This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Studies of Supply and Demand in Higher Education

Volume Author/Editor: Charles T. Clotfelter and Michael Rothschild, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-11054-0

Volume URL: http://www.nber.org/books/clot93-1

Conference Date: May 17-19, 1991

Publication Date: January 1993

Chapter Title: The University in the Marketplace: Some Insights and Some Puzzles

Chapter Author: Michael Rothschild, Lawrence J. White

Chapter URL: http://www.nber.org/chapters/c6096

Chapter pages in book: (p. 11 - 42)

1 The University in the Marketplace: Some Insights and Some Puzzles

Michael Rothschild and Lawrence J. White

1.1 Introduction

The application of economics principles to the behavior of colleges and universities is a topic of substantial interest and importance. The literature on various aspects of the economics of higher education is large and growing rapidly.[1] The resources commanded by all institutions of higher learning are large. In 1989 the aggregate expenditures of all two- and four-year undergraduate colleges and postgraduate institutions came to $131.4 billion. For purposes of comparison, this sum exceeded the sales of any three-digit manufacturing industry except petroleum refining and motor vehicles and of any three-digit service industry except hospitals.

Much of the application of economics principles to university behavior has focused on cost measurements and allocation issues. Surprisingly, there has been little attention given to the questions concerning the marketplace context of universities: how they compete for faculty ("inputs"), how they "position" themselves in the marketplace, how they decide on "prices" (tuition, room and board charges for resident students, etc.), how they decide on production levels (the number of students to admit), when to enter new markets (e.g., offering new programs or degrees, establishing new professional schools), and so on. Though a few authors briefly mention "competition" among uni-

Michael Rothschild is professor of economics and dean of social sciences at the University of California at San Diego and a research associate of the National Bureau of Economic Research. Lawrence J. White is the Arthur E. Imperatore Professor of Economics and chairman of the Department of Economics at the Stern School of Business, New York University.

The authors would like to thank Vince Crawford, Dermot Gately, Julianne Nelson, Sherwin Rosen, and the participants in the NBER Conference on Higher Education, especially Charles Clotfelter, for useful comments and suggestions on an earlier draft; they also thank Peter Rousseau for research assistance on this project.

1. See, for example, the recent collection of surveys edited by Hoenack and Collins (1990).

versities (e.g., Bok 1990, 104; Bowen 1980; Garvin 1980), none has analyzed this competitive process or made serious estimates of relevant parameters.

We believe that this absence of apparent interest in the market context may undermine—or, at a minimum, mask some crucial assumptions in—the cost or allocation analyses undertaken by some authors. For example, the "autonomous cost increase" model of Massy (1989) has embedded in it an implicit assumption that every university is a separate monopoly that faces an inelastic demand and that can raise its prices at will to cover all cost increases. Perhaps this is indeed the case; but if so, an unaddressed issue in the Massy analysis is the question of why universities have been so slow to raise their prices and revenues and thereby raise their expenditures. In any event, an explicit statement of this assumption would make clearer the basis for the Massy analysis.

At the opposite extreme, the allocation analyses of James (1978, 1986) and James and Neuberger (1981) assume that tuition prices are predetermined and beyond the control of the individual institution. Should we be comfortable with that basis for analysis?

As yet a third example, we note that a number of the authors providing estimates of the price elasticity of demand for higher education seem uninterested in whether they are measuring the price elasticity for higher education in aggregate or the cross-elasticity of some institutions vis-à-vis others.[2] Only researchers who were uninterested in market contexts would fail to be interested in the distinction.

We believe that the market context of higher education—whether universities compete, how they compete, and the consequences of that competition for university input, production, pricing, and output decisions—is interesting in its own right and important for understanding the cost and allocation issues that have concerned most researchers. This paper cannot possibly answer all of the relevant questions concerning competition among universities. But we hope to deal with some of them and raise important questions and puzzles for others to pursue. Indeed we hope to provoke and challenge at least as much as we analyze and explain.

In section 1.2 we address an allocation issue that has been raised by others (e.g., James 1978, 1986): Is there "cross-subsidy" among a typical university's activities and specifically between undergraduate and graduate teaching? We introduce the "stand-alone test" of Faulhaber (1975) to show that the previous claims of substantial cross-subsidy do not rest on a solid analytical foundation.

Section 1.3 analyzes issues of student quality and diversity in a university and their consequences for output and pricing. Suppose the mix of students affects the efficiency of teaching (e.g., for any average level of learning ability by students, the necessity for repetition or remedial effort will be less when the variance of learning abilities is less) or the quality of output (e.g., stu-

2. See the surveys in Leslie and Brinkman (1987) and Becker (1990).

dents' learning is enhanced by having fellow students with a diversity of backgrounds). An efficient university admissions policy would be to encourage a large pool of applicants (e.g., through apparent "underpricing") and then to accept students selectively and to price selectively (i.e., to practice price discrimination through selective scholarships) so as to achieve the efficiencies that accompany the mix and diversity characteristics. Simple market-clearing prices would not be as likely to achieve these efficiencies. In essence, the incoming students themselves are an important input to (and affect the efficiency of production of) the educational services output of the university, and the university's admission and pricing policies are likely to reflect this special relationship between input and output.[3]

Section 1.4 addresses some of the broader pricing, market, and competition questions. After noting that the preferences of the providers of nontuition funds must be a part of the analysis of university behavior, we first examine some questions concerning input behavior (e.g., why are research universities reluctant to reward teaching performance?) and then largely focus on output pricing and market behavior: For example, why do universities pass up apparent opportunities to practice revenue-increasing price discrimination? Why do universities generally change uniform tuition levels across different fields that appear to have substantially different marginal costs? Why do universities fail to price so as to capture the rents that attach to their brand-name reputations? What motivates entry and exit among universities? For most of these (and other) questions, we can offer insights and clarifications, but many basic puzzles remain.

Section 1.5 offers a brief conclusion.

1.2 The Criteria for Cross-Subsidization

The observation that in the modern research university, undergraduate education subsidizes graduate education and research is commonplace. Estelle James (1978, 1986, 1990) has been the most prominent and consistent proponent of this view. It is based on an analytic model of the goals of the university set down most precisely in a joint article with Egon Neuberger (James and Neuberger 1981).

The simplest version of their argument runs as follows: Suppose that a university department's only revenue comes from teaching undergraduates and that its only expense is buying (at the market price) faculty time. Faculty time may be allocated either to teaching undergraduates or to research. The department maximizes a utility function in which research is an argument subject to the constraint that expenditures may not exceed revenue. If any faculty time is spent doing research, then James would argue that undergraduate education

3. We can also draw the parallel here with the hiring policies of some companies that offer apparently "above-market" wages in order to obtain a selective and stable work force.

is subsidizing research because undergraduate education produces revenues while research does not. A more sophisticated version of the argument allows the faculty to care about the quality (but not the quantity) of undergraduate education and allows for revenue from graduate students and research, but reaches the same conclusion because large undergraduate courses can be used to bring in revenue so that faculty can do more research. It is this sophisticated version of the argument that James takes as embodying cross-subsidization; "profits" from undergraduates subsidize graduate education and research that "usually do not bring in enough revenues to cover their costs" (1986, 237).

One of the predictions of James's model is that universities will produce undergraduate education with a different technology than institutions that do not have graduate students and that do not do research. Liberal arts colleges and community colleges have smaller classes on average than research universities and do not use graduate students as teachers. Because the former technology is cheaper than the latter, undergraduates subsidize graduate education.

James (1986) argues that consideration of the cross-subsidy issue should make one reconsider arguments about the effects of state educational policy on the distribution of income. Hansen and Weisbrod (1969) argued that the California system of public education subsidizes higher-income residents of that state, since the latter's children tend to go to institutions (universities) at which the cost per pupil is higher than at the institutions (state and community colleges) to which the poor send their children. By James's reckoning, this is incorrect because the real cost of providing undergraduate education in a university is rather low.

Intuitively, there seems to be something wrong with the James argument because, unlike the privilege of sleeping under the bridges of Paris, admission to the University of California is restricted. Because there is evidence that consumers will pay more to attend universities than to attend community colleges, attendance at the former institutions must be worth more than enrollment at the latter. This observation is, in essence, the basis for our belief that undergraduate education does *not* subsidize graduate education and research. Undergraduate education is produced as both a joint product with graduate education (in research universities) and, at the same time, the only product of some firms in the education business—particularly liberal arts colleges and community colleges. Thus, undergraduate education produced as a joint product survives in a competitive market with undergraduate education produced as a sole product. The modern definition of cross-subsidization takes this fact as evidence that graduate education and research are *not* subsidized by undergraduate education.

A concise statement of the modern definition of cross-subsidization for the multiproduct firm is due to Faulhaber (1975). It is a sophisticated version of the stand-alone test. Suppose a firm produces goods that serve N different classes of customers. We want to ask whether or not the existing prices have

an element of cross-subsidy. According to Faulhaber, they do if it is possible for another firm to serve a subset of these customers and make a profit. The entering firm, of course, can only serve this subset of customers if these customers choose to be customers of the entrant rather than the incumbent—that is, if the entrant offers a more attractive price and quality combination.

In symbols, let $S = \{1,2, \ldots, N\}$; then if $y \in \mathbf{R}^N$ produces revenue $\pi(y)$, there is no cross-subsidization if for all subsets $T \subseteq S$, $C(y^T) \geq \pi(y^T)$, where

$$y_i^T = \begin{cases} y_i \text{ if } i \in T \\ 0 \text{ if } i \notin T \end{cases}$$

and $C(y^T)$ is the cost of producing y^T.

The application to education is immediate. Suppose that the three classes of consumers are undergraduates, graduates, and consumers of research. Then the fact that firms in the education industry that serve all three kinds of consumers survive in competition with firms that serve only one kind of customer is a demonstration that undergraduate education does not cross-subsidize graduate education and research.

Two arguments against this position must be considered. The first rests on the observation that the undergraduate education students get from a liberal arts college is different from the undergraduate education that students at a "multiversity" (Kerr 1964) receive. As we have observed, James states that a confirmed prediction of her theory is the fact that undergraduate colleges will have smaller class sizes than research universities. However, this seems to miss the point. Harvard and Swarthmore compete for the same students; so do UCLA and the Claremont colleges. Large research universities have larger classes than liberal arts colleges, but the different variants of the product survive in competition; Fords are different from Chevys, but both brands compete for the same customers.

Another objection is the observation that the zero-profit constraint is inappropriate for institutions of higher education. This has considerable force. Certainly it is a bit difficult to state precisely the yearly budget constraint of a private nonprofit institution with a large endowment that receives many charitable contributions (some from alumni, which might be considered as deferred payments of tuition) and sells research to many governmental agencies. Equally murky is the budget constraint of a public university that receives capitation fees for some students, sells research to governments, has an endowment, and can call on the state to fund its buildings with various kinds of bonds. However, it remains true that institutions of higher education do face some kind of long-run budget constraint. These constraints clearly involve subsidies. Within this complex system of subsidies, institutions that sell both graduate and undergraduate education survive in competition with institutions that sell only undergraduate education.

While colleges that produce only undergraduate education are common,

institutions that produce only graduate education and/or research are rare.[4] Even if they did not exist at all, it would, we think, be incorrect to conclude that undergraduate education in the large research university subsidizes graduate education. Although we can only offer partial evidence,[5] it is clear that there are economies of scope in higher education. Being part of a research university confers considerable benefits to undergraduates, benefits for which they are willing to pay both in money and in the acceptance of what some deem a poorer educational technology—larger classes and graduate student instructors. Some of the sources of these economies are obvious: library and computer facilities, the possibility of contact with the latest research, sheer size, and diversity; doubtless there are many others. Undergraduates and their parents value these things.

1.3 Admissions Policies: Selectivity and Pricing

Prices ration access to many goods in our society. A conspicuous exception is the right to attend the best institutions of higher education. Cost considerations do affect where and whether people go to college. However, by definition, select colleges and universities receive more applications than they can accept; many public colleges and universities will only admit students who achieve a particular academic standard. Why should this be so? The obvious answer is that it is not fair (in some sense) to let people buy their way into the best universities; access ought to be based on merit.[6] However, since in most other arenas the price system is an efficient way of allocating resources, it is interesting to examine whether or not the price system could in principle lead to an efficient allocation of students to different institutions of higher education.

1.3.1 The General Problem

Suppose there are sets $S = \{1,2, \ldots, N\}$ of students and $C = \{1,2, \ldots, T\}$ of colleges. An allocation A is an assignment of students to colleges, a mapping from S to C. Since one of the "colleges" in C can represent not going to college at all, the formulation is general. Under the allocation A, $A(S)$ is the college that student S attends. We summarize the benefit a student gets from a college in a single number $W_A[A(S)]$. $W_A[A(S)]$ is a net benefit; the real costs of attending college (mostly forgone earnings) are included; the price, or tuition, that the college charges is excluded. The subscript A indicates that

4. RAND, the Salk Institute, the Institute for Advanced Study, and Rockefeller University are examples. It is our casual impression that these institutions have somewhat more difficulty providing a steady flow of funds for their researchers than do institutions that produce undergraduate education as well as research and graduate education.

5. The cost functions estimated by Cohn, Rhine, and Santos (1989) indicate significant economies of scope in universities.

6. Rosovsky (1990) makes this argument eloquently.

benefits depend not only on the college attended but also on the complete allocation of students to colleges. The total surplus of an allocation A is just $B(A) = \Sigma_{s=0}^{S} W_A[A(S)]$. An allocation is efficient if $B(A) \geq B(A')$ for all allocations A'.

Allocations differ in efficiency only if there is some synergy. If the costs that a college incurs are the same for all students and if attendance at that college increases a student's human capital by the same amount regardless of the ability or composition of the student body, then the specific identities of the students who attend that college are irrelevant. If all colleges are like this, then all allocations are efficient. For allocations to have different efficiencies, it must be the case that students get different benefits from attending different colleges and that colleges' net contribution to their students depends on the students themselves. We can only have a concern for the efficiency of different allocations if students themselves are an important input into the educational process. If students are inputs in this sense, then there are externalities in the higher education industry.

A large and beautiful literature focuses on matching problems of this sort. The phenomena of college admissions motivated much of the work in this area. In fact, the title of the seminal paper is "College Admissions and the Stability of Marriage" (Gale and Shapley 1962).

Unfortunately the line of research that Gale and Shapley initiated can deal easily with only a restricted set of externalities. Perhaps the most convincing demonstration of the relevance of sophisticated game theory to real economic decisions is Roth's (1984) study of the matching problem for medical interns. Briefly, Roth showed that the procedure (called the National Intern Matching Program, or NIMP) used since the early 1950s to assign interns to hospitals worked because it produced *stable* allocations in the following sense: given the allocation produced by the NIMP, there did not exist a hospital or an intern not matched by the NIMP such that the intern preferred to be matched to the hospital and the hospital preferred the intern to an intern assigned to the hospital by the NIMP. The NIMP was stable because no hospital and intern could both improve their situation by defecting from the NIMP. This abstract result goes a long way to explain the remarkable success and stability of the entirely voluntary NIMP.

The proof that the NIMP produces stable allocations assumes that the preferences of hospitals for groups of interns and of interns for hospitals are very simple. Interns are assumed to have preferences only about hospitals and not to care about who their fellow interns are. Hospital preferences concerning groups of interns have a property called *responsiveness,* which means that they could be derived from a simple ranking of interns and are essentially free of compositional effects. Absent these restrictions, the NIMP may not be stable; worse still, stable matchings may not exist. Again, this abstract result has empirical bite. If interns may marry one another and if they want to work near one another (so that an assignment is not acceptable unless it allocated

married interns to the same hospital, or at least to hospitals in the same city), then stable allocations may not exist. The medical community noted that defections from NIMP started occurring in large numbers when increasing numbers of interns were married to one another. The matching literature has generally produced results that state that its most powerful and positive conclusions may not apply when people care about whom they are matched with. Those who have studied the college admissions problem have relatively little to say when students care who their classmates are and when colleges explicitly desire some sort of diversity.

Roth's analysis of the intern market had no place for prices. Kelso and Crawford (1982) showed that this was not an inherent limitation of the matching literature. Their very general model shows how competitive prices can be made an important part of the matching process. However, their analysis does not apply if colleges have explicit preferences about the composition of their student body or if students care about the identities of their fellow classmates.[7] Roth and Sotomayor (1990) provide a lucid review of this research.

Our general question is whether or not the price system will lead to an efficient allocation. We start with a trivial observation. Any allocation can be supported by a price system. A price system is just a listing of the prices that colleges charge students; that is, a price system is given by specifying $p(c,s)$, the price that college c charges student s. If

$$p_A(c,s) = \begin{cases} x_s \text{ if } A(s) = c \\ \infty \text{ if } A(s) \neq c \end{cases} \tag{1}$$

where $x_s \leq \infty$, then $p_A(c,s)$ implements A. This price system may seem strange; yet it is in some respects close to the system that some colleges use. A denial of admission is the same as a price of ∞. We do not generally think of price systems as being so personalized. However, scholarships determine the net prices that students pay for colleges, and these scholarships depend on a great many personal characteristics. What is perhaps most strange about the price system equation (1) is that it is not competitive; colleges must collude to implement it.

1.3.2 Benefits of Homogeneity

It is hard to teach a class when the students differ greatly in ability and background. We might surmise that an efficient allocation of students to colleges would group students of the same ability. Suppose the benefits that a

7. If the preferences reduce to money, then the general results apply. That is, if students care only about how much human capital their school gives them and if they recognize that this is affected by whom they meet in school, everything works. If, however, students care about both money and about who their classmates are, then stable allocations may not exist. This is true even if students can put a price on good fellowship. Similarly, if colleges care about the composition of the student body—a preference for diversity—as well as its efficiency in producing human capital, stable allocations may not exist.

college conferred on its students were an increasing function of average ability of the student body and a decreasing function of the variance of ability. An efficient price system would necessarily group students of similar ability together. It is natural to ask whether a price system can accomplish this.

If prices at each college are based on a student's ability, the signaling models of Spence (1974) and others can be brought to bear. In those models, people differ in some characteristic t. People can purchase differing amounts of a commodity g; here g denotes the amount of the commodity that people buy. The surplus from a t person's consuming g is $W(g,t)$. However, the person must pay a price $p(g,t)$, so the net benefit that accrues is just $w(g,t) = W(g,t) - p(g,t)$. In such a situation, a person of ability t will choose $g(t)$ to maximize $w(g,t)$. Under mild conditions on $w(g,t)$, $g(t)$ will be an increasing function of t; people with different skills consume different amounts of g. In the original signaling literature, g was taken to be years of schooling, but the structure of the argument does not depend on this interpretation. It is easy to devise a price system that will segregate people of different ability levels.

Two problems with such a price system must be mentioned. First, people differ in many characteristics, perhaps most importantly in liquidity or wealth. If capital markets are imperfect, then potential students may not be able to purchase the education that maximizes the present discounted value of future consumption. Second, if the benefit that a college education confers on its graduates depends on the mix of abilities of those graduates and if each college sets $p(c,s)$ to compete for students, then the structure of the model is the same as the model of competition among insurance companies for customers that Rothschild and Stiglitz (1976) and Wilson (1977) have analyzed. Such markets may lack equilibria—or at least the most obvious kinds of equilibria do not exist.

1.3.3 Benefits of Diversity

It is sometimes argued that a diverse student body is desirable. A competitive price system will achieve diversity only with difficulty or by accident. The prices that companies charge can in some cases depend on the observable characteristics of customers. They cannot depend simply on the identification of customers. However, without such prices it is not possible to achieve diversity.

Consider a very simple model. Suppose that four people are to be allocated among two colleges. Each college has a capacity of two students. We model the desire for diversity by presuming that students are risk averse and that the students of a given college share equally in the college's output, which is simply the sum of the random inputs of its students. There are two kinds of students. The input of students x_1 and x_2 is the random variable $\tilde{x}$, and the input of students y_1 and y_2 is the random variable $\tilde{y}$; $\tilde{x}$ and $\tilde{y}$ are independent, identically distributed random variables.

Clearly, the optimal allocation sends one x_i and one y_i to each college. An anonymous price system—that is, one that ignores a person's observable characteristics—could not accomplish this result. This is clearly a small-numbers problem; if a college admits a large number of students, then the law of large numbers indicates that each college should be able to achieve approximately the right mix of students. Similarly, an insurance company expects that its customers' risks are uncorrelated.

Since the law of large numbers does require large numbers to work, colleges may feel that using a competitive price system (one in which supply equals demand) would leave them with less control over the composition of the student body than they would like. Do colleges use the excess demand, which their less-than-market clearing prices generate, to make efficient allocations? We do not know; and given the difficulty of assessing the effects of matching in our economy,[8] we doubt that it is easily knowable. Still, it is important to understand the weakness in the a priori argument that competition will allocate students to colleges efficiently.

1.4 Markets and Competition

In this section, we address directly the question concerning the markets within which universities operate and the nature of the competition among universities. More often than not, as will be clear, we can only offer insights and raise questions and puzzles.

1.4.1 The Nature of the Enterprise

The standard economic model of anything is to assume it maximizes something subject to a resource constraint. This paradigm is hard to apply to higher education because it is difficult to state what is being maximized or what the resource constraint is. It is unclear who "the university" is, so it is not obvious who (or what) is doing the maximizing. This makes it difficult to state what is being maximized. The theory of the firm (in the absence of complete markets or perfect certainty) faces the same difficulty, but it is not difficult (in principle) to describe the different interests and prerogatives of the important actors (management, shareholders, and employees).

The goals of some members of the university community (faculty and students) are perhaps not too difficult to model, but the motivations of others (in particular, senior administrators, regents, and trustees) resist easy characterization. It is even harder to specify the prerogatives and bargaining power of the different constituents of the university. Faculty like to say (and to hear administrators say) that the faculty is the university. However, faculty often disagree among themselves. Biologists and historians may have very different

8. See Hartigan and Wigdor (1989, chap. 9) for a discussion of this issue in the context of job matching.

views of the nature of the university and its goals and problems. Administrators and trustees make important decisions about how the university is to run (and who is going to run it).

Although institutions of higher education do face resource constraints (and as we note below, some actually go bankrupt and leave the business), it is (as we observed above) hard to state this budget constraint very easily. Two important simple observations are that almost all institutions of higher education are nonprofit organizations[9] and that most rely significantly on other resources of revenue (e.g., governmental appropriations, alumni and corporate donations, research contracts and grants) to supplement tuition.[10]

There are immediate implications: (a) the standard paradigm of profit-maximizing behavior as a motive for pricing, output, and/or entry decisions has only limited explanatory power; (b) the survivorship paradigm (Alchian 1950; Winter 1971; Nelson, Winter, and Schuette 1976), as a backstop to profit maximization, loses much of its force in explaining these decisions, since nontuition contributors' goals will be important in determining a university's survival. In short, market pressures impose less discipline on the university than they do on the firm. Senior administrators, or more generally the decision processes of the university, operate under conditions of considerable slack. This freedom leaves the university room to live its version of the quiet life or to pursue the funds (and thus necessarily the goals) of nontuition contributors to the university.

The absence of profit-maximizing enterprises among universities is worthy of further consideration. Why should this be so? A simple claim that there are substantial asymmetric information (agent-principal) problems surrounding the instructor-student relationship—which might make student "customers" suspicious of the motives of the instructors in a profit-seeking enterprise—is not sufficient by itself.[11] Our society tolerates and supports profit-seeking trade schools, law firms, and medical practices, where agent-principal problems are substantial. The hospital sector has a mix of private nonprofit, religious, and government-operated enterprises (as is true of universities); but the hospital sector also includes for-profit enterprises. A better explanation than information asymmetry is the absence of good (human) capital markets. For most people, higher education is a good investment; it would remain a good

9. For 1985–86, only 220 (6.6 percent) out of 3,340 institutions of higher learning listed by the U.S. Department of Education were in the category of "organized as profit making" (U.S. Department of Education 1991, 229). Of the 220, over 86 percent (190) offered a program that extended for less than four years. It appears that a large fraction of this "for-profit" group was trade and technical schools (ibid., 228).

10. For public universities in 1986–87, tuition accounted for 14.7 percent of total current-fund revenues, and sales and services accounted for another 21.2 percent, leaving 64.1 percent to be covered from nonfee sources. For private universities, tuition accounted for 39.6 percent of revenues, and sales and services accounted for another 21.7 percent, leaving 38.7 percent to be covered from nonfee sources (ibid., 295–96).

11. A related, and more insidious, possibility is raised by Spencer (1991a, 1991b), who claims that college accreditation bodies are hostile toward for-profit educational enterprises.

investment even if tuition were set equal to cost.[12] However, most young people cannot pay the full cost of an education; they cannot borrow the funds, since they have no collateral. An interesting consequence of this shortfall between tuition and the costs of education is an attenuation of the ability of students (as customers) to influence the ways in which universities behave.

1.4.2 Inputs

We start with input markets,[13] primarily because the analysis seems clearest there. With the exception of the teacher (professor) inputs, universities are just one among many input users, and the markets are basically competitive. Further, with respect to professor inputs, universities clearly do compete among themselves to fill positions. The individual university demand curves for professors, though, warrant some further consideration. Those demand curves are, arguably, derived demand curves—derived from the demand for the university's outputs. To some extent those demand curves do reflect the nature of universities' outputs: for example, teaching colleges are more likely to look for good teachers; research universities are more likely to demand productive researchers. Still, research universities "sell" large amounts of undergraduate education; the marginal revenue product of outstanding teachers would seem to be quite high. Why do good teachers command such small monetary (and other) rewards in large research universities? Why have research universities been so reluctant to establish job categories for outstanding teachers? Why has competition not operated in this dimension?

On this last point, we note that professional schools have been more responsive with respect to teaching. Many schools, even those that pride themselves as research institutions, have established "clinical professor" positions that often emphasize teaching or other nonresearch contributions of a faculty member. We suspect a reason for this is that in some professional schools, particularly law and business schools, a high proportion of gross receipts comes in the form of tuition and deferred tuition (alumni gifts). For such schools, student satisfaction impinges more immediately on the school's budget constraint. (This argument, however, cannot explain the existence of clinical professors in medical schools.)

Finally, our casual impression is that university teaching has been resistant to technological change. Why is this so? Surely it is not the case in the age of the computer and the VCR that the technology of teaching is inherently incapable of significant technological improvement. It is also our casual impression that the education that takes place outside the higher education industry

12. Human capital is even more of a bargain than it usually appears, if one assumes that education not only improves productivity on the job (an effect that shows up in wages) but also increases the ability to use leisure time. See Jorgenson and Fraumeni (1991) for some astonishing calculations.

13. We exclude the analysis of incoming students as inputs, which was covered in section 1.3.

(businesses and the military, for example) has embraced technical change more rapidly than have colleges and universities.[14]

1.4.3 Outputs

Universities are clearly multiproduct enterprises that operate in many markets. Among their outputs are educational services for undergraduate students, educational services for graduate students (arts and sciences, as well as professional education), research, room and board services for resident students, and athletic entertainment services. We will focus primarily on the market for educational services.

Do universities compete with each other in the market for educational services? Casual empiricism suggests that they do compete for students. The terms of this competition include the quality (somehow measured) of the university, the quality of the student body that the university attracts, the location and physical surroundings of the university, and the price (tuition) charged.

To support our claim that universities do compete on price, we offer the following: University deans (including heads of programs and heads of professional schools) do pay attention to the tuition levels of universities of similar quality and/or in similar locations and are concerned that their own tuition levels not diverge appreciably from those of their rivals. Further, the U.S. Department of Justice's Antitrust Division recently investigated alleged meetings by administrators from at least 23 prestigious East Coast colleges and universities, who met annually to agree on the scholarship levels that would be offered to prospective freshmen (Jaschik 1989; Putka 1989; Salop and White 1991).[15] One participant apparently feared that without these meetings, the universities "might be dragged into a kind of 'bidding war' for the best students" (Cotter 1989). It is interesting to note that another 33 universities that were under investigation for sharing information on scholarship aid included the Great Lakes Colleges Association (a group of 12 liberal arts colleges in Indiana, Michigan, and Ohio), a group of 8 women's colleges (6 of which are located in the South), and an additional group of 12 private universities that had very high tuition fees (Jaschik 1989). Within each of these three groups, the schools would likely have perceived one another as direct competitors and would have been interested in restraining price competition.

This evidence is, at best, only indirect support for the claim that price competition among universities is a significant phenomenon. It is supported, however, by many of the studies of student enrollment choices among universities.

14. For brief discussions of efforts to provide higher education that is more responsive to "customers'" demands, see Spencer (1991a, 1991b) and Charlier (1991).

15. In May 1991 the Justice Department formally charged eight Ivy League schools and Massachusetts Institute of Technology with price fixing. The eight Ivies immediately settled the case with a consent decree (in which they did not admit any guilt but agreed to discontinue the meetings), but MIT declined to join the settlement and was subsequently found guilty at trial.

These studies often include as explanatory variables the tuition (and other fees) and scholarship amounts of both the selected university and those that were rejected. The coefficients on the tuition and scholarship amounts (or, in some studies, the net cost) offered by the rejected schools are usually significant and have the expected signs (e.g., the coefficient on the tuition level of a rejected university has a positive sign) (Radner and Miller 1975; Miller and Radner 1975; Hight 1976; Fuller, Manski, and Wise 1982; Corman 1983; Manski and Wise 1983; Ehrenberg and Sherman 1984). Thus, students do seem to be sensitive to the prices of the alternatives open to them. (Unfortunately, we have not been able to uncover studies that examine the price cross-elasticity of demand among specific universities, which would provide us with a greater understanding of the specific nature of the competition among the universities.)[16]

It seems unlikely that price competition among universities approaches the textbook model of the perfect competition among wheat farmers. Individual universities have perceived quality differences and 'brand-name" reputations that surely influence student choice. Also, locational differences among universities imply transportation cost differences (as well as psychic "away from home" differences, which can be a plus or a minus for a university's attraction) for many students.[17]

Competition among universities appears to have both geographic-space and product-space dimensions.[18] High-prestige schools probably compete in a nationwide market. For example, in the market for freshman applicants, Har-

16. These investigations would require time-series cross-section panels that would either use individual university applications as the dependent variables (and include university tuition levels as a right-hand side variable) or use individual student applications and acceptance choices as the dependent variables.

Spies (1990) has studied how family income affects the probability of applying to an expensive and selective private college or university. Spies found that the relationship between the probability of applying and income had a gentler slope for those who applied for financial aid than for those who did not. Without criticizing Spies's work (which is careful and involves the replication of the basic results over three different cohorts of applicants), we note that he did not pose his question (what determines the probability of applying to a particular kind of college?) as that of estimating a demand function. Price (gross or net tuition) is not included as a variable. McPherson and Winston (1991) develop a model in which universities compete but in which information asymmetries between sellers (universities) and buyers (students) cause the terms of competition to focus on costly symbols of quality and also cause buyers to judge quality on the basis of price (tuition); this latter effect would deter the sellers from cutting prices in order to compete and could even impart a price-raising bias to their behavior. McPherson and Winston offer no evidence to support their model. We believe that the evidence from the enrollment choice studies cited in the text, in which the coefficients on the tuition levels of rejected universities have positive signs, casts doubt on the validity of the McPherson-Winston hypothesis.

17. In fall 1988 over 80 percent of freshmen enrolled in a college or university in the same state in which they had previously resided (U.S. Department of Education 1991, 196); this percentage has been remarkably stable over the past two decades (Harris 1972). In most of the demand studies, distance from home is a negative factor in a potential student's choice; see Hoenack and Weiler (1976); Fuller, Manski, and Wise (1982); Manski and Wise (1983); Ehrenberg and Sherman (1984); and McClain, Vance, and Wood (1984).

18. Garvin (1980, chap. 2) makes some of these same arguments.

vard and Stanford probably compete for roughly the same pool of students (and probably also compete for a common pool of applicants to their medical, business, and law schools and to most of their graduate programs in arts and sciences). Schools with lesser prestige are likely to compete among themselves on a regional basis; the lure of a specific national "brand name" is likely to be less important for students in this market segment, and the costs associated with regional location are likely to loom relatively larger. Finally, universities are likely to compete most intensively with universities in their same quality segment. For instance, Yale and Harvard are likely to consider each other as competitors, while neither is likely to think of the University of Bridgeport as a competitor.

We can now discuss a number of important topics related to competition among universities.

Tuition Levels and Scholarship Levels

Suppose a university charges a tuition level of X to all its i students and offers a vector of scholarships Y to those same i students ($O \leq Y_i \leq X$). As a first approximation, if the university instead charged a tuition of X + \$10,000 and offered a new vector of scholarships of Y + \$10,000, nothing should change;[19] if the university—because it asks for family financial information from all its applicants—could selectively offer scholarship increments that were less than \$10,000 to some students and still not lose those students, then the university's net revenues would increase.[20] In principle, the university's net revenues would continue to increase as it raised tuition levels and selectively increased scholarship amounts until all but one of its students were on partial or complete scholarship; in essence, the university would be practicing first-degree price discrimination. Universities clearly do engage in price discrimination to some extent. Scholarship aid (including Pell Grants) amounted to 24 percent of aggregate tuition receipts by private universities and to 35 percent by public universities in 1986–87 (U.S. Department of Education 1991, 291–92). Still, one can ask why universities do not engage in more of it and why they do not make a greater effort to achieve the first-degree price discrimination ideal described in the previous paragraph.

There are a number of possible answers to this question, but one of them, we believe, can immediately be discarded. It might be claimed that students would somehow perceive tuition increases matched by identical scholarship funding increases as not being neutral and that they would thereby be deterred

19. This is equivalent to an auto dealer's adding \$10,000 to all list prices but also offering \$10,000 "discounts."

20. We abstract from any added administrative costs. Also, it is worth noting that the auto dealer would be unlikely to succeed with a similar price discrimination scheme, because of competition among auto dealers and because auto dealers typically do not know a prospective buyer's income or other characteristics (though the dealer may learn them after the sale, while arranging for the financing of a purchase).

by the tuition increase (Hearn and Longanecker 1985). The available evidence, however, points strongly toward our equivalence hypothesis. Studies of student enrollment choices among types of universities sometimes include both tuition levels and scholarship amounts (offered by the chosen and rejected universities) as explanatory variables. These studies show that tuition levels and scholarship amounts have virtually identical coefficients (with opposite signs) in explaining student enrollment choices (Fuller, Manski, and Wise 1982; Manski and Wise 1983; Ehrenberg and Sherman 1984). Thus, students who are offered scholarship aid do not seem to suffer from "tuition illusion," and claims of nonneutrality are unlikely to be adequate explanations for why universities do not practice price discrimination to a greater extent.

We are left with two possible answers to this question. The first is that price competition among universities would undercut and unravel this extreme form of price discrimination. The second is that the nontuition funds providers would be offended by this apparent gouging by the university (i.e., the increases would not be neutral from their perspective), and their contributions would decrease, thereby reducing (or eliminating) the net revenue gain to the university from the price discrimination scheme. Among the most important contributors are future alumni, whose generosity toward their alma mater could possibly be severely tempered by the memory that she had charged all that the traffic would bear. We currently do not have enough information about price competition among universities or about the behavior of nontuition funds providers to assess the relative importance of these explanations.

Scholarships and Price Competition

In section 1.3 we suggested that a price discrimination scheme (i.e., selective scholarships) could allow the university to achieve a desired mix of students, which would enhance the efficiency and productivity of the university's educational output. Is this form of price discrimination compatible with competition among universities? Or does the university's desire for an optimal mix create a potential market failure that would argue for limits on competition and that could justify the alleged agreements on scholarship levels that the Justice Department investigated?

The case for a market failure does not appear to be strong. The externality of the "desirable" students is wholly internalized within the university. If, say, a "desirable" student enhances the educational experience of other students, then those other students should be willing to pay higher tuition to a university that offers this diversity; the externality is internalized. Though competition for desirable students, through larger price discounts (i.e., larger scholarships), reduces university net revenues, this is true of competition for all of the university's outputs.[21] Further, the experience of the past decade in the

21. We see only one special problem that suggests special treatment for this industry. If, as we argued in the last part of section 1.3, diversity is a small-numbers problem, then coordination among universities in allocating students may be desirable.

airline industry suggests that modest levels of price discrimination can survive in markets that are workably competitive.

Pricing within the University

Casual empiricism suggests that the marginal costs of educating an undergraduate in the sciences are substantially higher than the marginal costs of educating an undergraduate in the humanities. Nevertheless, we generally see uniform tuition levels within a university across most majors (though different schools or programs within a university may charge modest fee differentials). Why is this so?

We have already (in section 1.2) dealt with the normative issue of whether such uniform pricing generates cross-subsidies among areas. There is still the positive question of why this uniformity occurs and persists.

In a multioutput (profit-maximizing) enterprise with common costs (economies of scope) and with differing marginal costs among the separate outputs, pricing is a complex phenomenon. A monopolist will look to the demand elasticities of its separate products, as well as their marginal costs, to determine its prices. A firm in competitive markets will seek a combination of prices and products that yields an aggregate surplus over its separate marginal costs that is adequate to cover its common costs. Though neither market structure necessarily generates an outcome in which the firm's prices correlate positively with its marginal costs, *uniformity* of prices for outputs with substantially different marginal costs would occur purely by chance (and would be highly unlikely to replicate itself in thousands of separate enterprises).[22] And with marginal costs as the starting point for pricing under either form of market structure, there is a mild presumption that a positive correlation between prices and marginal costs should emerge.[23]

At first glance, then, tuition uniformity seems to be an oddity that is inconsistent with profit-maximizing behavior in any market structure. One explanation might be as follows: Many undergraduate institutions do not charge per course or per credit but rather per semester or quarter. In principle all students can take all courses (or could if they so planned their programs). What is being sold is the ability to pick from a menu, and this is no more strange than the observation that many salad bars charge per trip rather than per nutrient.

The salad bar analogy is strongest, however, where monitoring costs are high relative to the price of the items. This does not seem to be the case for student course enrollments. An alternative model would be that of two-part

22. Where marginal cost differences are small and the transactions costs of enforcing marginal cost pricing are high, we are likely to see uniform pricing. For example, restaurants typically charge a uniform price for coffee, regardless of whether a customer adds cream and/or sugar. On the other hand, delicatessens often charge extra for extra materials that can be ordered with a sandwich (e.g., lettuce and/or tomato), presumably because the marginal costs are higher and the monitoring costs are small.

23. Restaurants generally charge higher prices for their steaks than for their hamburgers and higher prices for their strawberry shortcake than for their donuts.

tariffs, in which customers are charged a lump-sum entry fee and are then charged prices for individual services that approximate marginal costs (Oi 1971). In this framework, then, we would expect to see all students pay a common enrollment fee (subject to the price discrimination possibilities discussed above) and then be charged specific course fees that were roughly commensurate with the marginal costs of those courses.

We are thus left with the puzzle of uniform or near-uniform tuition levels in the presence of substantial marginal cost levels. Perhaps this is another area where the preferences and prejudices of nontuition funds providers are important. Again, we believe that this is an area that warrants further research.

Pricing and Prestige

Mercedes automobiles sell for appreciably more than Chevrolets; Rolex watches sell for appreciably more than Timexes. But even among private universities, high-prestige institutions often do not charge tuition levels substantially above those of lower-prestige institutions. Why is this so? Why do high-prestige institutions decline to try to capture most of the rents that are associated with their "brand names"?

A recent survey of graduate professional schools provides striking evidence to support this picture of relative uniformity.[24] In tables 1.1 and 1.2 we present the tuition levels and expected starting salaries for graduates of top-ranked business schools and law schools. If we focus on the private universities in the rankings,[25] we find a picture of relative uniformity of tuitions among the leading schools. There is a mild positive correlation between a school's tuition and its rank: for business schools the rank correlation is 0.58; for law schools it is 0.46. When we look at the correlation between tuition and expected annual starting salaries, there are again positive rank correlations: 0.56 for business schools and 0.71 for law schools. Simple ordinary least squares regressions of tuition levels (TL) on expected salaries (ES), however, yield the following (with t-statistics in parentheses):

$$\text{Business schools: TL} = \underset{(6.35)}{11.60} + \underset{(2.48)}{0.085}\ \text{ES};\ r = 0.55;\ n = 16\,.$$

$$\text{Law schools: TL} = \underset{(5.01)}{9.05} + \underset{(3.48)}{0.095}\ \text{ES};\ r = 0.69;\ n = 15\,.$$

These results indicate that students at business and law schools where expected starting salaries are higher do pay higher tuitions, but those higher annual tuitions are *less than 10 percent* of the higher expected annual starting salary.[26]

24. We do not have any immediate evidence concerning undergraduate institutions, but we are reasonably confident that a similar picture would emerge.

25. State universities, with the exception of the University of Michigan, are charging tuitions—even to out-of-state students—that have more to do with state legislatures' policies than with any notions of market pricing.

26. These results are consistent with those found by Ehrenberg (1989).

Table 1.1 **Rankings of Leading Business Schools**

Rank/School	1990 Out-of-State Tuition[a]	Average Starting Salary[a]	Rank, Excluding State Universities		
			Overall	Tuition	Salary
1. Harvard	$16.4	$63.0	1	9	1
2. Stanford	16.6	60.5	2	4.5	2
3. Penn	16.5	55.0	3	7	5
4. Northwestern	16.6	54.0	4	4.5	7
5. MIT	17.2	59.0	5	1	3
6. Chicago	16.7	54.5	6	3	6
7. Duke	16.2	51.0	7	11	11
8. Dartmouth	16.5	57.0	8	7	4
9. Virginia	11.7	55.3	—	—	—
10. Michigan	15.7	53.3	—	—	—
11. Columbia	16.3	52.0	9	10	10
12. Cornell	16.1	50.7	10	12	12
13. Carnegie	16.5	52.0	11	7	9
14. N Carolina	5.6	50.8	—	—	—
15. UC Berkeley	7.8	50.0	—	—	—
16. UCLA	8.1	51.5	—	—	—
17. Texas	3.6	44.0	—	—	—
18. Indiana	8.2	44.1	—	—	—
19. NYU	15.5	53.2	12	13	8
20. Purdue	16.8	43.5	—	—	—
21. USC	14.4	49.1	13	16	13
22. Pittsburgh	16.9	43.5	14	2	16
23. Georgetown	14.5	45.2	15	15	14
24. Maryland	7.1	42.9	—	—	—
25. Rochester	14.7	44.5	16	14	15

Source: U.S. News & World Report, April 29, 1991, p. 68.
[a]In thousands.

Finally, the more limited data in table 1.3, for medical schools, show even less correlation (rank correlation = 0.09) between rank and tuition than for the business and law schools.

Again we have a puzzle. The students, rather than the schools, are capturing the rents.[27] Even if schools provide only signals (Spence 1974) or filters, is the filter worth this little? Are the preferences of nontuition funds providers important here? Again, we suggest that this is a fruitful area for future research.

27. It has been suggested to us that the higher starting salaries offered to the graduates of the leading law and business schools may be just a cost-of-living compensation adjustment; that is, the leading professional schools tend to be located in metropolitan areas with above-average living costs and their graduates tend to work in these same pricey areas. If this were so, the students' net rents would be much smaller than the gross differentials in starting salaries indicate. Our casual impression from the cost-of-living comparison data gathered by Kramer (1989) for law school graduates is that the net rents accruing to the graduates of leading professional schools are still substantially positive. Without more complete data on the location choices of the graduates of the leading and lesser schools and of the cost-of-living differentials among these locations, however, we are unable to pursue this net rent hypothesis any further.

Table 1.2 Rankings of Leading Law Schools

Rank/School	1990 Out-of-State Tuition[a]	Average Starting Salary[a]	Rank, Excluding State Universities		
			Overall	Tuition	Salary
1. Yale	$15.4	$66.1	1	7.5	7
2. Harvard	14.5	67.2	2	14	4
3. Chicago	15.7	71.0	3	5	3
4. Stanford	14.9	65.0	4	12	10
5. Columbia	16.1	78.3	5	3	1
6. Michigan	15.7	59.6	—	—	—
7. NYU	16.6	76.7	6	1	2
8. Virginia	10.1	63.0	—	—	—
9. Duke	15.3	60.2	7	9	13
10. Penn	15.1	64.6	8	11	11
11. Georgetown	15.4	66.0	9	7.5	8
12. UC Berkeley	8.8	58.0	—	—	—
13. Cornell	15.9	66.2	10	4	6
14. Northwestern	15.5	65.1	11	6	9
15. Texas	6.0	52.6	—	—	—
16. USC	16.4	66.7	12	2	5
17. Vanderbilt	14.8	55.0	13	13	15
18. UCLA	9.0	62.7	—	—	—
19. Iowa	7.7	50.0	—	—	—
29. UC Hastings	8.7	62.7	—	—	—
21. Wisconsin	9.1	47.5	—	—	—
22. G Washington	15.2	61.0	14	10	12
23. Minnesota	8.7	45.7	—	—	—
24. Notre Dame	13.0	56.9	15	15	14
25. N Carolina	7.0	40.5	—	—	—

Source: U.S. News & World Report, April 29, 1991, p. 74.
[a]In thousands.

Entry and Exit

Entry and exit play important roles in the standard competitive model, helping to expand or contract supply and thereby hastening the elimination of short-run rents or losses. Entry can occur de novo (by start-up firms) or through "product extensions" by existing firms.

Table 1.4 shows the number of two-year and four-year colleges and universities that have been in the market over the past 40 years. There has been substantial growth in these numbers; that is, net entry has been considerable. (It should be noted that over time some two-year schools have converted to four-year schools and some schools in both categories have exited the market entirely, so gross entry in all categories has been larger than any net calculation would indicate.) Table 1.5, covering professional schools, tells the same story of substantial net entry.

What motivated these entry decisions? It is clear that the expanding population and rising incomes of the U.S. economy created an increased demand for university education in the United States; the rising international repu-

Table 1.3 **Rankings of Leading Medical Schools**

Rank/School	1990 Out-of-State Tuition[a]	Rank, Excluding State Universities	
		Overall	Tuition
1. Harvard	$18.0	1	3
2. Johns Hopkins	16.5	2	7
3. Duke	14.2	3	11
4. UC San Francisco	5.9	—	—
5. Yale	17.0	4	6
6. Washington University	14.9	5.5	9
7. Penn	18.3	5.5	2
8. Stanford	17.9	7	4
9. UCLA	8.0	—	—
10. Cornell	19.2	8	1
11. Michigan	20.4	—	—
12. Columbia	17.9	9	5
13. U Washington	12.5	—	—
14. Chicago	16.1	10	8
15. Vanderbilt	14.6	11	10

Source: U.S. News & World Report, April 29, 1991, p. 68.

[a]In thousands.

Table 1.4 **Number of Institutions of Higher Education**

	Excluding Branch Campuses				Including Branch Campuses			
	Publicly Controlled		Privately Controlled		Publicly Controlled		Privately Controlled	
	4-year	2-year	4-year	2-year	4-year	2-year	4-year	2-year
1949–50	344	297	983	227	n.a.	n.a.	n.a.	n.a.
1954–55	353	295	980	221	n.a.	n.a.	n.a.	n.a.
1959–60	367	328	1,055	254	n.a.	n.a.	n.a.	n.a.
1964–65	393	406	1,128	248	n.a.	n.a.	n.a.	n.a.
1969–70	426	634	1,213	252	n.a.	n.a.	n.a.	n.a.
1974–75	447	767	1,297	236	537	896	1,329	242
1979–80	464	846	1,399	266	549	926	1,408	269
1984–85	461	868	1,450	367[b]	566	935	1,459	371[b]
1989–90[a]	n.a.	n.a.	n.a.	n.a.	595	968	1,532	440

Source: U.S. Department of Education (1991), 228.

[a]Data for this year are not entirely comparable with earlier years because of revised survey procedures.

[b]Large increases are due to the inclusion of trade and technical schools.

tation of U.S. universities also added to demand. Total student enrollment (the intersection of demand and supply) rose from 2.3 million in 1947 to 13.0 million[28] in 1988. Still, this increase in output might have been accom-

28. This includes part-time students.

Table 1.5 Number of Institutions Conferring Professional Degrees

Year	Dentistry	Medicine	Law
1949–50	40	72	n.a.
1959–60	45	79	134
1969–70	48	86	145
1974–75	52	104	154
1979–80	58	112	179
1984–85	59	120	181
1987–88	55	120	180

Source: U.S. Department of Education (1991), 248.

modated solely through internal expansion of the 1,851 institutions that existed in 1949–50. Why did entry occur alongside internal expansion?[29] Even if we exclude the growth in the number of publicly controlled institutions (the causes of which might be harder to model), there were still increases of over 50 percent in the numbers of two-year[30] and four-year privately controlled institutions. Why did this entry occur? We would guess that the availability of private donations and endowments to provide the start-up capital for new private institutions (the equivalent of the owners' initial investments in any for-profit enterprise) was often an instrumental factor, but there were surely other factors as well. Research on university entry behavior (including "product extensions"—new programs or schools begun by existing universities) would appear to be worthwhile.

One other feature of table 1.4 is worthy of notice: the data indicate that publicly controlled universities are much more likely to establish branch campuses than are privately controlled universities. It is unclear to us why these private institutions believe that their brand names cannot be extended to multiple locations.[31] This too appears to be an area that warrants research.

Finally, table 1.6 shows the number of colleges and universities that have shut their doors in the past three decades—that is, they have exited the education market.[32] The exit decision by for-profit firms in the private sector is

29. Enrollments at publicly controlled universities expanded by over 780 percent between 1947 and 1988, while enrollments in privately controlled institutions expanded by over 240 percent. Both of these expansions greatly exceeded the percentage increases in the numbers of institutions, so internal expansion clearly did accompany entry.

30. Some of the increase occurred through entry by for-profit trade and technical schools.

31. State chartering restrictions appear to prevent universities from branching across state lines (much as is true for commercial banks). But the near-absence of intrastate branching by private universities remains a puzzle. Why does the University of California have eight branch locations, while Stanford only has its "home office"? A few universities have established locations abroad and in Washington, D.C., but these branch locations are usually designed for special programs of their students based at the home campuses, rather than as freestanding (full-service) branches.

32. In some instances, private universities have in essence exited, but they have been superseded by public institutions.

Table 1.6 **Number of Institutions of Higher Education that Have Closed Their Doors**

	Publicly Controlled		Privately Controlled	
	4-year	2-year	4-year	2-year
Total, excluding branch campuses, 1960–61 to 1989–90	1	37	167	118
Total, including branch campuses, 1969–70 to 1989–90	4	29	152	90

Source: U.S. Department of Education (1991), 231.

not a well-researched area, so we have even less here to serve as a basis for explaining university behavior. Again, research would be worthwhile.[33]

1.4.4 Positioning in the Market

How do universities position themselves in the market? Why do Harvard, Northeastern, Antioch, and Grinnell attract the specific groups of students that they do? How can they change their positioning (e.g., improve their perceived quality and prestige)? How often (and why) do universities attempt to change their positioning? When (and why) do they succeed (or fail)?

As was true for entry, we suspect that availability of private and public contributions and endowments are important (this especially seems to be true for professional schools in the past two decades). Still, further research could surely shed useful light here.

1.4.5 What about a Monopoly Model?

As noted earlier, the autonomous cost increase model advocated by Massy (1989) assumes that most (if not all) universities are separate monopolies that face inelastic demands and thus can raise their prices at will to accommodate rising costs.[34] We believe that the empirical evidence, scanty though it may be, throws substantial doubt on this basis for Massy's analysis.

Still, let us suppose that universities truly were monopolies. The theory of monopoly, of course, yields a prediction about the *level* of prices of a monopoly relative to those of an otherwise similar competitive industry. It says nothing about *rates* of price increases. If universities really were separate monop-

33. It has been suggested to us that the cloudy property rights that accompany the nonprofit status of private universities may impede their ability to shut their doors and liquidate assets.

34. As we noted in footnote 16 above, McPherson and Winston (1991) offer an alternative model that might explain a pattern of secular cost increases: asymmetric information problems cause universities to compete through costly symbols of quality. As we explained there, however, we believe that the available evidence casts serious doubt on the McPherson-Winston hypothesis.

olies and could raise their prices at will, then the important question would be: Why have universities *not* raised their tuition earlier and faster?

We find it hard to believe that over 3,000 monopoly university administrators, year after year, would have consistently passed up opportunities to increase revenues substantially by raising tuition. Though it is possible that perceptions of gouging by nontuition funds providers might have stayed the tuition-raising hands of some university administrators during some periods, we doubt that the gouging perceptions could have been a complete restraint at all times.

Could it be that universities are already pricing at monopoly levels and that it is these elevated prices that generate substantial cross-elasticities of demand and thus bring the universities into competition with each other? If this proposition were true, it would mean that universities' prices are currently generating explicit or implicit rents and that there is a lower set of pices that would eliminate the rents and at which there would be low or zero demand cross-elasticities among the universities.[35]

The proper test of this proposition would require the measurement of universities' rents at current prices. Since universities currently charge tuition and other fees that cover only a fraction of their costs and since universities' input prices are largely determined in competitive markets, the existence of explicit rents seems unlikely. Also, as we noted above, it appears that many high-prestige universities are not even exploiting the rents associated with their brand names.

It is possible that universities are absorbing potential explicit rents in the form of production inefficiencies—Leibenstein's (1966) *X*-inefficiency. With the presence of over 3,000 universities in the market, we consider it unlikely that *X*-inefficiency would uniformly hide the rents that would otherwise be accruing to these monopolies. Still, in the absence of a comparison model of an *X*-efficient university, we must remain somewhat agnostic on this point.

1.5 Conclusion

The analysis of university behavior in a market context has been an under-researched area in economics. In this paper we have argued that a competitive framework for analysis appears reasonable but that the nonprofit status of universities and the major role of nontuition funds providers introduce special

35. For antitrust purposes, this is the proper test of a monopoly. In a major antitrust case that tried to determine whether Du Pont had monopoly power in the sale of cellophane (*U.S. v. E. I. DuPont de Nemours and Co., 351 U.S. 377 [1956]*) the U.S. Supreme Court made the mistake of looking only at the cross-elasticities of the demand at the prevailing prices for cellophane and not asking about the rents that were accruing and about what the cross-elasticities and rents might have been at lower prices. As many commentators noted, if Du Pont did have a monopoly in cellophane, profit-maximizing behavior would call for the company to raise its price to the point where significant cross-elasticities with other flexible wrapping materials would have developed (Stocking and Mueller 1955; Posner 1976, 127–128).

features into any competitive structure. We have offered some insights into university behavior and raised a number of interesting questions and puzzles. We suggest that these questions and puzzles provide a rich agenda for future research that will help us better understand market behavior in this important sector of the U.S. economy.

References

Alchian, Armen A. 1950. Uncertainty, evolution, and economic theory. *Journal of Political Economy* 58:211–21.

Becker, William B. 1990. The demand for higher education. In *The economics of American universities,* ed. Stephen A. Hoenack and Eileen L. Collins, 155–88. Albany: State University of New York Press.

Bok, Derek. 1990. *Universities and the future of America.* Durham, N.C.: Duke University Press.

Bowen, Howard R. 1980. *The costs of higher education.* San Francisco: Jossey-Bass.

Charlier, Marj. 1991. First principles: Ailing college treats student as customer, soon is thriving. *The Wall Street Journal,* July 17, A1.

Cohn, Elchanan, Sherrie L. W. Rhine, and Maria C. Santos. 1989. Institutions of higher education as multi-product firms: Economies of scale. *Review of Economics and Statistics* 71:284–90.

Corman, Hope. 1983. Postsecondary education enrollment responses by recent high school graduates and older adults. *Journal of Human Resources* 17:247–67.

Cotter, William R. 1989. Colleges' efforts to rationalize the financial-aid system should not be treated as violations of antitrust laws. *Chronicle of Higher Education,* October 4, B1.

Ehrenberg, Ronald G. 1989. An economic analysis of the market for law school students. *Journal of Legal Education* 39:627–54.

Ehrenberg, Ronald G., and Daniel R. Sherman. 1984. Optimal financial aid policies for a selective university. *Journal of Human Resources* 19:202–30.

Faulhaber, Gerald R. 1975. Cross-subsidization: Pricing in public enterprise. *American Economic Review* 65:966–77.

Fuller, Winship C., Charles F. Manski, and David A. Wise. 1982. New evidence on the economic determinants of postsecondary schooling choices. *Journal of Human Resources* 17:477–98.

Gale, David, and Lloyd S. Shapley. 1962. College admissions and the stability of marriage. *American Mathematical Monthly* 69:9–15.

Garvin, David A. 1980. *The economics of university behavior.* New York: Academic Press.

Hansen, W. Lee, and Burton A. Weisbrod. 1969. *Benefits, costs, and finance of public higher education.* Chicago: Markham.

Harris, Seymour E. 1972. *A statistical portrait of higher education.* New York: McGraw-Hill.

Hartigan, John A., and Alexandra K. Wigdor, eds. 1989. *Fairness in employment testing: Validity generalization, minority issues, and the general aptitude test battery.* Washington, D.C.: National Academy Press.

Hearn, James C., and David Longanecker. 1985. Enrollment effects of alternative postsecondary pricing policies. *Journal of Higher Education* 56:485–508.

Hight, Joseph E. 1976. The demand for higher education in the U.S., 1927–72: The public and private institutions. *Journal of Human Resources* 10:512–19.

Hoenack, Stephen A., and Eileen L. Collins, eds. 1990. *The economics of American universities.* Albany: State University of New York Press.

Hoenack, Stephen A., and William C. Weiler. 1976. Cost related tuition policies and university enrollments. *Journal of Human Resources* 10:332–60.

James, Estelle. 1978. Product mix and cost disaggregation: A reinterpretation of the economics of higher education. *Journal of Human Resources* 12:157–86.

———. 1986. Cross-subsidization in higher education: Does it prevent private choice and public policy? In *Private education: Studies in choice and public policy,* ed. Daniel Levy, 237–57. New York: Oxford University Press.

———. 1990. Decision processes and priorities in higher education. In *The economics of American universities,* ed. Stephen A. Hoenack and Eileen L. Collins, 77–106. Albany: State University of New York Press.

James, Estelle, and Egon Neuberger. 1981. The university department as a nonprofit labor cooperative. *Public Choice* 36:585–612.

Jaschik, Scott. 1989. Investigation into tuition fixing spreads. *Chronicle of Higher Education,* October 4, A1.

Jorgenson, Dale W., and Barbara M. Fraumeni. 1991. The output of the education sector. Harvard Institute of Economic Research Discussion Paper no. 1542. Cambridge, Mass.: Harvard University.

Kelso, Alexander S., Jr., and Vincent P. Crawford. 1982. Job matching, coalition formation, and gross substitutes. *Econometrica* 50:1483–1504.

Kerr, Clark. 1964. *The uses of the university.* Cambridge, Mass.: Harvard University Press.

Kramer, John R. 1989. Who will pay the piper or leave the check on the table for the other guy? *Journal of Legal Education* 39:655–95.

Leibenstein, Harvey. 1966. Allocative efficiency vs. *X*-inefficiency. *American Economic Review* 56(June): 392–415.

Leslie, Larry L., and Paul T. Brinkman. 1987. Student price response in higher education. *Journal of Higher Education* 58:181–203.

Manski, Charles F., and David A. Wise. 1983. *College choice in America.* Cambridge, Mass.: Harvard University Press.

Massy, William F. 1989. *A strategy for productivity improvements in college and university academic departments.* Stanford, Calif.: Stanford University.

McClain, David, Bradley Vance, and Elizabeth Wood. 1984. Understanding and predicting the yield in the MBA admissions process. *Research in Higher Education* 20:55–76.

McPherson, Michael S., and Gordon C. Winston. 1991. The economics of cost, price, and quality in U.S. higher education. Williams College Working Paper no. DP-13. Williamstown, Mass. April.

Miller, Leonard S., and Roy Radner. 1975. *Demand and supply in United States higher education: A technical supplement.* Berkeley, Calif.: Carnegie Commission on Higher Education.

Nelson, Richard R., Sidney Winter, and H. L. Schuette. 1976. Technical changes in an evolutionary economy. *Quarterly Journal of Economics* 90:90–118.

Oi, Walter Y. 1971. A Disneyland dilemma: Two-part tariffs for a Mickey Mouse monopoly. *Quarterly Journal of Economics* 85:77–96.

Posner, Richard A. 1976. *Antitrust law: An economic perspective.* Chicago: University of Chicago Press.

Putka, Gary. 1989. Do colleges collude on financial aid? *The Wall Street Journal,* May 2, B1.

Radner, Roy, and Leonard S. Miller. 1975. *Demand and supply in United States higher education.* New York: McGraw-Hill.
Rosovsky, Henry. 1990. *The university: An owner's manual.* New York: W. W. Norton.
Roth, Alvin E. 1984. The evolution of the labor market for medical interns and residents: A case study in game theory. *Journal of Political Economy* 92:991–1016.
Roth, Alvin E., and Marilda A. Oliveira Sotomayor. 1990. *Two-sided matching: A study in game theoretic modeling and analysis.* Cambridge: Cambridge University Press.
Rothschild, Michael, and Joseph E. Stiglitz. 1976. Equilibrium in competitive insurance markets: An essay on the economics of imperfect information. *Quarterly Journal of Economics* 90:629–50.
Salop, Steven C., and Lawrence J. White. 1991. Antitrust goes to college. *Journal of Economic Perspectives* 5:193–202.
Spence, A. Michael. 1974. *Market signaling: Information transfer in hiring and related screening processes.* Cambridge, Mass: Harvard University Press.
Spencer, Leslie. 1991a. College education without the frills. *Forbes,* May 27, 290–94.
———. 1991b. The perils of socialized higher education. *Forbes,* May 27, 294–304.
———. 1991c. Good school story. *Forbes,* May 27, 304–6.
Spies, Richard R. 1990. The effect of rising costs on college choice: The third in a series of studies on this subject. Princeton, N.J.: Princeton University.
Stocking, George W., and Willard F. Mueller. 1955. The cellophane case and the new competition. *American Economic Review* 45:29–63.
U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics. 1991. *Digest of education statistics, 1990.* Washington D.C.: National Center for Education Statistics.
Wilson, Charles, 1977. A model of insurance markets with incomplete information. *Journal of Economic Theory* 16:167–207.
Winter, Sidney G. 1971. Satisficing, selection, and the innovating remnant. *Quarterly Journal of Economics* 85:237–61.

Comment Martin Feldstein

This is an excellent paper, interesting both for the answers that it provides and for the additional questions that it raises but leaves unanswered. It is an important paper because it looks beyond the previous studies of demand and costs to try to understand the structure of the market within which institutions of higher education operate.

The authors recognize that almost all colleges and universities are nonprofit institutions and then proceed to ask why in so many cases these institutions do not behave as we might expect for-profit institutions to behave. Before discussing some of the specific topics raised by Rothschild and White, I will offer my own general point of view on this subject.

Martin Feldstein is the George F. Baker Professor of Economics at Harvard University and president of the National Bureau of Economic Research.

I believe that two facts provide the key to understanding the behavior of institutions of higher education and of the higher education marketplace in general. First, private colleges and universities and prospective entrants into the market must compete with state institutions. State universities, colleges, junior colleges, and specialized institutions are subsidized by state governments in a way that permits them to offer every type of education at much lower prices than even well-endowed private institutions can. Why states choose to act in this way rather than to provide funds to students and allow them to purchase services in the market (as states do for health care through the Medicaid program) is an interesting question in itself but one that I will not discuss here.

The second principal fact is that, because private colleges and universities are nonprofit institutions, those persons in positions of authority generally have little incentive to make the kinds of unpleasant decisions and unpopular changes that would be required in a for-profit context. This lack of incentive is reinforced by a traditional lack of power of university administrators. Colleges and universities are not hierarchical institutions like business corporations, in which the chief executive officer can make major decisions on business policy, personnel, and the like. Instead there is a tradition that requires the president and other key university officials to consult faculties and alumni representatives before making major changes in the structure of the university or its operating policies.

This lack of power and lack of incentive reinforce each other. Corporate chief executive officers could decide to sell a major portion of the company, to change the product mix, to change the pricing policy, or to make other such fundamental shifts. They might discuss these plans with key senior corporate officers or with the board of directors, but in the end everyone recognizes that the CEO has the authority to make the decision. The president of a university or the dean of a faculty does not have the same authority. It is hard to imagine a university president announcing a unilateral decision to eliminate the biology department, to acquire another college to be operated as a branch, or to double tuition.

Any major decision within a university can only be reached after long and often painful confrontation and negotiation. Such tough decisions may be made when the institution faces very serious financial problems and is threatened with the possibility of bankruptcy. But as a general matter, university officials lack the incentive to make such tough and confrontational decisions in order to reduce costs or increase surplus.

There is an interesting analogy to managerial behavior after leveraged buyouts in private shareholder-owned corporations. Although the management of a large for-profit company is supposed to be motivated to make decisions that will increase long-term profits, it is often reported that management behavior changes substantially after a leveraged buyout puts managers in the position

of owners. They are then much more aggressive about cost reductions, including eliminating levels of middle management and making other unpopular changes.

If corporate manager-owners are at one extreme of the power-incentive spectrum, university administrators are at the opposite extreme. Lacking the power to make changes without painful confrontation and lacking the personal incentive to overcome that obstacle, administrators are likely to prefer the status quo and to avoid initiatives that would make their institution different from others. Many specific features of college and university behavior can therefore only be explained in terms of the history of higher education in the United States rather than with a model of profit maximization or cost minimization.

To those who would insist that the only satisfactory form of explanation is a model of maximizing behavior, I offer the following formal reinterpretation of what I have been saying: Decision makers in universities and colleges are (of course) utility maximizers whose personal utility is a function of such things as compensation, the pleasantness of their day-to-day work experience, the satisfaction of doing their job well, and the prestige of their positions. They know moreover that their future employment prospects (salary, position, etc.) depend on their current performance and reputation. Seeking to achieve in the institution a major change that runs counter to existing practice at that and other institutions might increase the "satisfaction of doing the job well," but it would not increase salary. It would create confrontations that reduce the pleasantness of the daily work experience, and it might create a reputation for being disruptive that would hurt the individual's future job prospects at that or other institutions. In such a situation, the utility maximizer generally does not make major changes in the status quo or seek to depart from general practice among similar institutions.

The competition from heavily subsidized state institutions prevents the entry of for-profit institutions that could create a different style of management based on different incentives and different authority. Consider now how this perspective helps to answer some of the apparent puzzles raised by Rothschild and White.

The Lack of For-Profit Institutions of Higher Education

Rothschild and White suggest that for-profit educational institutions do not exist because students cannot borrow adequately against the human capital that will be created. That is not convincing, since parents now pay as much as $80,000 for four years of undergraduate education at private institutions. A more plausible answer is that they are willing to pay those fees because of the reputation and presumed exclusiveness of the private colleges and universities. A new for-profit institution would be unlikely to develop the reputation required to overcome the very subsidized tuition at public institutions.

Input Policy

In looking at inputs, Rothschild and White ask why research universities have been so reluctant to establish job categories for outstanding teachers or to use new video technology to increase the efficiency of teaching. I would add another "puzzle."

Colleges and universities do not permit faculty members to teach regularly at other institutions—even during the hours that they are permitted to engage in outside activities, even for "noncompeting" institutions. Why, for example, does Yale not permit a faculty member to spend a few hours per week teaching a regular course at the University of Bridgeport (to use the institution that Rothschild and White cite as one that does not compete with Yale for students)? The professor might augment his or her income by 20 percent or more, students (and possibly faculty) at Bridgeport would benefit, and the professor would be diverting no more time from Yale duties than would be spent in consulting, editing, or textbook writing. There is nothing inherently unprofessional about such behavior, since physicians frequently work at more than one hospital. A for-profit university might permit such outside activities as a way of increasing a faculty member's income with little or no extra effort or might even organize such an outside market for its faculty members' services.

Any such change would antagonize a considerable number of faculty members, who might worry that this would eventually lead to lower salaries as it becomes expected that faculty members will do such outside teaching. The academic profession as a whole would frown on such an innovation as potentially reducing the total demand for faculty members. Students and alumni of Yale would fear that the Yale education would no longer be seen as unique. The same considerations relate to the increased use of video recording that Rothschild and White mention. A dean or provost who contemplated organizing the Yale "faculty timesharing service" to offer Yale faculty services to neighboring institutions would probably be more impressed by the confrontations that lie ahead than by the potential gains if he succeeded. With no market competition to force the change and no incentive for personal gain to make the university administrator accept the pain of making the change, the status quo continues.

Pricing and Output Mix

Or consider the Rothschild-White puzzle that universities charge the same amount per course (or at least per point of academic credit) regardless of the marginal cost of producing that bit of educational service and of the pattern of demand elasticities. There is of course a problem of defining the relevant marginal cost. An additional student can enter a large lecture at no extra cost in terms of instruction and without imposing any adverse externalities on other students in the course. The only additional resource requirement may be the cost of grading or perhaps of a small fraction of a graduate student teaching

assistant. Taken literally, the marginal cost is so close to zero that a two-part tariff pricing system of the type suggested by Rothschild-White would degenerate into the existing flat fee.

A looser and perhaps better definition of marginal cost would regard the course rather than the student as the unit to be evaluated. Thus a small class of 10 taught by a professor would be deemed to have 20 times the marginal cost per student in a class with 200 students, at least if the professor's salary does not have to be increased for teaching large classes.

But assuming that this problem of defining marginal cost is overcome, consider the effect of introducing a new schedule of tuition charges that reflects the fact that the marginal cost of a large lecture course in economics or history is lower than a small class in French drama or Irish poetry. Many students might decide that the extra cost of the more obscure courses was not worth paying. They would flock to the large low-cost lectures. As the specialized courses shrink, their price would rise, accelerating this adjustment. This move to take advantage of economies of scale while still providing the specialized products when there is sufficient market demand is just what we as economists like to see happen in other industries. We might have certain reservations about the narrowing of undergraduate education or the lack of in-depth specialization and of faculty-student contact, but even this might be overcome by requiring students to take a certain number of small specialized courses in order to receive a degree.

Yet think of the transition problem from the point of view of the dean or university president. The faculty members whose courses are no longer wanted cannot be discharged because of tenure commitments. Early-retirement incentives and other policies might help to eliminate these quasi-fixed costs, but the faculty would be unhappy, other educational institutions would be critical, some students would object to the higher cost of the courses that they had planned to take, and so on. Even if a new variable-price tuition system with adequate educational safeguards could be designed that would make the university more efficient, the time and pain of the transition make it easy to understand why an administrator with no personal financial incentive would be loath to try.

Market Failures

Rothschild and White discuss (section 1.3) whether a competitive allocation is efficient. They reach the conclusion that, although one cannot be certain, there are "weaknesses in the a priori argument that competition will allocate students to colleges efficiently." Nevertheless, when they discuss the specific issue of collusion in the setting of scholarships and tuitions (section 1.4), they conclude that the "case for a market failure does not appear to be strong."

I agree with that conclusion. More generally, while I have no doubt that there are market failures that would cause a theoretical purist to reject a decen-

tralized system of education in favor of government regulation or private collusion, I think it is important to recognize the imperfections of the government system and the failure of nonprofit institutions to act optimally. Certainly, the experience around the world in a variety of other fields is causing governments everywhere to reduce regulations and to privatize previously state-owned or state-subsidized institutions.

Future Research

Making the best use of our higher education resources is important not only because of the volume of inputs in this industry but, even more significantly, because of the contribution of higher education to aggregate economic growth and the level of individual economic success. Research on the economics of the higher education industry is also something that we as university-based economists are particularly well suited to do. We start with a much better understanding of the institutions of this industry than of other manufacturing and service industries. I hope that the fascinating paper by Rothschild and White and, more generally, this volume will stimulate substantial research on the important issues in the economics of higher education.