View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Sound Ideas

Economics, Department of

Economics Theses

University of Puget Sound *Year* 2006

Looking Good or Learning Good? An Education Production Function with Ancillary Services as an Input

Linh Hoang
University of Puget Sound

This paper is posted at Sound Ideas.
http://soundideas.pugetsound.edu/economics_theses/33

Looking Good or Learning Good?

An Education Production Function with Ancillary Services as an Input

Abstract: Universities have been putting more emphasis on developing ancillary services in an effort to make them look better and become more attractive to both prospective students as well as financial donors. However, in making the decision as to what level of ancillary services they should administer, universities face the problem of whether they are compromising their academic quality.

Linh Hoang

Senior Seminar - Fall 2006

Bruce Mann

Introduction

Although educational institutions differ substantially from for-profit businesses, they, like all businesses, compete with each other in the education market. Just as businesses compete for customers, schools compete for students. A high school graduate, as an economic agent, will try to maximize his utility by deciding whether to proceed to higher education, and then which institution to enroll once the decision on continuing his education has been made (Wilson, 2001). The student, while making decision on which college or university to enroll, will take into consideration several factors, including his own characteristics (academic ability and education aspiration) as well as other external influences (Chapman, 1981). The external factors include his significant others (family, friends, college personnel) whose opinions are, to an extent, influential in the student's decision making process, his family's socioeconomic background, total education expenditures and financial aid offers, the institution's characteristics (location, availability of desired academic programs, perceived quality, and other non-academic curriculum, etc.), and the expected future return to education (Chapman, 1981; Jimenez and Salas-Velasco, 2000).

From the universities' point of view, there are several avenues in which universities can influence a person's choice of schooling.[1] Why, however, do universities care about having an impact on an individual' school choice in the first place? One can argue that these schools try to attract as many students (up to the desired number of enrolled students), or at least applications, as possible in order to increase their revenues from application fees as well as tuition. In addition, a wider pool of applicants means more power to the school, a larger number of students with superior academic profiles, as well as increased campus diversity. If we assume that

[1] Typically, universities play a more prominent role in the education choice of an individual once that person has already decided to engage in higher education. Universities do not have substantial impact in a person's decision of whether to further his education or to join the work force instead (Wilson, 2000).

colleges and universities are organizations trying to maximize their output, specifically student learning, and having brighter, more talented, and more culturally-oriented students is expected to encourage learning and stimulate intellectual activities, then it is understandable that schools would try to compete for these "good students."

One way through which an institution can encourage a student to enroll is by offering a financial aid package that will help him cover his educational expenses. However, just as cost is not the only factor that influences an individual's choice of schooling, financial assistance is not the sole offering to students by universities. Schools also compete for good students by trying to differentiate themselves among other institutions through developing unique characteristics with regards to academic curriculum as well as non-academic curriculum. The non-academic curriculum includes student personnel services (housing and dinning, health and counseling, bookstores, and other services that make a student's life at the university easier) and student activities (college athletics programs, clubs and organizations, community services, and other activities that seek to enrich the college experience).

With increased tendency to incorporate marketing strategies into the competition efforts, universities have changed and developed to make themselves more attractive to prospective students (Litten 1980, p. 41). This means that institutions, to an extent, would tailor their academic programs as well as the non-academic – ancillary – services to meet their targeted students' needs. One problem in an individual's school selection process is how to accurately evaluate the images that schools presented them with. While it is relatively easy to assess the resources of the schools, it is more difficult to measure the quality of education that universities offer.[2] If changes in ancillary services are more visible to students, while changes in academic

[2] The ranking systems offered by various accrediting organizations are accurate to the extent that an institution ranked at No. 2 would perhaps really be better than one ranked at No. 108. However, a student,

quality are more difficult to observe, then institutions might be inclined to place more emphasis on developing new ancillary services rather than investing in improving pedagogical methods. As a result, in cases where schools tend to shift their focus from the objective of maximizing student learning, to more immediate goals like increasing attractiveness, higher education institutions face the question of whether this shift in incentives compromise with the original education outcome, i.e. student learning.

This paper presents an education production function of a higher education institution trying to maximize its output, i.e. student learning, given that in an environment of increased competition, the institution also aims to become more attractive to prospective students. The question it addresses is whether attractiveness increases the enrollment of "good students," which is expected to positively affect student learning. I will examine the impact that a change in the level of ancillary services has on learning, both directly and indirectly through its impact on the enrollment of good students. The relationships become more complicated when the university operates on limited resources. The investment of more resources in one type of input will reduce the amount of resources available to other inputs. In addition, although the university has only one final output, along the production process, it also inadvertently makes decision to reach other intermediate outcomes. These outcomes in turn affect the primary learning output. Ultimately, the problem the university faces is to decide on the level of ancillary services so as to maximize learning, while taking into consideration all other interactions in the production process.

---

based on his intellectual ability, would usually consider schools that have similar level of prestige, and therefore could make little use of the ranking system, except for choosing second-choice or back-up schools. Perhaps the closest approximation of education quality could be obtained through current students and alumni. Nevertheless, imperfect information has been proved to be a substantial problem in the education market (Becker, 1982; Kealy & Rockel, 1987)

Literature Review

Education Production Function

The major study that set ground for subsequent researches on education production function is Coleman's 1966 *Equality of Educational Opportunity*. Besides its substantial scope – the study surveyed over half a million students – the Coleman Report is important in the sense that it introduced a new way of thinking about the input-output relationship in education (Hanushek, 1979).

Following this study, a wide variety of literature sought to discern the relationships between various inputs and outputs in the education of an individual.[3] While the set of inputs used in the majority of these studies are essentially the same throughout – including variables such as family background, student's innate ability, and school's characteristics – the outputs examined can be categorized into two types. The first type includes the outcomes produced when a student is still in school, such as cognitive achievement (Brown & Saks 1975, Dolan & Schmidt 1987, Card & Krueger 1992, Hanushek 1996 & 2003), student attitudes toward learning (Levin 1970, Michelson 1970, Boardman, Davis & Sanday 1973), and attendance rates (Katzman 1971). The second type of education outputs focuses on the effects of education on a person's life after graduation, such as earnings (Link & Ratledge 1975, Morgenstern 1973, Wachtel 1976, Betts 1996), labor market performance (Murnane, Willett & Levy 1995), and social capital (Johnson & Stafford 1973).

Of the studies that focused on the impacts of school inputs on student learning, the vast majority examined the relationship between school resources, i.e. per-student expenditure, and student achievement. There has been a consensus over three decades of studies that there exists "no strong or consistent relationship between variations in school resources and student

[3] For a more comprehensive summary of the education production function literature, see Hanushek, 1997.

performance" (Hanushek, 1997). However, when school inputs are disaggregated into smaller components, such as teacher attributes, curriculum characteristics, and campus environment, there is much controversy in whether these components have an impact on learning and, if they do, how. Hanushek (1971) found no correlation between teaching experience as well as graduate education of teachers and gains in students' achievement. Aryes and Bennett (1983), on the other hand, concluded that faculty characteristics are the most important influence on student achievement, besides student body attributes and curriculum design. Goldhaber and Brewer (1997) also found that some teacher characteristics (specifically teacher qualifications and teacher behaviors) do in fact have positive impacts on students' performance. A study by Jacob and Lefgren (2004) shows that spending more money on teacher training doesn't lead to higher achievement in students. The mixed results suggest that there might be unobservable characteristics of schools inputs that influence students' performance but have not been accurately measured (Goldhaber & Brewer, 1997).

Non-academic inputs

Among the ancillary services, student personnel services have always been an integrated part that makes up the college environment, especially for residential colleges and universities. Although they might not have any direct impact on students' intellectual development, residence halls, dinning halls, bookstores, campus café's, etc. constitute the campus environment in which students learn and grow, in terms of academic advancement as well as personal development (Centra & Rock, 1971; Pascarella, 1984). Nevertheless, merely having a campus cannot by itself generate further development of the students if the students themselves do not actively seek to be involved. Involvement in university-supported social activities on campus has been proved to result in higher educational aspirations and stronger commitment to achieve those goals

(Pascarella, 1984; Anderson, 1988), as well as more openness to diversity and challenges (Pascarella et. al., 1996; Whitt et. al. 2001).

Of the discussions around how student activities influence an individual's college experience, studies of the impacts of intercollegiate athletics programs on students have been among the most controversial. A large portion of the studies looked at how being a student athlete affects a student's overall college experience (level of satisfaction) and his/her life after college (Blann 1985, Bredemeier & Shields 1986, Kennedy & Dimick 1987, Stone & Strange 1989). There is a smaller collection of studies on the cognitive impact of being a student athlete. Papers that studied the impact of athletics participation on GPA generally come to a consensus that there is no significant differences between athletes' and non-athletes' level of GPA, given their background characteristics (Pascarella & Smart, 1991; Hood et. al., 1992; Aries et. al. 2004). When questions about the conceptual meaning of GPA are raised, scholars shifted their focus to measure the effects of athletics participation in cognitive learning. Major studies by Astin (1993), Pascarella et. al. (1995), and Pascarella et. al. (1999) supported the results that there is significant negative impact of being an athlete in the revenue-producing sports (football and basketball) on a student's cognitive learning.

Peer Effect

Besides school inputs, the student body itself is an important source of influence on the intellectual environment at a particular college. Studies on the effect of peer ability on educational attainment have, for the most part, found that when low-ability students are put in classrooms with higher-ability students, there is a significant positive impact on the achievement of the low-ability students. Although the mixing of students of different ability in a classroom also results in a negative impact for the high achievers, the positive effect exceeds the negative

one, resulting in an overall positive impact (Summers and Wolfe, 1977; Argys et al., 1996). Zimmer and Toma (2000) found that this pattern, i.e. raising the average peer level increases individual student achievement levels, is consistent even across countries.

The Model

Ancillary services have so far not been included in the education production function literature. They either have not been included in the function or have been included in larger variables like school organizational characteristics or college environment. Nevertheless, as previous studies suggest, ancillary services do indeed affect the learning output of an education institution, both directly and indirectly.

Consider a university as an economic agent trying to maximize its output, which is student learning. Learning is characterized by the following production function:

learning: $\mathbf{L = g\,[\,E\,(L^e, A)\,;\,A\,;\,x\,]}$[4] (1)

s.t. $\mathbf{TR = TC}$

$\mathbf{z\,[\,E\,(L^e, A)\,] + r(A) = c(x) + p(A)}$ (2)

where: **E** is the enrollment of "good students." Good students are those who have necessary traits, such as high cognitive ability, intellectual curiosity, and leadership skills, to be able to succeed academically and to help inspire their peers to succeed. The more good students an institution has, the higher the average ability and hence the higher learning output will be. This peer effect has been found to have substantial impact on the learning output an institution

[4] Note that in this production function, I do not examine the impacts on the level of learning at a particular institution of other agents that are also involved in the learning production process, including the students themselves and their families. This paper is interested in how a university makes decision regarding the level of ancillary services so as to maximize its learning output, so unless variables such as student cognitive ability and parents education and background have an impact on this decision, it is more favorable to not include those variables in order to keep everything simple.

can produce (Summers and Wolfe, 1977; Argyes et al., 1996; Zimmer and Toma, 2000). Therefore, as **E** increases, we would expect an increase in **L** ($\partial \mathbf{L}/\partial \mathbf{E} > \mathbf{0}$).

E depends on the attractiveness of the institution, which is characterized by i) $\mathbf{L^e}$ – the learning perceived to be taking place at the institution. In other words, this is what students (customers) think the level of learning is at that school. Students form perceptions through various information channels, including friends, current students, alumni, and the ranking systems offered by accrediting organizations. Good students are attracted to institutions where they perceive to have high levels of learning relative to other universities that they also consider. In other words, an increase in the aggregate $\mathbf{L^e}$ is expected to increase **E** ($\partial \mathbf{E}/\partial\ \mathbf{L^e} > \mathbf{0}$). ii) **A** – the level of ancillary services (including student services such as housing, dinning, counseling and health services and university-supported student activities such as athletic, music and performance, sorority/fraternity, and student government programs).

For the model's purpose, **A** can be divided into two types: the revenue-generated ancillary services that do not generate positive learning impacts ($\mathbf{A^\$}$) and the non-revenue services that can positively influence learning ($\mathbf{A^L}$). The model, therefore, now reads:

learning: $$\mathbf{L = g\ [\ E\ (L^e, A^\$, A^L)\ ;\ A^\$\ ;\ A^L\ ;\ x\ ]} \qquad (3)$$

s.t. $$\mathbf{z\ [\ E\ (L^e, A^\$, A^L)\ ,\ A^L\ ] + r(A^\$) = c(x) + p(A^\$, A^L)} \qquad (4)$$

$\mathbf{A^L}$ includes all the university-supported student activities and counseling and health services. The student activities do not have a direct effect on learning; however, they increase the students' college experience satisfaction, help students become more open toward diversity and challenge (Pascarella et. al., 1996; Whitt et. al. 2001), and encourage stronger commitment and higher goals (Anderson, 1988). These are positive traits that could be argued to result in higher learning outcome. Counseling and health services, for the most part, help students become more

prepared, psychologically and physically, to face academic as well as other challenges. Students become more ready and focused, and these are also positive characteristics that could affect learning positively. In short, an increase in $\mathbf{A^L}$ leads to an increase in **L** ($\partial \mathbf{L}/\partial \mathbf{A^L} > \mathbf{0}$).

$\mathbf{A^\$}$ includes services like housing and dinning services as well as more auxiliary ones like renting out conference rooms, open spaces or gymnastic equipments. These services do not have any direct impact on learning.

College athletics programs can be categorized into either group, $\mathbf{A^\$}$ or $\mathbf{A^L}$, depending on the level of commercialization and professionalism of a particular program. For institutions with large athletics programs that rely on the earnings from the program operations as a source of revenue, the programs are considered to be $\mathbf{A^\$}$. When this is the case, the addition of the revenue-producing sport programs to the variable $\mathbf{A^\$}$ leads to a negative impact of $\mathbf{A^\$}$ on the learning output **L** ($\partial \mathbf{L}/\partial \mathbf{A^\$} < \mathbf{0}$), since revenue sports have been found to negatively affect the academic achievement of the student-athletes (Astin, 1993; Pascarella et. al., 1995;1999).

x is a vector of variables other than ancillary services that affect learning. **x** includes observable as well as unobservable variables such as teaching and instruction, campus environment, staff and faculty characteristics, etc. Although the literature on how some of these inputs affect learning yield controversial results (Hanushek, 1971; Goldhaber & Brewer, 1997; Jacob & Lefgren, 2004), I am not confining **x** to only these variables but also those that really do have a postitive impact on learning – regardless of whether we currently know what they are. Assuming that **x** includes variables that positively affect learning, an increase in **x** will lead to an increase in **L** ($\partial \mathbf{L}/\partial \mathbf{x} > \mathbf{0}$).

Total Revenue $\mathbf{TR = z\,[\,E\,(L^e, A^\$, A^L)\,, A^L] + r(A^\$)}$ where i) **z** is a vector of revenue variables including tuition revenue, donations, and government grants. Tuition is

decided by the institution; however, while it is favorable for schools to increase their revenues, they do not do so by increasing tuition fees if they can help it, since this would prevent some good students from attending the school. Government grants work as subsidies for students who would not have afforded higher education otherwise and therefore are not within the university's control. Increasing donation, on the other hand, is both desirable and feasible. Gifts from alumni constitute a large part of donation giving to a higher education institution, and the amount of alumni donation depends on the university's "academic reputation, measured scholastic aptitude of its students, its student-faculty ratio, and its functions and structure" (Cunningham and Cochi-Ficano, 2002, p.560). More specifically, Harrison et. al. (1995) found that schools with higher level of student involvement in campus activities receive higher giving, while having an NCAA Division I athletic program has no significant impact on donation. Rhoads and Gerking (2000), on the contrary, found evidence that shows a positive impact of having successful athletic programs on the levels of alumni giving as well as other sources of donation. They also found that this positive effect is relatively small compared to the effect of faculty and student quality on alumni contributions. Therefore, **z** depends directly on **E**, which represents the quality of student body, and the level of $\mathbf{A^L}$. Variables that influence **E**, namely the perceived learning $\mathbf{L_e}$ and the level of ancillary services **A**, can also influence **z** indirectly. From the findings on alumni giving patterns to universities, we would expect an increase in either **E** or $\mathbf{A^L}$ to result in an increase in **z** ($\partial\ \mathbf{z}/\partial\ \mathbf{E} > \mathbf{0}$ and $\partial\ \mathbf{z}/\partial\ \mathbf{A^L} > \mathbf{0}$). ii) $\mathbf{r(A^\$)}$ is the revenue obtained from operating ancillary services (dinning service, dormitory, sport games and art performance tickets, etc.) and $\partial\ \mathbf{r}/\partial\ \mathbf{A^\$} > \mathbf{0}$.

Total Cost $\mathbf{TC = c(x) + p(A)}$ where i) $\mathbf{c(x)}$ is a vector of the costs of the variables included in **x** (teacher salaries, lab and classroom facilities, etc.) and $\partial\ \mathbf{c}/\partial\ \mathbf{x} > \mathbf{0}$. ii)

p(A) is the cost of operating ancillary services. Both the non-revenue and revenue-generated ancillary services cost money to operate, so $\partial\, \mathbf{p}/\partial\, \mathbf{A^{\$}} > \mathbf{0}$ and $\partial\, \mathbf{p}/\partial\, \mathbf{A^{L}} > \mathbf{0}$.

Maximization Condition

Using (3) and (4), we obtain the following Lagrangian function:

$$\mathbf{g\,[\,E\,(L^{e},\,A^{\$},\,A^{L})\,;\,A^{\$}\,;\,A^{L}\,;\,x\,]} + \boldsymbol{\lambda}\mathbf{(z\,[\,E\,(L^{e},\,A^{\$},\,A^{L})\,,\,A^{L}\,]} + \mathbf{r(A^{\$})} - \mathbf{c(x)} - \mathbf{p(A^{\$},\,A^{L}))}$$

The first order condition[5] says:

$$\frac{g_E \frac{\partial E}{\partial A^L} + g_{A^L} + g_E \frac{\partial E}{\partial A^\$} + g_{A^\$}}{z_E \frac{\partial E}{\partial A^L} + z_{A^L} - \frac{\partial p}{\partial A^L} + z_E \frac{\partial E}{\partial A^\$} + \frac{\partial r}{\partial A^\$} - \frac{\partial p}{\partial A^\$}} = -\frac{g_x}{\frac{\partial c}{\partial x}}$$

The left hand side of the equation is the net marginal benefit of ancillary services on learning, both directly and indirectly through the enrollment of good students, per net dollar generated by operating ancillary services. The right hand side is the marginal benefit of all other input variables on learning for every dollar spent on these inputs. In order to maximize the learning output, higher education institutions will choose the level of ancillary services at which the marginal rate of substitution of ancillary services for other school inputs equals to the ratio of the net revenue/cost of ancillary services and the cost of the other inputs. Interpreted another way, operating ancillary services brings both benefits and costs – and universities need to choose an appropriate level of these services at which an additional unit of **A** would yield equal benefits and costs.

Discussion

As discussed earlier, with the increased competition in the higher education industry, universities seek to become more attractive by extending their ancillary service offers. These

[5] See Appendix I for a mathematical presentation.

services, ranging from a bookstore that looks like Barnes and Nobel[6] to students' individual closet specially designed to store ski boards[7], are often costly. At the same time, the number of private institutions (both two-year and four-year) has increased by 9% over the last decade[8], while funding from the government and private donors have not kept up with the growth of the higher education market.[9] As a result, in order to raise enough money to fund ancillary investments, universities have looked at more ways to increase their financial capabilities. One of the increasingly popular methods used by higher education institutions to finance is commercialization. In his book *University in the Market Place*, Bok listed the three major commercial avenues that higher education institutions have entered, including for-profit internet education, research patenting and entrepreneurship, and big-time intercollegiate sports. College athletics programs have become increasingly commercialized in the last three decades, and as schools compete for the best student-athletes, they end up compromising their admission standards to admit academically under-qualified students (Bok, 2003). Shulman and Bowen (2001) found that in recent years, athletes, male and female alike, have a greater chance of being admitted than non-athletes, as compared to how the chance played out forty years ago. They also found student athletes nowadays under-perform academically compared to non-athletes, which wasn't the case in past decades; moreover, athletes also performed worse in academics relative to

[6] Howard University's bookstore, a state-of-the-art facility that opened in 1999, initiated the trend of "superstores taking over campus bookstores," where campus stores are no longer just a place that sells textbooks. Universities are now willing to invest millions of dollars to build superstores that resemble Barnes and Nobel or Borders (Grant, Tracy. "Howard University Bookstore: The Future of the college bookstore." *Mosaic Literary Magazine*. Bronx: Jun 30, 2001., Iss. 10; pg. 20).

[7] At Sierra Nevada College, a small liberal arts located in the mountain range between Nevada and California, in one of the residence hall, each student get a closet specifically designed to store skis and snowboards – the nearest ski slope is 15 munites away. (Van Der Werf, Martin. **"**The End for a Private College - With Big Assets." *The Chronicle of Higher Education*. Washington: Sep 29, 2006.Vol.53, Iss. 6; pg. A.33)

[8] In the school year 1996-97, there was 2,307 degree-granting private higher education institutions. In the school year 2004-2005, this number went up to 2,516. (See table 1 in Appendix II)

[9] In the period of five years from 1999 to 2004, private donation has only increased by 5%. Additionally, in two subsequent school years 2001-02 and 2002-03, private donation actually declined. (See table 2 in Appendix II)

their intellectual ability. Consequently, the average level of student quality would decrease at institutions that are resorting to commercialization as a way to finance their expensive ancillary services, or in other words, **E** would decrease as universities increase their $\mathbf{A^{\$}}$ ($\mathbf{\partial E/\partial A^{\$} > 0}$).

Another way in which higher education institutions hope to finance their increasing costs is to rely on the goodwill of their former "customers." As noted earlier, gifts from alumni are expected to increase with an increase in either the enrollment of "good students" **E** or the level of $\mathbf{A^{L}}$. **E** also increases with respect to an increase in $\mathbf{A^{L}}$. As a result, universities would seek to increase ancillary services that, in theory, positively affect the learning outcome, in order to attract more funding from alumni and other charitable private donors.

Interestingly, as higher education institutions seek out ways to finance ancillary services in order to become more attractive and competitive, they find that increasing ancillary services also brings financial advantages. Nevertheless, in the process of deeper engagement in developing more ancillary services, universities also suffer from some negative impacts such an act could bring. First, increasing investments in ancillary services inevitably reallocates some of the resources that would have otherwise been invested in other school input variables (**x**). As **x** has positive impacts on the learning output, the reduced financial emphasis on **x**, which would decrease the level of **x**, would likely result in a decrease in the level of learning.

Secondly, the increased engagement of an institution in more revenue-generated ancillary services turns the "good students" away from the institution. Decreasing quality of the student body would lead to a decrease in the overall learning outcome. In addition, in the case of intercollegiate athletics programs, the emphasis on commercialization of these programs might also have direct negative impacts on learning, although this result remains controversial. (Pascarella & Smart, 1991; Hood et. al., 1992; Pascarella et. al., 1995; 1999; Aries et. al., 2004).

Despite the two negative impacts, the increased finances from commercialization and donation dollars can be subsequently used to invest in services that do actually increase learning, namely $\mathbf{x}$ and $\mathbf{A^L}$. The question becomes whether these increases in funding for $\mathbf{x}$ and $\mathbf{A^L}$, which ultimately raise the learning output $\mathbf{L}$, are large enough to offset the negative impacts that commercialization and resource allocation have on learning.

Limitations and Conclusions

The model developed in this paper is a fairly simple one that could be developed further to show a more realistic, and inevitably more complex, picture of the relationships among the involved variables. One of the intact variables is $\mathbf{L^e}$, the level of learning that students perceive an institution offers. The expected learning comes from information the students obtain from various sources such as current students, alumni and the ranking system. Among these factors, the ranking system is starting to play an increasingly important role, as universities become more and more engaged in the race for high rankings (Washburn 2005). In her book, Washburn points out that the efforts to quantify and compare higher education institutions create the incentives among universities to compete and commercialize. How accurate the ranking system, the degree to which students (customers) believe in the ranking, and the level at which universities value their positions with regards to others, if incorporated into the model, would help portray more accurately how universities make decisions with regards to their ancillary services.

Nevertheless, the model shows that higher education institutions should take into account both the benefits and the costs of operating ancillary services. While improvement of ancillary services would potentially make an institution more attractive and more competitive compared to other institutions, the increased emphasis in these services would also take away resources that would have been invested in other important inputs like teaching and research, especially in the

age of limited funding like nowadays. Additionally, over-investing in ancillary services, especially those that also generate revenues, can discourage the "good students" from enrolling in a particular university. Universities need to keep in mind that while an increase in ancillary services might have immediate positive impact on their image and reputation, in the long run, operating these services can become costly, both in terms of finance and academic.

The analysis of how resource allocation decisions within an institution can influence its primary outcome, i.e. learning, raises another question. Throughout the decades, scholars have observed that although expenditure per student has consistently been rising, learning does not seem to improve as much, if at all (Hanushek, 1997). For the last decade, with a 48% increase in total expenditures, private higher education institutions have increased spending on student services by 60.2 % and instructions by 51.7%. These are among the expenditures that have increased the most, while the least increase is seen in public services (15.8%), and net grant aid to students has actually decreased by 22.4 %.[10] Given that increased spending in student services and instructions has not resulted in higher intellectual development of students, this raises the question of whether universities are misallocating their resources.

Or it can be an entirely different question. Although in this model, universities are assumed to be maximizing the level of learning, some scholars have also asked whether learning, or intellectual development, continues to be a priority for higher education institutions (Sack, 2001). Student-athletes have began to place training and winning over academic achievements while educators have began to care more about research and publication than imparting knowledge. So the question might not be how much learning can we get, but do we really care about learning?

[10] See table 3 in Appendix II

Appendix I

Lagrangian:

$$[\, E(L^e, A^\$, A^L) ; A^\$; A^L ; x \,] + \lambda\,(z\,[\, E(L^e, A^\$, A^L), A^L \,] + r(A^\$) - c(x) - p(A^\$, A^L))$$

First-order conditions:

$$g_E \frac{\partial E}{\partial A^L} + g_{A^L} + \lambda z_E \frac{\partial E}{\partial A^L} + \lambda z_{A^L} - \lambda \frac{\partial p}{\partial A^L} = 0 \qquad \text{(i)}$$

$$g_E \frac{\partial E}{\partial A^\$} + g_{A^\$} + \lambda z_E \frac{\partial E}{\partial A^\$} + \lambda \frac{\partial r}{\partial A^\$} - \lambda \frac{\partial p}{\partial A^\$} = 0 \qquad \text{(ii)}$$

$$g_x - \lambda \frac{\partial c}{\partial x} = 0 \qquad \text{(iii)}$$

From (i) + (ii) we have (iv):

$$g_E \frac{\partial E}{\partial A^L} + g_{A^L} + g_E \frac{\partial E}{\partial A^\$} + g_{A^\$} + \lambda \left(z_E \frac{\partial E}{\partial A^L} + z_{A^L} - \frac{\partial p}{\partial A^L} + z_E \frac{\partial E}{\partial A^\$} + \frac{\partial r}{\partial A^\$} - \frac{\partial p}{\partial A^\$} \right) = 0$$

From (iii) and (iv) we have:

$$\lambda = - \frac{g_E \frac{\partial E}{\partial A^L} + g_{A^L} + g_E \frac{\partial E}{\partial A^\$} + g_{A^\$}}{z_E \frac{\partial E}{\partial A^L} + z_{A^L} - \frac{\partial p}{\partial A^L} + z_E \frac{\partial E}{\partial A^\$} + \frac{\partial r}{\partial A^\$} - \frac{\partial p}{\partial A^\$}} = \frac{g_x}{\frac{\partial c}{\partial x}}$$

Appendix II

Table 1

Number of higher education institution 1996-97 through 2004-05			
Year	*Total*	*Public*	*Private*
1996-97	4,009	1,702	2,307
1997-98	4,064	1,707	2,357
1998-99	4,048	1,681	2,367
1999-2000	4,084	1,682	2,402
2000-01	4,182	1,698	2,484
2001-02	4,197	1,713	2,484
2002-03	4,168	1,712	2,456
2003-04	4,236	1,720	2,516
2004-05	4,216	1,700	2,516
** Data taken from the National Center for Education Statistics*			

Table 2

Voluntary support for higher education					
Year	1999-2000	2000-01	2001-02	2002-03	2003-04
Total support	**$23,200**	**$24,200**	**$23,900**	**$23,600**	**$24,400**
Alumni	6,800	6,830	5,900	6,570	6,700
Nonalumni individuals	5,420	5,200	5,400	4,280	5,200
Corporations	4,150	4,350	4,370	4,250	4,400
Foundations	5,080	6,000	6,300	6,600	6,200
Religious organizations	370	370	360	360	350
Other	1,380	1,450	1,570	1,540	1,550
** Data taken from the National Center for Education Statistics*					

Table 3

Total Expenditure of private higher education insitutions 1996-97 through 2002-03						
Year	*Total expenditure*	*Instruction*	*Public Service*	*Student Services*	*Net grant aid to students*	*Others*
1996-97	$67,399,563	$21,126,357	$1,621,583	$4,430,241	$1,529,456	$38,691,927
1997-98	69,300,699	23,404,428	1,672,991	4,903,988	1,297,749	$38,021,542
1998-99	75,516,696	25,181,848	1,521,440	5,295,059	1,222,565	$42,295,784
1999-2000	80,613,037	26,012,599	1,446,958	5,688,499	1,180,882	$46,284,099
2000-01	85,625,016	27,607,324	1,473,292	6,117,195	1,176,160	$49,251,045
2001-02	92,192,297	29,689,041	1,665,884	6,573,185	1,188,690	$53,075,497
2002-03	99,757,733	32,062,218	1,878,380	7,096,223	1,187,285	$57,533,627
** Data taken from the National Center for Education Statistics*						

Reference

Anderson, Kristine. The Impact of Colleges and the Involvement of Male and Female Students. Sociology of Education. Vol. 63, No. 3. July 1988, 160-177.

Argys, Laura, Daniel Rees, & Dominic Brewer. Detracking America's schools: Equity and zero cost? *Journal of Policy Analysis and Management*, Vol. 15, No. 4. Fall 1996, 623-645.

Aries, Elizabeth, D. McCarthy, P. Salovey, M. Banaji. A Comparison of Athletes and Non-Athletes at Highly Selective Colleges: Academic Performance and Personal Development. *Research in Higher Education*, Vol. 45. Sept 2004, 577-602.

Aryes, Q. Whitfield & Ronald Bennett. University Characteristics and Student Achievement. *The Journal of Higher Education*, Vol. 54, No. 5. Sept-Oct 1983, 516-532.

Astin, Alexander. "What matters in college? Four critical years revisited." San Francisco: Jossey-Bass. 1993.

Beker, William. The Educational Process and Student Achievement Given Uncertainty in Measurement. *The American Economic Review*. Vol. 72, No. 1. Mar 1982, 229-236.

Bok, Derek. Universities in the Marketplace: The Commercialization of Higher Education. Princeton: Princeton Univ. Press, 2003.

Card, David & Alan Krueger. Does school quality matter? Returns to education and the characteristics of public schools in the United States. *Journal of Political Economy*, Vol. 100. 1992, 1-40.

Centra, John & Donald Rock. College Environments and Student Academic Achievement. *American Educational Research Journal*. Vol. 8, No. 4. Nov 1971, 623-634.

Chizmar, John F. & Thomas A. Zak. Modeling Multiple Outputs in Educational Production Functions. *The American Economic Review*. May 1983, 18-22.

Cunningham, Brendan & Carlena K. Cochi-Ficano. The Determinants of Donative Revenue Flows from Alumni of Higher Education: An Empirical Inquiry. *Journal of Human Resources*. Vol. 37, No. 3. Summer 2002, 540-569.

Goldhaber, Dan & Dominic Brewer. Why Don't Schools and Teachers Seem to Matter? Assessing the Impact of Unobservables on Educational Productivity. *The Journal of Human Resources*, Vol. 32, No. 3. Summer 1997, 505-523.

Hanushek, Eric. Teacher Characteristics and Gains in Student Achievement: Estimation Using Micro Data. *The American Economic Review*. Vol. 61. No. 2. May 1971, 280-288.

Hanushek, Eric. Conceptual and Empirical Issues in the Estimation of Educational Production Functions. *The Journal of Human Resources*, Vol. 14, No. 3. Summer 1979, 351-388.

Hanushek, Eric. Assessing the Effects of School Resources on Student Performance: An Update. *Educational Evaluation and Policy Analysis*, Vol. 19, No. 2. Summer 1997, 141-164.

Hanushek, Eric. Outcomes, Incentives, and Beliefs: Reflections on Analysis of the Economics of Schools. *Educational Evaluation and Policy Analysis*, Vol. 19, No. 4. Winter 1997, 301-308.

Hanushek, Eric. The failure of input-based schooling policies. *Economic Journal*, Vol. 113. Feb 2003, 64-98.

Harrison, Willian, Shannon Mitchell & Steven Peterson. Alumni Donations and Colleges' Development Expenditures: Does Spending Matter? *Journal of Economics and Sociology*. Vol. 54, No. 4. Oct 1995, 397-412.

Hood, A., Craig, A. & Ferguson, B. The impact of athletics, part-time employment, and other activities on academic achievement. *Journal of College Student Development*, Vol. 33. 1992, 447-453.

Jacob, Brian & Lars Lefgren. The Impact of Teacher Training on Achievement. *The Journal of Human Resources*, Vol. 39, No. 1. Winter2004, 50-79.

Jimenez, Juan & Manuel Salas-Velasco. Modeling Educational Choices. A Binomial Logit Model Applied to the Demand for Higher Education. *Higher Education*, Vol. 40, No. 3. Oct 2000, 293-311.

Kaplan, Richard. Intercollegiate Athletics and the Unrelated Business Income Tax. Columbia *Law Review*, Vol. 80. Nov 1980, 1430-1473.

Kealy, Mary & Mark Rockel. Student Perception of Quality: The Influence of College Recruitment Policies. *Journal of Higher Education*. Vol. 58, No. 6. 1987, 683-703.

Lacy, Williams. Interpersonal Relationships as Mediators of Structural Effects: College Student Socialization in a Traditional and Experimental University Environment. *Sociology of Education*, Vol. 51. 1978, 201-11.

Litten, Larry. Marketing Higher Education: Benefits and Risks for the American Academic System. *The Journal of Higher Education*, Vol. 51, No. 1. Jan-Feb 1980, 40-59.

Pascarella, Ernest. College Environmental Influences on Students' Educational Aspirations. Journal of Higher Education, Vol.55, No. 6. 1984(a), 751-771.

Pascarella, Ernest. Reassessing the Effects of Living On-campus Versus Commutting to College: A Causal Modeling Approach. *Review of Higher Education*, Vol. 7. 1984(b), 247-260.

Pascarella, Ernest & John Smart. Impact of intercollegiate athletic participation for African-American and Caucasian men: Some further evidence. *Journal of College Student Development*, Vol. 32. 1991, 123-130.

Pascarella, Ernest, Bohr, Nora, & Terenzini. Intercollegiate athletic participation and freshman-year cognitive outcomes. *Journal of Higher Education*, Vol. 66. 1995, 369-387.

Pascarella, Ernest; Rachel Truckenmiller; Amaury Nora; Patrick Terenzini, Marcia Edison & Linda Serra Hagedorn. Cognitive of Intercollegiate Athletic Participation: Some Further Evidence. *The Journal of Higher Education*, Vol. 70, No. 1. Jan – Feb 1999(a), 1-26.

Pascarella, Ernest; Marcia Edison; Amaury Nora; Patrick Terenzini; Linda Serra Hagedorn. Influences on Students' Openness to Diversity and Challenge in the First Year of College. *The Journal of Higher Education*, Vol. 67, No. 2. Mar-Apr 1996(b), 174-195.

Rhoads, Thomas & Shelby Gerking. Educational Contributions, Academic Quality, and Athletic Success. *Contemporary Economic Policy*. Vol. 18, No. 2. Apr 2000, 248-258.

Sack, Allen. "Big-time athletics vs. academic values: It's a rout." *The Chronicle of Higher Education*. Washington: Jan 26, 2001.Vol.47, Iss. 20; pg. B7.

Shulman , James & William G. Bowen. The Game of Life: College Sports and Educational Values. Princeton, NJ: Princeton Univ. Press, 2001.

Summers, Anita & Barbara Wolfe. Do schools make a difference? *The American Economic Review*, Vol. 67, No. 4. Sept 1977, 639-652.

Washburn , Jennifer. University, Inc.: The Corporate Corruption of Higher Education. New York: Basic Books, 2005.

Whitt, Elizabeth; Marcia Edison; Ernest Pascarella; Patrick Terenzini; Amaury Nora. Influences on Students' Openness to Diversity and Challenge in the Second and Third Years of College. *Journal of Higher Education*. Vol. 72, No. 2. Mar-Apr 2001, 172-204.

Wilson, Kathryn. The Determinants of Educational Atainment: Modeling and Estimating the Human Capital Model and Education Production Functions. *Southern Economic Journal*, Vol. 67, No. 3. Jan 2001, 518-551.

Zimmer, Ron & Eugenie Toma. Peer Effects in Private and Public Schools across Countries. *Journal of Policy Analysis and Management*, Vol. 19, No. 1. Winter 2000, 75-92.