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THE ORGANIZATION OF A NATIONAL SYSTEM OF HIGHER
EDUCATION: SOME PRELIMINARY THOUGHTS ON A
DECENTRALIZED SYSTEM

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PRELIMINARY THOUGHTS ON A DECENTRALIZED SYSTEM

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Abstract

The purpose of this paper is to address a fundamental question about higher education. If a country wanted to design a system of higher education, what would the optimal institutional structure of the system look like? This question is very broad so we limit our initial approach by analyzing one aspect of this question and ask how well a decentralized higher education system will perform. This paper is preliminary and does not provide an answer to this question; rather it attempts to lay out a framework for thinking about this question using existing systems, principally the US, as a model for how such a system would work.

THE ORGANIZATION OF A NATIONAL SYSTEM OF HIGHER EDUCATION: SOME PRELIMINARY THOUGHTS ON A DECENTRALIZED SYSTEM

The purpose of this paper is to address a fundamental question about higher education. If a country wanted to design a system of higher education, what should the optimal institutional structure of the system look like?

While the question is very broad and basic, it has important relevance in today's world. Many countries are enacting major reforms of their higher educational systems or are trying to build new systems of higher education. Former communist countries are experiencing pressures to reform their systems to meet the demands of their expanding market economies. Europe is engaged in the "Bologna Process" which is seeking to create a more uniform higher education system in Europe in the hopes that it will make it easier for students and faculty to interact. Many developing economies are attempting to build new higher education systems so they can participate in the global economy.

This question is also relevant for policy decisions in the US. The historical development of the US system has created a number of anomalies. For example, what advantage is there to the present mix of private and public institutions? Why do some states provide generous support for higher education and others do not?

The approach here will be to look at one aspect of this question. While many institutional structures can be used in designing a system of higher education, one approach is to establish a very decentralized system where individual universities have a great deal of autonomy. Then the question is similar to the question that Adam Smith raised in the context of a private market economy: Does a higher education system where independent universities seeking their own goals produce the best outcomes for society? This leads to further questions about how government should govern the environment for higher education so that the outcomes are positive. For instance, should government bring anti-trust actions against universities that collude to determine what scholarship aid students will receive?

A decentralized system is, of course, only one way of organizing a higher education system. Many countries have higher education systems that are dominated by public institutions which are closely monitored by a central authority. A more complete analysis would compare and contrast the advantages and disadvantages of these two approaches. In this paper we will focus on decentralized systems, in later work we hope to compare an optimal decentralized system with a centralized hierarchically organized system.

In trying to understand how an optimal decentralized higher education system might function, we rely heavily on the experience in the US to provide guidance in pointing out where problems are likely to arise. For example, the US system is dominated by private non-profit institutions and publicly supported institutions that have considerable autonomy. We ask whether there are some inherent aspects of a decentralized higher education system that would justify having non-profit and publicly supported institutions rather than for-profit institutions.

If we are going to discuss what an optimal system should look like it is important to define how a higher education system will contribute to social welfare. This is a difficult problem because the mission of universities is complex. Universities not only teach students, they also engage in

research and community service. In the next section we briefly discuss some of the issues involved in defining the social objectives for universities. In the following section we look at the goals of the individual university and why for-profit institutions may not be the best institutions for pursuing the goals of higher education. In this section we also argue that not for-profit universities will seek prestige. We then discuss how this might influence their behavior. In the third section we turn to the revenue side and discuss the revenue constraint. From this we are able to describe a constrained maximization problem. Finally in the last section we outline some behavior of US universities and how they have reacted to changes in the economy during the last few decades.

I. Universities and Their Contribution to Social Welfare

Like other institutions in the economy universities employ resources to provide a service to society. Bowen (1977) describes the mission of higher education as:

Learning, in this sense, means knowing and interpreting the known (scholarship and criticism) discovering the new (research and related activities), and bringing about desired change in the cognitive and affective traits and characteristics of human beings (education). Learning is the chief stock in-trade of higher education. (p. 8)

Bowen then goes on to describe different definitions of the purpose of higher education and in the following chapter describes how the goals of higher education can vary depending on the nature of the society in which it is placed. As an example, he discusses the support for collectivism vs. individualism. Higher education can also produce negative outcomes, at least from the perspective of some people. For example, a liberal professorate may promote values that conservatives feel are inappropriate.

In Bowen's view the Goals for Society (p. 59) are:

- a) Advancement of knowledge
- b) Discovery and encouragement of talent
- c) Advancement of social welfare (i.e. economic efficiency and growth, enhancements of national prestige, solution of social problems, etc.)
- d) Avoidance of negative outcomes for society

Bowen goes on to say that many of these goals are difficult to measure and may not be achievable in practice. Furthermore, because of cultural differences, these goals may be defined differently in different countries.¹

II. Goals of the University

While teaching students is a central responsibility of all higher education institutions, many higher education institutions also engage in research and provide community outreach. These institutions can vary greatly in terms of how much emphasis they give to these differing

¹ This raises some interesting questions when one observes that so many students seek out higher education opportunities in other countries. Are these students seeking a cultural indoctrination that is different from what they would receive in their home country?

On the other hand, the Erasmus program in Europe encourages an interchange of students coming from different countries to promote more cultural understanding.

activities. In the U.S., the Carnegie Foundation for the Advancement of Teaching has developed a classification system for higher education institutions. The system was originally “organized around three fundamental questions: what is taught (Undergraduate and Graduate Instructional Program classifications), who are the students (Enrollment Profile and Undergraduate Profile), and what is the setting (Size & Setting). Another newer classification system (2006) “focuses on community engagement” (Carnegie website). This system forms the basis of the classification system used by the *U.S. News* college ranking system. Institutions more or less compete in markets that are defined by this system. For example, in the *U.S. News* college ranking there are geographical groupings of colleges that do not compete at the national level. The goals of the institutions in different categories can differ significantly. This diversity is an important aspect of higher education in the US.

For-Profit vs. Nonprofit Institutions

In the U.S. there are basically three types of higher education institutions: private non-profit, private for-profit and public. Historically, private for-profit institutions have been a small part of the higher education system and these schools mostly concentrated on technical training. That has been changing in recent years with the establishment of schools like the University of Phoenix which is now the largest university in the U.S. with 160,000 students.

This raises the question of why higher education is so dominated by nonprofit and public institutions. The most common argument is spelled out nicely by Winston (1999):

In a seminal article, Henry Hansmann (1980) identified the legal and economic rationale for the nonprofit firm as a situation in which, because of asymmetries of information, the buyer is highly vulnerable to sellers' opportunism.

Markets like these are sometimes referred to as "trust markets" because of that vulnerability. The nonprofit structure of suppliers encourages the honest, if profit sacrificing behavior, that justifies trust. By reducing incentives for the opportunistic behavior, nonprofits become the preferred suppliers in certain settings: they increase the probability -and the confidence of donors or buyers- that they're getting what they are paying for, tending to offset the contract failure inherent in such asymmetric markets.

Rothschild and White (1993) take issue with this position. They point out that trade schools, legal and medical practices and hospitals have similar problems of asymmetric information but for-profit institutions operate in these areas. They argue that a better explanation for why the small presence of for-profits institutions is the lack of human capital markets. Because it is difficult for students to borrow against their future income potential, higher education must be heavily subsidized.²

Another possible reason for the development of this sector along nonprofit lines is historical. The cost of educating a student in the U.S. is much higher than the tuition charges. The difference is made up for by endowment and gift income, public support and cross subsidization from other university activities. With such a wide gap it would be difficult for a for-profit institution to enter the market. Following this argument to its logical conclusion, one would expect for-profit

² This argument depends, of course, on the presumption that more intense competition in a higher education market with for-profit institutions will not force the cost of education down enough that education will become more affordable.

institutions to enter the sector to compete in areas where other sources of revenue to support the cost of education were small.

Another argument for nonprofit higher education institutions places more emphasis on the role of research. Bok (2003) expresses concern about the commercialization of higher education institutions. He does not condemn all activities between universities and businesses. Indeed, joint ventures with business can produce real advances, but he is worried about corruption of academic values. He sees universities playing an important role in evaluating commercial products. As the world becomes more complex, and it is harder for the general public to evaluate these products, it is important to have in society a neutral observer who can be trusted. When businesses provide extensive funding for research and university researchers become increasingly dependent on this funding, it is harder for the university to portray itself as a neutral observer. He is particularly concerned about the funding in the medical area, where, for example, pharmaceutical companies fund laboratories to evaluate new products.³

The rapid growth of schools like the University of Phoenix suggests that there may be a niche which is not being filled by the other types of institutions. The University of Phoenix uses bare-bone facilities, with lecture plans prepared by the central administration. An effort is made to present classes at times when students will find it easiest to attend class. This structure is considerably different from the approach of either private non-profit or public institutions. Since the private for-profit sector is still relatively small, and there are so many unresolved issues surrounding private non-profit and public institutions, we will focus on latter.⁴

Goals of Nonprofits

As argued by Hansmann (1980) nonprofit institutions are distinguishable from for-profit institutions by a "nondistribution constraint". Nonprofit firms still must be concerned that their revenues exceed their costs. Still nonprofits can act in ways that profit maximizing firms are unlikely to do. They can overpay for inputs, like overpaying managers. They can shift "profits" from one internal operation to another in order to support an activity that cannot generate enough revenue on its own (A profit maximizing firm would abandon the unprofitable activity). This allows the nonprofit to pursue goals that would not meet the test of the market.

Nonprofits may also experience less outside pressure because they cannot be taken over in a capital market (Rose-Ackerman, 1996). Greater weight will be placed on the outside board to

³ It is not clear that universities must play this role. There are other institutions in society which could perform this function. Certainly the government has taken on this task in many areas, including product safety and evaluation of the effectiveness of pharmaceuticals. But government also has its own weaknesses. There is a large literature on the capture of regulatory bodies by the sector that they are supposed to control.

If universities are to play the role of neutral observers in the commercial area, do academic values also extend to other areas of society where neutral observers would also be valuable as the world becomes more complex? It is often argued that universities, or at least faculty members, have strong biases in political debates. It is not clear that being nonprofit institutions has much impact here, although there may be more political influence on public institutions than private institutions.

⁴ It can be argued that the University of Phoenix is more like a technical school than a liberal arts college or university. Like a technical school its clientele is older, mostly working, with a clearer vision of the skills that they want to acquire.

impose this discipline, but boards are not always up to the task. Thus nonprofit institutions have constraints but the market imposes less discipline than would be imposed on a profit maximizing firm.⁵ (Winston (1999))

A higher education system made up entirely of nonprofit firms would act very differently from Adam Smith's model of a decentralized market economy. In Smith's model the pursuit of profit encourages firms to be responsive to market demand and new entry occurs when profit opportunities arise. In a world of nonprofits the incentives for entry must be very different. For example, new institutions might be created for religious reasons. This has been an important motivation for new universities in the US. The story told behind the creation of Sabanci University, a new private university in Istanbul, is that the founder was convinced that starting a prestigious university would be a way of being remembered in future generations.⁶

Nonprofits will also have less incentive to expand. The rapid growth of student enrollments in the post-World War II period has been concentrated in the public sector. Winston (2001) argues that because the cost of educating a student exceeds the tuition students pay, expanding enrollments is not in the interest of the nonprofit private college or university. Public universities have expanded more to meet this demand because their funding comes from the public sector, which is pressuring them to expand and providing at least some of the funding to permit them to expand.

Because they are not subject to the same market pressures as a firm in perfect competition, higher education institutions have the advantage (disadvantage) of having additional freedom, within limits, to set their own agenda. Whether universities pursue objectives which satisfy a social purpose and efficiently use the resources available to them will depend importantly on what these goals are.

Several researchers have attempted to identify goals for universities. A common element in most of this research is that prestige is an important goal. Garwin (1980) lays out a formal utility maximizing model similar to a household utility maximizing model where there are inputs into a household production function. His utility function is:

$$(1) \quad u = u(pr, \text{studqual}, \text{stud\#}, Z)$$

where pr is prestige, studqual is the quality of the students, stud\# is the number of students, and Z is a vector of other factors (p. 26-28). He then adds several other equations that determine these variables. For instance, prestige is based on some weighted average of the prestige of various departments in the university. He then estimates equations to see if he can find the expected signs. All of the expected signs in this equation are positive.⁷

⁵ This is not to argue that all firms are profit maximizing firms. To the extent that firms have market power and protect themselves from takeover, they also have more freedom to pursue goals other than pure profit maximization.

⁶ The story goes that Sabanci, who was the head of the largest industrial group in Turkey, was asked if he had ever heard of Stanford University. He was then asked if he had heard of Leland Stanford. The reason that Leland Stanford, a railroad magnate who drove the 'golden spike' for the transcontinental railroad, is remembered is because Stanford University is named after him.

⁷ Note that the positive sign on student numbers contradicts our earlier argument that universities have an incentive to limit enrollments.

Expressing the objective function as a utility function gives the model some degrees of freedom. He points out that different schools will put more emphasis on different factors. Private research universities would put more emphasis on prestige and student quality. Large public universities would put emphasis on expanding student enrollments.

Brewer, *et. al.* (2002) also include prestige in their objective function, but they make a distinction between prestige and reputation. Reputation, according to their definition, is something that can be evaluated more directly and has a shorter half-life. Reputation is based on such factors as whether students seeking employment in certain fields are likely to be satisfied with the university. This is something that can be determined soon after graduation. Information about the likelihood of future employment in a particular field can also be obtained by looking at the experience of recent graduates. Reputation is particularly important because of the information asymmetries that exist in the education market.

Prestige, according to Brewer, *et. al.*, is a much harder to measure. Prestige is built around three prestige generators: student quality, research and sports. With the possible exception of sports, these are all harder to measure in the short-run. For this reason, the half-life of prestige is longer. They note that prestige plays an important role in the *US News* rankings where 25% of the score is based on the opinions of administrators in other colleges and universities in the same category.

For Brewer *et. al.* the distinction between reputation and prestige is important. Using their definitions reputation is more directed at 'consumer service' where the customers are students. Universities which are more concerned about reputation focus on enhancement of teaching. Those universities who seek more prestige have a broader agenda which, most importantly, includes research. These prestige-seeking universities also have a broader set of revenue sources, including research funding and alumni giving.

Brewer, *et.al.* argue that prestige competition can be very expensive in terms of the investments that universities must make, and they wonder whether these investments are socially justifiable. They suggest that these investments are a factor in the increasing cost of higher education and in their surveys they observe universities which are more financially fragile because they are prestige-seeking.

Their treatise is useful in highlighting the diversity in American higher education, but they do not have a clear model of competition in the higher education sector nor do they have a well defined social welfare function. Without these, the arguments they make for the strengths and weaknesses of the US higher education system are not as convincing as they might otherwise be.

In recent years an important barometer of higher education success is the *US News* rankings of colleges and universities. The first rankings were published in 1983 (after Garvin (1980)) and have led to numerous other rankings of higher education systems worldwide. Intended as a source of information for students looking for a college, the rankings are now used by schools to measure and promote their success. Much like the polls listing the top collegiate football teams, the rankings provide an easy way for the general public to get a sense of the relative reputation of various higher education institutions.

While it is difficult to get an exact measure of the importance these rankings have on actual decision-making within higher education institutions, Monk and Ehrenberg (1999) studied the impact of a change in ranking on the top private universities and colleges. They found that with

a five point improvement in the rankings a school received more applications, rejected more students, average SAT scores of the admitted class improved and the school could reduce the level of institutional grant aid.

There are also strong indirect indications that the rankings are having an important impact on institutions. The rankings are controversial both within and outside of academia.⁸ When the pay of the president of the Arizona State University was explicitly linked to the *US News* rankings, it was acknowledged that while an *explicit* connection between pay and rankings was unusual, it also noted that “the rankings are ‘a very common part of the conversation’ among board members about presidential performance and goals” in universities.⁹ (Jaschik, 2007)

The linkage between the rankings and evaluation of university presidents can be compared to the linkage between corporate executives and stock market performance through the granting of options. When there is a clear measure of performance that affects the compensation of the leaders of an organization, this will have an important influence on the direction of the organization.

The impact is also significant for professional schools. In a recent article the dean of the University of Cincinnati School of Law is quoted as saying.

“It is hard to overestimate the effect law school rankings have on everyday campus life... Students worry about how a ranking will affect their chances of future employment. Faculty worry about whether a drop in rankings will make it more difficult to publish in law reviews. Deans feel that they will be judged by how many places up or down the school moves in the rankings.” (Edwards, 2008, p. 40)

Further evidence of the importance of the *US News* rankings is the attempt by the Annapolis Group, an organization of leading independent liberal arts colleges, to forgo participation in the *US News* surveys. Members of this group feel that the rankings provide incentives for colleges to distort their priorities, in part because of pressure from trustees, and make expenditure decisions that are not in the best interest their colleges (Hoover, 2007).

This anecdotal evidence suggests that while a high ranking is not the only goal that directs resource decisions in nonprofit higher education institutions, the rankings are an important influence on decisions made by these institutions and should be part of their objective function.¹⁰

The Role of University Rankings

Competition for higher ranking has two important implications for judging whether the decentralized higher educational system in the US is meeting society's needs. First, if higher education institutions are being judged on the basis of their ranking, they will meet the needs of society only if the criteria used to rank institutions are consistent with society's goals. To the extent that the goal of the ranking system created by *US News* is to provide information to

⁸ See <http://www.library.uiuc.edu/edx/rankbib.htm> for a short bibliography of some of the articles about s ranking issues.

⁹ This quotation is drawn from a statement by Charles Quatt whose company provides advice on compensation issues, but did not advise the Arizona State University board.

¹⁰ For additional examples of the impact of the rankings on decision-making in colleges and universities see Ehrenberg (2002)

prospective students, it is an attempt to overcome information asymmetries that exist in the market place. Second, the structure of the competition among higher education institutions is like a *tournament*. In this sense it differs from the standard market model of a competitive firm.

1) *US News Ranking Criteria*

The US News Ranking criteria are peer assessment (reputation) (25%), student retention (20% in national universities and liberal arts colleges and 25% in master's and baccalaureate colleges), faculty resources (20%), student selectivity (15%), financial resources (10%), graduation rate performance (5%; only in national universities and liberal arts colleges), and alumni giving (5%) (US News and World Report, 2008). As can be seen from the list, there is a heavy emphasis here on input measures rather than output measures. This reflects the difficulty in measuring the output of services industries in general.

The heaviest weight in the index is on reputation which is a survey of college presidents, deans and admission officers. The survey is designed to “to account for intangibles such as faculty dedication to teaching” (US News and World Report, 2008). While administrators probably know more about other universities than the average college applicant coming out of high school, it is unclear what is really being measured here. In fact many administrators refuse to fill out the form because they do not want to engage in a ‘beauty contest.’ (Ehrenberg, 2002)

Student retention is a goal for which all universities should strive, but like other criteria in the *US News* rankings, attempting to achieve a high score may actually lower education values. Much like the rules passed by the NCAA to ensure that athletes are also students, higher student retention rates can be achieved by watering down the curriculum. So it is not clear that an outside pressure to increase student retention rates will actually improve the education that students will receive.

Faculty resources are another important criteria used by *US News*. Faculty resources are measured by class size (i.e. number of classes under 20 students and number of classes with more than 50 students), faculty salaries, highest degree earned by faculty, proportion of full-faculty faculty and student/faculty ratios. As with the goal of student retention, these goals are worthy, but having them imposed from outside may cause distortions in the way institutions allocate resources.

The fourth criterion is student selectivity. There are many ways to distort this statistic from early decision programs which increase yield rates (i.e. number of students who accept offers of admission) to dropping SAT scores as part of the application process.¹¹

US colleges promoted their student selectivity long before the *US News* ranking system so having highly selective universities is not a new aspect of the decentralized higher education system in the US. Eppele, *et.al.* (2006) provide theoretical support for the argument that tracking students by ability has advantages when the educational experience depends on peer ability. Sallee, *et.al.* (2008) make a similar argument when there are complementarities between resource expenditure and ability.¹²

¹¹ See Ehrenberg (2002) for a discussion of these strategies.

¹² Sallee *et. al.* (2008) carry out an exercise similar to ours in that they analyze how a social planner would choose the number of higher education institutions a country should have, and how students of different abilities should be allocated among these universities. Our goal is similar but our focus is more institutional. We are not interested just

Having a system which tracks the best students into a subset of universities, however, has conflicted with other societal goals. For instance, there have been concerns about affirmative action (diversity) and the admission of low-income students. Attempts by universities to maintain high levels of selectivity based on student SAT test scores and high school performance often run counter to these objectives¹³. Indeed, some university presidents have bemoaned the fact that the goals of diversity and admission of low income students are harder to achieve given the pressures they feel in trying to improve their standing in the *US News* rankings (Hoover, 2007)¹⁴

The next criterion is financial resources. Here *US News* calculates the amount of instructional resources available per student (sport, dorm and hospital costs are not included). In an indirect way these figures include research expenditures at the university so universities that have high research budgets would do well on this criterion.¹⁵

The last two criteria receive a relative small weight so we will not elaborate on them further. The analysis of the other five criteria shows the weaknesses in a system where attempts are made by an external agency to quantify the goals that higher education institutions should seek. This is not a problem unique to higher education. It is similar to the problem that confounds any organization which tries to quantify its goals and gives rewards to units within the organization that successfully meet the quantitative goals.¹⁶

In a quantitative measurement system it is particularly difficult to measure aspects of performance which are not easily quantifiable. The *US News* survey attempts to do this with its peer survey, but the results of the survey have met with a skeptical response.

The purpose of the ranking is to provide students with information on their college choice decision. While there is some controversy about this aspect of the ranking system, the real problem is that it is hard for colleges to ignore the rankings. It has become a instrument for measuring their success, particularly with trustees who are looking for ways of judging the performance of the institution they are monitoring. Thus the rankings are being used for a purpose for which they are not designed. In an environment where information asymmetries are a serious concern, the rankings partially fill this gap, but, perhaps, at a cost to society in terms of how higher education institutions are being managed.

The *US News* rankings are an American response to the absence of good information about universities and how they are performing. Recently other rankings have appeared which rank universities worldwide. One popular ranking is the Academic Ranking of World Universities

in the number of universities and student allocation among them. We are also interested in the incentives that motivate decisions made by universities and how these decisions affect economic outcomes

¹³ The tracking that occurs at the university level would be very controversial if it were carried out in elementary or secondary schools.

¹⁴ In their empirical work on US universities, Epple, *et.al.* (2006) find that universities do care about the income level of their students and “thus tend to subsidize students from families with lower incomes.” (p. 887)

¹⁵ This criterion creates some strange incentives for universities. Ehrenberg (2002) relates a situation where he was at a meeting with a trustee at Cornell, where he teaches and has been an administrator. The trustee wanted to control expenses, but Ehrenberg had to point out that this would hurt Cornell's placement in the rankings since this would reduce Cornell's per student instructional resources. This is clearly a perverse incentive from an efficiency perspective and will increase the resources society needs for higher education..

¹⁶ See Miller (1984) for a discussion of how the problems created by quantitative goals set by Soviet central planners and similar to the problems in any large organization.

published by the Institute of Higher Education, Shanghai Jiao Tong University. In an optimal decentralized higher education system, there may be better ways to manage the problem of information asymmetries, but given the importance of these rankings in the mindset of so many institutions and the absence of an alternative way of overcoming the information asymmetry problem, we will include this notion in describing the goal function for the university.

These rankings cannot be the only element in the university's objective function, however. The *US News* rankings focus directly on the needs of students and do not attempt to measure other goals (i.e. research, etc.) to which universities aspire. So the rankings relate to part to only part of a university's mission, but we include them as part of the objective function.

2) Nature of the competition

The competition over rankings is different from the competition in a normal competitive market. It is more like a tournament where there are winners. This raises an important question as to whether this competition leads to a overinvestment or underinvestment in resources. There are now two related literatures on this topic. One literature begins with Lazear and Rosen (1981). They describe conditions in labor markets where *manipulation of the reward structure* can create an environment where basic efficiency criteria are satisfied. This result depends on various assumptions about the information structure of the environment, risk characteristics of the players, and the nature of the uncertainty. The related literature is the 'rat-race' literature which usually makes reference to Akerlof (1976) as an important early article.

In a more recent paper about labor market issues in sports, Rosen (2001) describes the basic relationship between these two approaches:

Rank order considerations that determine outcomes can create excessive personal incentives to improve one's skills: a player with greater skills imposes negative externalities on rivals because others must react defensively to preserve their relative ranking. In most other labour market contexts, the decision of one person to acquire more human capital has only pecuniary externalities on others: personal decisions are properly internalised by market prices. In sports, the attempts of one player to gain a competitive advantage put direct pressure on rivals to keep up. Since each contestant does not value the extra costs imposed on others, there is much 'rat race' potential in sport (Akerlof, 1976). An extreme case is when the customer value of the contest is completely relative and depends exclusively on rank of contestants (Frank and Cook, 1995), that is, on who wins irrespective of skill or quality of play. In this case any attempt by contestants to improve their skills is a pure arms race and socially wasteful. Arms limitations treaties are necessary to avoid excess buildup of skill. Of course when absolute quality considerations totally dominate value, these investments are socially efficient (Lazear and Rosen, 1981) and arms limitation is unwarranted. In sports the truth usually lies somewhere in between. Lately some economists have stressed the rank and relative aspects of competition rather than the skill or quality of performance aspects, but empirical evidence on the extent of overinvestment is lacking. Nor has anyone spelled out how it could be ascertained. (p. F62)

We would argue that a similar analysis is needed to determine whether there is an under or overinvestment by colleges and universities.¹⁷

¹⁷ In a later section we argue that academic departments also engage in a similar rank order competition. A similar model would be needed to determine whether this competition leads to an appropriate level of investment.

Goals and Incentives for Universities in a Decentralized Environment

When looking at the goals and incentives associated with a decentralized environment for universities, we have relied heavily on using the US as a model for what such an environment might look like. We must ask, however, to what degree an optimal decentralized system will follow the outline of the US system and to what degree it might differ.

There appears to be a good argument that asymmetric information problems will lead to a sector which is largely dominated by nonprofit institutions.¹⁸ If this is true, then the goals of nonprofit higher educational institutions need to be described and the organization of higher education competition needs to be analyzed.

The US experience suggests that the information asymmetry problems are important determinant of how this competition proceeds and that ranking systems like *US News* are being used to overcome these information asymmetry problems.¹⁹ This is clearly a second best solution, but the spread of ranking systems to other countries suggests that it may be difficult to find other methods to overcome these problems. If this is so, then we need to consider the potential problems with these systems in terms of how well the incentives they give to universities may enhance or distort the objective of meeting society's needs. To the extent they encourage inappropriate behavior, through the goals they promote or through the competitive nature of the environment they create (i.e. ranking tournament), this may be a fundamental weakness of a decentralized system of higher education.

Thus far we have explored the goals of the university as they relate more or less directly to the teaching mission of the university. In the next section we explore issues related to the research mission.

Research Mission

Research is an important part of the mission of research universities in the United States, much less so at other higher education institutions. It is totally absent from the mission of for-profit institutions like the University of Phoenix.

There were dramatic changes in the relationship between teaching and research in the sciences that came about with the establishment of the University of Berlin, now Humboldt University, in 1810. As the short history of Humboldt University states:

...the foundation concept which Wilhelm von Humboldt had put forward made it the "mother of all modern universities".

¹⁸ Courant, *et. al* (2006) point out that almost all the for-profit schools provide either technical training where the education needs are more narrowly defined or business training like the University of Phoenix. Liberal arts education, which is much harder to evaluate, is provided by nonprofits.

¹⁹ There have been suggestions that a weakness in the *US News* rankings is that *US News* is a for-profit organization and this gives the magazine the incentive to change the rankings so they can sell more magazines. An alternative possibility would be to have the rankings provided by a nonprofit organization like *Consumer Reports*. The Department of Education is also trying to develop a data base College Opportunities Online Locator, or COOL, that will provide students with information that they can use for making college choices. See *Chronicle of Higher Education* (2006)

This concept envisaged a "Universitas litterarum" which would achieve a unity of teaching and research and provide students with an all-round humanist education. This concept spread throughout the world and gave rise to the foundation of many universities of the same type over the following 150 years. (Humboldt, 2008)

While continental European universities moved away somewhat from this model as research institutes separate from universities spread, American universities expanded on this idea. (Ofer, 2007)

For many universities academic research has become an important part of the mission of the university and can be a source of revenue to the university as well as an important factor affecting the reputation of the university. Research reputation varies across departments since most research is carried out within an academic discipline. For example, when Garwin (1980) presents his utility function for universities he explicitly makes the prestige of the university a function of the prestige of individual departments. His empirical work then utilizes surveys done by the American Council of Education on the performance of individual academic departments to build his prestige equations. Following his lead we could write a prestige function:

$$pr = pr(pr^1, pr^2, pr^i, \dots, pr^n)$$

Unlike Garwin, who used this to define the prestige variable in his equation, we envision this capturing specifically research prestige. At the same time we recognize that research prestige could influence factors as such as the reputation factor in surveys like *US News* which are directed towards guiding students in making decisions regarding the education function of universities.

We could therefore imagine a model of university behavior where:

$$U(\text{Ranking}(pr), pr)$$

$$pr = pr(pr^1, pr^2, pr^i, \dots, pr^n)$$

where the ranking variable is some explicit ranking like *US News* or the Shanghai Jiao Tong University rankings.

Academic departments are also ranked by various surveys including a ranking by the National Research Council (NRC) (<http://graduate-school.phds.org/>). These rankings are usually based on some kind of publication criteria. These rankings can be especially important in recruiting graduate students since undergraduate students often consult their teachers for advice on applying to graduate programs.²⁰

By writing the utility function in this general way, we are leaving open the possibility that some higher education institutions may put a very small weight on research; others a very large weight.

²⁰ The NRC system allows students to weigh different criteria in coming up with a ranking of departments they are considering. Various criteria include citations, size of department, reputation of the department, selectivity and diversity.

In Britain the evaluation of research productivity has a more explicit role in the utility function of universities and how they are managed. In 1985 the British established a Research Assessment Exercise (RAE) where funding for the next four or five years from the state Funding Councils would be based on the RAE. The RAE is an evaluation done by peers within each discipline and university departments are rated on the basis of the evaluation. The purpose of the RAE is to manage government research funding more efficiently (Henkel, 1999).

Under this system departments decide if they want research funding. If they want the funding, then they must participate in the process. The departments are graded from one to five stars. Rising or falling in their rankings can have serious repercussions for the department and the university:

In less than a decade it has become one of the most important influences on academic institutions, directly, through providing the basis of state funding allocations, and indirectly, as the mediator of information that enables the profession to accord status and the market to bestow its custom. (Henkel, 1999, p. 120)²¹

As with any system of this type there are advantages and disadvantages. The system has been criticized because of the short time horizons between RAE evaluations discourage longer term projects; the difficulty in doing interdisciplinary research because the evaluations are done on a department basis; and because of the structure of the RAE there is more separation between 'research faculty' and 'teaching faculty'.

Under either an American system, which has less explicit rankings, or the British system with the REA ranking system, departments are participating in a tournament for prestige in their academic discipline; much like the university is participating in its own ratings game. The same questions will arise in this context as to whether there is an under or overinvestment in these activities as a result of this competition.

III. Funding of University Activities

Thus far we have analyzed the utility function of the university, but we have not addressed the question of the resource constraints. Universities receiving funding from four basic sources: student tuition, research funding, public support, and private giving. What percentage of their support they receive from these various sources can vary enormously. For example, if public support for universities varies significantly across countries. In 2005, public support was over 80% in France and Germany whereas public support represented around 35% of funding in the US and around 21% in South Korea. (OECD, 2007, Chart B3.2)

Depending on the source of funding and how important it is to the overall funding of the university, each constituency can put pressure on universities in different ways.

A. Student Tuition

In the US, even though student tuition is very high relative to world standards, tuition only covers a part of the total cost of educating a student even at private colleges and universities.

²¹ In some ways this situation is similar to the situation in world financial markets. The World Bank and the IMF do detailed country studies. Once they give their imprimatur to a country's financial condition, it is much easier for the country to obtain funding from private markets.

Rothchild and White (1995) address this question in a model where outputs depend on consumer inputs. The notion here is that students benefit from the presence of other students of a particular type. They find that the tuition payments from a student will depend on what kind of inputs they provide. For example, if diversity is considered a positive input, then students from a minority group which is in high demand would pay less tuition. Their tuition would be equal to the value of the human capital they receive minus the value of the inputs that they provide to other students.²²

As the authors point out, their model does not explain important aspects of the US higher education system. While the model does explain why some students going to the same university pay different tuition (through scholarships), they have no data to support the notion that the differences are due to the factors in their model. Furthermore, the model does not explain why the same tuition is charged for courses within the same college even when costs can differ significantly. Additionally, the model does not explain the small variation in tuition charges across widely different private colleges and universities (i.e. small colleges and large universities).²³

The fact that universities are sensitive to price competition is evident in the establishment of scholarship cartels like the one that brought anti-trust action against several Ivy League schools in the later 1980s. Other similar scholarship cartels existed among the Great Lakes Colleges and a group of 8 women's colleges (mostly in the South) (White and Rothchild, 1993). The existence of several of these groups also points to the fact that the student market is highly segmented. Some colleges and universities compete on a national level, but most compete within a particular region.

B. Research Funding

Economic efficiency requires that universities promote research which is socially productive. Universities have played a role in society where there has generally been more tolerance for research which may not have dividends for a long period of time. This makes it extremely hard to evaluate the benefits of university research.

Funding for academic research comes from a number of sources. An important source is the allocation of resources within the university itself. In many universities there is an expectation that an important part of faculty time will be spent on research. To the extent that other responsibilities, like teaching, are reduced to make room for research, the university is reallocating resources to the research mission.

Not all universities engage in serious research and not all faculty at research universities engage in research. An important question is where to draw these lines in an economically efficient way. This is what the British RAE system attempts to do. First, universities designate whether or not they wish to be considered for research funding. Next, they identify which faculty are research faculty. This second designation is based on the number of research publications by a faculty member. The result has been a separation within institutions of teaching versus research faculty (Henkel, 1999).

²² The authors are well aware that a weakness in the model is that it assumes profit maximizing universities that are in competitive zero profit equilibrium.

²³ They point particularly to business and law schools where the tuition differences are small compared to the differences in salaries that graduates can expect.

While no formal funding approach like this exists within the US, the publication of peer reviewed research work plays an important role in evaluating the research productivity of faculty. Thus there is pressure on academics to pursue a research agenda which is likely to be positively reviewed.

Some research is also funded by outside agencies. Funding for research also puts pressure on universities to meet the needs of the funding agencies. While faculty have a great deal of freedom to decide what areas of research they want to pursue, the funding of research can influence the direction of research activity. This is a particularly important issue in areas like science where research funding is needed to pursue a research agenda.

Government has been an important source of research funding in many countries, although the process for providing funding can differ greatly across countries. As we have seen above, the UK distributes funds based on the REA system. (France?). In the US there are several funding sources including the National Science Foundation, the National Institute of Health (which are a peer reviewed systems), the Department of Defense and others. Depending on the agency support may be for basic research or work that is closely related to the mission of the agency. In the US state and local governments also support activities that are of particular interest to their constituencies.

For the most part research done for government agencies is published in the public domain.²⁴ In recent years there has also been more work supported by the private sector. Because firms in the private sector hope to profit from the discoveries that result from the research they support, their goals often conflict with the goals of academics who wish to disseminate their results to the research community.

A related issue is the patenting of new discoveries and the rights associated with potential commercialization. Some universities, such as Oxford University (Cook, *et. al.* 2008) have set up special units to bring together commercial interests and university researchers, and work out contracts that are agreeable to both parties. A spur to patenting by university researchers in the US is the Bayh-Dole Act passed in 1980. The act gave universities the right to patent and license inventions resulting from federally funded research. Since the passage of the act, some US universities have set up special units to promote licensing of discoveries. Except in a few instances these efforts have been less lucrative for universities than they hoped. (Bok, 2003?)

Of particular concern to Bok is other ways in which the private sector has intruded on the work of academics. He worries, for instance, that funding by pharmaceutical companies is placing some academics in a position where they may be biased in the way they evaluate new products. He cites examples where universities have punished researchers who have found unfavorable results which might hurt the university's funding.

The new relationship with the private sector and the possible licensing of university research work have raised a new set of questions about the role that universities should play in research development in society.

C. *Public Funding*

As mentioned earlier public funding of universities varies dramatically across countries. This funding also takes a variety of forms. These include direct support for operations in publically

²⁴ An important exception is some work done for the defense department and intelligence agencies..

supported institutions, scholarships and student loan programs, and research support. An important question is how much control of university operations should government exercise over universities if government funds are used to support their operations?

If one envisions a decentralized higher educational system as a kind of Adam Smith world, then universities should have discretion over key decisions, and the government would provide a framework within which universities compete. Smith's world was, of course, a world of private sector actors which did not receive public funding. This suggests a conflict between a decentralized system and a system which receives public funding where public agencies want to hold recipients of public funding accountable for their expenditures of public monies.

In the US states contribute most of the direct assistance to public universities. There is considerable variation among states in terms of the degree of control that they attempt to exercise over public universities.²⁵ Burke and Modarresi (1999) report on a survey of performance funding and budgeting by states. Performance funding, using a series of indicators, ties funding to specific achievements of universities. Performance budgeting ties funding to reports that universities submit for review. They found that sixteen states used performance funding and another twenty-three used performance budgeting. South Carolina implemented what was perhaps the most extreme system where "100 percent of the state's appropriation were to be based on such measures as quality of faculty, instructional quality, administrative efficiency, and the user-friendliness of the institution." (Heller, p.56). Reviews of the South Carolina system suggest that this budgeting system did not meet its legislative goals.

The federal government, while providing much less direct funding of university operations, has also pressured universities by threatening to cut off federal funding. Two recent issues that might affect federal funds are policing of internet downloads by students and military recruiting on campus. The latter issue relates to the military's policies towards gays and lesbians.

Another issue that has received less attention is changes in the university accreditation process. The Bush administration has been pushing for testing of college students in ways similar to the No Child Left Behind Law which institutes testing for K-12 students.

Whether these government controls on the activities of universities are appropriate depends on whether universities are more likely to act appropriately without these regulations than with them. In other words, do regulations do more harm than good? It is very difficult to answer this question without a model of university behavior which provides a clearer picture of how well universities meet social objectives without these regulations.

D. Private Giving

An important reason that, especially private universities, can provide an education which costs far more than the tuition that students pay is private giving. Historically private giving has been a more important source of revenue for private universities, but public universities now have large endowments as well. The University of Texas System (\$15 billion) and the University of Michigan (\$7 billion) now have some of the largest endowments in the US. In 1989 total university endowments in the US were about \$69 billion: in 2007 the total was more than \$400 billion. The distribution of endowments across universities is very unequal. The top ten universities in terms of endowments have \$143 billion and the top thirty have more than half of all endowments funds (NACUBO 2008).

²⁵ The *Dartmouth Case* of 1819 established the independence of private universities. (Heller, 2004)

This wide dispersion of endowments has created a very uneven competition for universities. Harvard has the country's largest endowment, approximately \$35 billion; approximately double third place Stanford's endowment. Income from Harvard's endowment represented 33% of Harvard's operating expenses of \$3.2 billion in the 2006-2007 academic year and was the largest single source of funds for operations (Harvard, 2007). As such it represented only a 3% payout from the university's endowment.²⁶

As endowments have grown, Congress has been concerned about how this money is being spent by colleges. The income earned by higher education institutions is not presently taxed. In response to these pressures Harvard has decided to provide more scholarship assistance to students whose families make under \$180,000 a year. Families would not have to pay more than 10% of their income in tuition. This is expected to cost Harvard about \$20 million- a trivial amount compared to their endowment income. Brown University which has an endowment of \$2.8 billion (less than one-tenth of Harvard's) would find these costs much harder to bear.

IV. A Utility Maximization Problem with a Revenue Constraint

Since a university is a non-profit organization with goals that it wishes to achieve, it is possible to define the problem as a utility maximization problem with a revenue constraint where the revenue constraint is defined by the resources the university is able to obtain from student tuition, research funding, public funds and endowment income.²⁷

Thus the problem can be stated as:

$$\text{Max } U(\text{Ranking}(pr), pr)$$

$$pr = pr(pr^1, pr^2, pr^i, \dots, pr^n)$$

$$\text{s.t. } B = T + R + P + E$$

where B is the total budget, T is tuition revenue, R is research revenue, P is public funding and E is endowment income.

The problem is made more complex by the relationships that exist between rankings and department prestige and the budget constraint. Because of competition in the market for students, tuition rates are largely determined by market forces so universities can increase tuition revenue only by increasing the number of students. Other revenue sources, however, can be influenced by prestige factors.

²⁶ Congress is considering a law which would force colleges to pay out 5% of their endowment each year. If Harvard paid out 5%, then the operating budget would receive \$1.75 billion or more than half of the fiscal year 2006-07 expenditures.

²⁷ We have simplified the problem in a serious way. Many universities obtain revenues from selling other services (i.e. medical services and sports entertainment. Medical services in particular can be an important source of revenue that can support other activities on campus. We leave out these considerations to make the model more tractable.

Research revenue can be increased by having a more prestigious academic department. If this department is in an area where there is considerable outside funding available, then building the reputation of that department can have a considerable effect on university revenues. Thus universities have an incentive to invest more in the prestige of departments which have outside sources of revenue, and provide fewer internal resources to department that do not bring in outside money.

With the ability to license new discoveries universities will also have an increased interest in funding research ventures which have potential market value.

Thus we could write a research revenue as function of pr where the partials with respect to the different departments could be quite different.

$$R(pr^1, pr^2, pr^i, \dots, pr^n, m^1, m^2, \dots, m^n)$$

The m^i reflect the potential of marketing research results through licensing or other corporate relationships where not just the researcher, but also the university receives financial rewards. For many departments the partial here is likely to be zero.

Public funding can also be sensitive to the reputation of the university although the prestige of individual departments may be less important than the overall reputation of the university. Public funding of universities is a big budget item for many state governments and public funding can fluctuate significantly along with state revenues.²⁸ A simple function describing public funding would include these factors:

$$P(pr, SB)$$

where SB represented the condition of state budgets. Private institutions also receive some state funding but they are much less reliant on these funds.

Endowments also depend on the reputation of the university, but other factors are also important. Universities can be sensitive to future donors as part of the admission process. Remaining in contact and finding ways for successful graduates to participate in university affairs can also be a way to encourage private giving.

The return on investments is also a determinant of endowment growth. Like any other investor there is a tradeoff between risk and return. While it is difficult to assess the risks universities are taking with the endowment funds, it is interesting to note that endowments in excess of \$1 billion in 2007 had 30% of their endowments in either hedge funds, private equity or venture capital. This compared with a total of 10.1% in these categories for institutions with endowments in the \$50 – 100 million range (NACUBO, 2008).

While there is no simple description of the factors affecting endowment levels, and thus endowment income for operating expenses, two factors seem to play the largest role: investment returns and private giving. The latter is influenced by prestige so:

²⁸ State funding per full time equivalent unit (FTE) in 2005 was its lowest level in 25 years. It has risen somewhat since then but is still at a low level for this period. (SHEEO, 2008) The future does not look bright as states struggle with other increasing demands.

$E(r, pr)$

where r is the investment return on the endowment portfolio.

This problem can now be formally solved, but this would still leave open the question of whether a decentralized university system would efficiently meet social needs. This question can only be answered by analyzing the system as a whole.

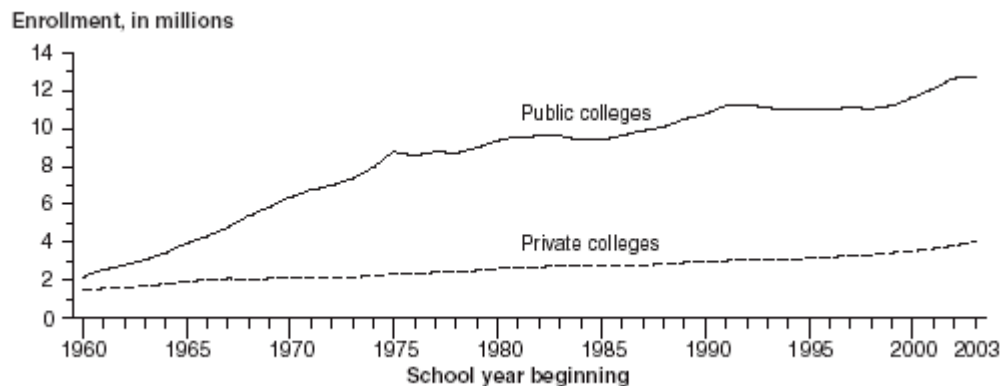
V. System Effects

We do not attempt to formally solve this problem for the system effects, although this would be nice. Our approach at this point is to ask how such a university is likely to respond to changes in its environment, for example, increases in students enrolling in higher education, or shifts in society's needs for training in new areas.

a) Student Enrollments

As Winston (2001) has argued, private universities which provide a large subsidy to students (i.e. cost far exceeds tuition) have little incentive to respond to higher demand for higher education. The statistics in the US bear this out. As Figure 1 illustrates enrollments in higher education have grown dramatically since the 1960s. In 1961 there were just over 4 million students enrolled in higher education; by 2004 there were over 17 million. In 1961 60% of students were enrolled in public institutions; by 2004 75% are enrolled in public institutions. If we go back to 1947, there were more students attending private schools than public schools.

Figure 1: Higher Education Enrollments in the US



Source: *Digest of Education*, p. 280, Department of Education

The nonprofit nature of most higher education institutions also raises questions about entry and exit of schools. While exiting may be a function of financial considerations, entering a non-profit sector will be motivated by other concerns. Because of the wide diversity of higher educational institutions in the US, it is hard to determine what motivates leaders to open new schools. Religion is one factor. For example, the number of religious affiliated schools expanded from 774 in 1980 to 922 in 1990. From 1960 to 2004 the number of private schools grew from 1321

to 2516 and the number of public institutions increased from 695 to 1700.²⁹ When compared with the enrollment figures, it is clear that most of the additional seats in public institutions came from expanding the size of colleges and universities. For private schools the number of institutions increased by 90% and enrollments increased by 160%.

A problem with these general figures is that they include all kinds of post-secondary schools. A more focused look at colleges and universities that are ranked classified by the Carnegie Classification system as research direct universities and liberal arts colleges (680 schools) provides a somewhat different snapshot of the dynamics affecting higher education. Of the 76 schools that were founded since World War II, 30 were public schools, 46 were private schools and 33 of these had a religious affiliation.³⁰ Sixteen of the new campuses were in California.

If we look further at this set of schools 61 were founded between the end of World War I and the end of World War II or an average of 2.3 schools a year vs. 1.3 schools a year during the explosion of enrollments during the post-World War II period.

Exit also occurs. Between 1970 and 2004, 539 schools closed their doors, this included branch campuses. Of these 495 of these were private schools of which 256 were two-year programs. Only 5 four-year public schools (or campuses) closed during this period.

These statistics leave open the question of how a decentralized higher education system that lacks a profit motive is responding to changing educational needs.

b) *Shifting Needs in Society*

While an important goal for a higher education system is to educate informed citizens, higher education also prepares people for professional employment. These needs change over time and higher educational institutions need to adjust to new professional environments.

Table 1

²⁹ The 1960 figures do not include branch campuses while the 2004 figures do. so the figures are not entirely comparable.

³⁰ Three of the thirteen non-religiously affiliated schools were the Claremont Colleges: Claremont McKenna, Pitzer and Harvey Mudd. A fourth was Hampshire College (1965) which was started by nearby small colleges which wanted to expand but wanted to maintain their small size.

**Bachelor's degrees conferred by degree-granting institutions,
selected disciplines for years 1970-71 and 2005-06**

Discipline division	1970-71	2005-06	Growth	Growth of
			Rate	PhDs
Total Number of Degrees.....	839,730	1,485,242	77%	75%
Business	115,396	318,042	176%	121%
Social sciences and history	155,324	161,485	4%	7%
Education	176,307	107,238	-39%	26%
Health professions and related clinical sciences	25,223	91,973	265%	1276%
Psychology	38,187	88,134	131%	130%
Visual and performing arts	30,394	83,297	174%	123%
Communication, journalism, and related programs	10,324	73,955	616%	218%
Biological and biomedical sciences	35,683	69,178	94%	61%
Engineering	45,034	67,045	49%	101%
English language and literature/letters	63,914	55,096	-14%	163%
Computer and information sciences	2,388	47,480	1888%	1006%
Lib arts & sciences, general studies, and human	7,481	44,898	500%	163%
Security and protective services	2,045	35,319	1627%	7900%
Parks, recreation, leisure, and fitness studies	1,621	25,490	1472%	9600%
Agriculture and natural resources	12,672	23,053	82%	10%
Public administration and social services	5,466	21,986	302%	305%
Physical sciences and science technologies	21,410	20,318	-5%	4%
Foreign languages, literatures, and linguistics	20,988	19,410	-8%	-1%
Mathematics and statistics	24,801	14,770	-40%	8%
Philosophy and religious studies	8,149	11,985	47%	4%

SOURCE: U.S. Department of Education, National Center for Education Statistics, Higher Education General Information Survey (HEGIS), "Degrees and Other Formal Awards Conferred" surveys, 1970-71 through 1985-86; and 1990-91

Table 1 illustrates the changes in the awarding of bachelors' degrees in the largest academic disciplines. As can be seen in the table, there have been significant shifts in the areas where students have chosen to study. In terms of the number of student, the biggest changes have been in the number of business students and students studying in health related fields. In percentage terms the biggest shifts have been in computer science and security services which have been rapidly expanding areas in the economy during this period. The largest decline has been in training for education. The largest declines occurred in the late 1970s and early 1980s in about equal proportions for men and women. The number of teachers in elementary and secondary schools rose only about 10% between 1975 and 1991. (Digest, 2006)

Table 2

Table 12. Earnings (in constant 2003 dollars) of full- and part-time employed 1992–93 bachelor's degree recipients in 1994, 1997, and 2003, by selected characteristics

Selected characteristics	Full time at one job			Part time at one job		
	1994	1997	2003	1994	1997	2003
Total	\$30,800	\$39,900	\$60,600	\$14,300	\$17,300	\$41,400
Academic	26,500	36,300	58,300	11,800	14,800	42,500
Social and behavioral sciences	26,900	39,200	62,300	11,500	11,200	36,300
Arts and humanities	25,000	33,600	52,800	11,200	16,800	44,800
Biological sciences	29,200	33,900	62,200	12,200	16,100	51,500
Mathematics/physical sciences	27,100	37,800	58,200	12,000	‡	‡
Other academic	26,200	34,000	53,200	13,500	16,800	50,300
Career-oriented	32,700	41,400	61,700	16,100	19,400	40,700
Business and management	33,800	43,400	65,900	14,000	17,000	46,800
Education	26,600	31,700	43,800	14,900	15,200	24,300
Health	40,500	45,600	65,000	20,500	28,200	45,900
Engineering	38,900	51,400	74,900	15,900	‡	‡
Computer science	33,400	50,400	72,600	‡	‡	‡
Other career-oriented	29,200	37,400	59,300	17,100	20,600	38,400
Science/technology/engineering/ mathematics (STEM) ¹	33,800	45,600	68,300	13,600	15,600	47,500
Non-STEM fields	30,200	38,800	58,900	14,500	17,600	40,600

Recently the Department of Education did a longitudinal study of the class of 1993 (Department of Education, 2008). Table 2, which is taken from the report, shows salary patterns for different majors for the graduating class of 1993 over a 10 year period. To the extent that these salary differentials reflect demand in the economy for people with this training, one can see why the enrollment patterns in Table 1 have evolved the way they have. Business and computer science majors have done very well, while education majors have fallen behind salaries for other majors.

While these shifts reflect the interests of students, it is more difficult to find statistics on how universities have responded to these changes in terms of their internal staffing. Having tenured faculty can make these shifts particularly challenging. What can be observed is a major shift towards part-time faculty which gives the university more flexibility and reduces salary costs.

An indirect measure is how many PhDs are graduating in different fields and how this is changing over time. The last column in Table 1 shows the change in the number of PhDs granted between 1970 and 2004. Some of the changes are very close to the changes in bachelor degrees granted; others are not. Most reflect the size and relative direction of changes in undergraduate enrollments. Some of the differences may reflect changes in the way that PhDs are used outside of academics in certain fields.

Conclusions

This paper is intended only to be a beginning of a discussion of the issues surrounding higher education. We described some of the features of the decentralized higher education system in the US and used this as a basis for thinking about how a better decentralized higher education system could be organized. Without a more formal model of how competition in a higher education system might function, we were only able to present some general facts about how higher education in the US is responding to the needs of society. We were able to say almost nothing about the efficiency of such a system and without a more formal model we were not

able to make policy recommendations for improving the system. These are serious deficiencies in our knowledge about a sector which plays such a central role in our society.

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