| **1993** | 692 | 187 | 21 |
| **1994** | 679 | 200 | 23 |

| Year | # of students attending positive net price colleges | # of students attending negative net price colleges | % of students attending negative net price colleges |
|---|---|---|---|
| **1990** | 2,124,276 | 391,661 | 16 |
| **1991** | 2,084,086 | 473,594 | 19 |
| **1992** | 1,998,879 | 523,320 | 21 |
| **1993** | 2,031,167 | 465,397 | 19 |
| **1994** | 1,917,423 | 543,122 | 22 |

## Table 8

## Summary Statistics for 1991-92, by net price of college*

| | Net Subsidy | | Switchers | | Net Cost | |
|---|---|---|---|---|---|---|
| Variable | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. |
| Tuition + Fees | 578 | 486 | 895 | 828 | 1,462 | 1,273 |
| Aid Per Student | 985 | 716 | 966 | 836 | 728 | 541 |
| Tuition+Fees-Aid per student | -333 | 269 | 2 | 273 | 789 | 981 |
| Pupil-Teacher ratio | 16.79 | 4.63 | 17.17 | 4.98 | 19.53 | 18.58 |
| Faculty with PhD | 0.07 | 0.05 | 0.10 | 0.08 | 0.09 | 0.08 |
| Part-time Faculty | 0.54 | 0.20 | 0.57 | 0.15 | 0.60 | 0.17 |
| Full-time Students/100 | 154.73 | 546.77 | 134.72 | 482.45 | 71.66 | 376.72 |
| Part-time Students/100 | 4.87 | 4.93 | 8.47 | 10.03 | 6.47 | 5.68 |
| NJCAA Member | 0.45 | 0.50 | 0.55 | 0.50 | 0.64 | 0.48 |
| Fraternities and/or Sororities | 0.05 | 0.22 | 0.17 | 0.38 | 0.13 | 0.34 |
| Minority Students | 0.38 | 0.27 | 0.38 | 0.25 | 0.17 | 0.16 |
| Over 50% Reside in Dorms | 0.01 | 0.10 | 0.02 | 0.13 | 0.02 | 0.16 |
| 10-49% Reside in Dorms | 0.34 | 0.48 | 0.17 | 0.38 | 0.11 | 0.32 |
| Average Age of Entering Freshman | 22.61 | 3.66 | 22.76 | 3.26 | 23.09 | 3.72 |
| Metro Area > 500,000 residents | 0.13 | 0.34 | 0.23 | 0.42 | 0.10 | 0.29 |
| Metro Area 250K-500K residents | 0.10 | 0.30 | 0.09 | 0.29 | 0.09 | 0.29 |
| Metro Area 50K-249K residents | 0.29 | 0.46 | 0.32 | 0.47 | 0.37 | 0.48 |
| Private | 0.00 | 0.05 | 0.01 | 0.12 | 0.04 | 0.19 |
| Religious Affiliation | 0.00 | 0.05 | 0.01 | 0.09 | 0.02 | 0.13 |
| Middle Atlantic Region | 0.05 | 0.21 | 0.11 | 0.32 | 0.18 | 0.38 |
| Southeastern Region | 0.15 | 0.36 | 0.22 | 0.42 | 0.22 | 0.42 |
| Midwest Region | 0.05 | 0.22 | 0.08 | 0.28 | 0.30 | 0.46 |
| Southwest Region | 0.27 | 0.44 | 0.19 | 0.39 | 0.04 | 0.19 |
| West Region | 0.49 | 0.50 | 0.38 | 0.49 | 0.21 | 0.41 |
| Age of College in 1990 | 43.40 | 21.40 | 41.10 | 21.08 | 37.34 | 24.90 |
| Varsity Football Team | 0.49 | 0.50 | 0.33 | 0.47 | 0.14 | 0.35 |
| Varsity Men's Basketball Team | 0.73 | 0.45 | 0.70 | 0.46 | 0.74 | 0.44 |
| Intramurals Offered | 0.61 | 0.49 | 0.70 | 0.46 | 0.82 | 0.39 |
| Number of Intramural Sports | 6.86 | 7.60 | 7.80 | 8.09 | 11.16 | 8.74 |
| Number of Schools | **106** | | **172** | | **601** | |
| Number of Students | **253,985** | | **486,538** | | **1,781,676** | |

*** All variables weighted by FTE in 1989-90.**

## Table 9

## Hedonic Equations with College Fixed Effects, by net price patterns*

| | Net Subsidy | | Switchers | | Net Cost | |
|---|---|---|---|---|---|---|
| Variable | Estimate | Std. Error | Estimate | Std. Error | Estimate | Std. Error |
| **p91** | -99.75 | 28.53 | -80.87 | 37.29 | -4.87 | 10.54 |
| **p92** | -113.47 | 29.74 | -91.90 | 39.66 | 2.74 | 10.83 |
| **p93** | -109.85 | 31.22 | -50.98 | 40.46 | 46.47 | 11.41 |
| **p94** | -153.94 | 32.68 | -124.55 | 42.18 | 61.02 | 11.92 |
| **Pupil-Teacher ratio** | 105.47 | 12.11 | 24.56 | 17.89 | 9.08 | 1.96 |
| **Pupil-Teacher ratio squared** | -1.97 | 0.31 | -0.12 | 0.40 | -0.02 | 0.01 |
| **Faculty with PhD** | 729.96 | 754.86 | -1001.02 | 567.50 | 165.97 | 156.13 |
| **Faculty with PhD missing** | -22.14 | 93.94 | -25.89 | 147.11 | 61.29 | 43.14 |
| **Part-time Faculty** | 870.02 | 220.43 | 319.79 | 269.39 | 50.64 | 86.73 |
| **Full-time Students** | -0.43 | 0.93 | -0.42 | 1.27 | -1.29 | 0.45 |
| **Full-time Students squared** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Part-time Students** | 13.57 | 30.56 | -9.11 | 22.70 | -5.79 | 7.56 |
| **Part-time Students squared** | -0.75 | 0.75 | 0.18 | 0.43 | 0.14 | 0.25 |
| **NJCAA Member** | 57.02 | 84.13 | -186.57 | 96.52 | -64.11 | 31.33 |
| **Fraternities and/or Sororities** | 111.45 | 117.01 | 404.11 | 116.13 | 24.47 | 31.76 |
| **Minority Students** | -627.00 | 481.69 | -40.68 | 335.41 | 192.61 | 154.11 |
| **Over 50% Reside in Dorms** | -307.50 | 384.90 | 305.85 | 377.90 | 0.94 | 101.15 |
| **10-49% Reside in Dorms** | -66.46 | 183.77 | 164.84 | 295.71 | -83.64 | 57.84 |
| **Average Age of Entering Freshman** | -11.86 | 12.21 | -1.10 | 16.91 | 0.21 | 3.74 |
| **Age missing** | -297.63 | 287.92 | -84.12 | 379.94 | -10.72 | 91.02 |
| **Constant** | -1412.62 | 458.29 | -218.78 | 560.69 | 683.48 | 127.53 |
| **N** | **530** | | **860** | | **3,005** | |
| **R**2** | **0.70** | | **0.39** | | **0.97** | |
| **F(college attributes)** | | | | | | |
| **F(brand effects)** | **4.87** | **p<.000** | **2.04** | **p<.000** | **103.80** | **p<.000** |

*** Dependent variable equals Net_price. Weighted by the number of FTE students in 1989-90. Each regression is estimated via fixed effects.**

## Table 10

## Price Index of Colleges with Always Positive Net Prices

| Year | CPI: College Tuition and Fees | All Colleges* | Net Cost Colleges** |
|---|---|---|---|
| 1990 | 100.0 | 100.0 | 100.0 |
| 1991 | 105.7 | 96.1 | 99.4 |
| 1992 | 113.6 | 97.1 | 100.4 |
| 1993 | 120.7 | 104.6 | 106.0 |
| 1994 | 125.9 | 104.1 | 107.8 |

* Derived from full sample results in table 5b.
** Derived from first set of results in table 9.