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Sources of funds and quality effects in higher education

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Abstract

Economists have suggested that the quality of higher education is not independent of the sources of funds used to fund that education. This paper examines the relationship between student measures of teaching quality and institutional revenue sources. The results indicate that a greater reliance on private subsidies is associated with higher measures of teacher quality. A greater reliance on public subsidies, however, leads to lower teacher quality ratings. The importance of these results for shaping public policy decisions is also discussed. [JEL I22, L30, H42]

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“The endowments of schools and colleges have necessarily diminished more or less the necessity of application in the teachers. Their subsistence, so far as it arises from their salaries, is evidently derived from a fund altogether independent of their success and reputation in their particular professions.” (Adam Smith, *An Inquiry into the Causes and Consequences of the Wealth of Nations*, 1993 World Classics Edition, p. 421)

1. Introduction

More than two hundred years have passed since Adam Smith argued that the performance of institutions of higher education is influenced by the sources of their operating revenue. Economists and public policy-makers continue to debate the merits of private and public subsidies to higher education. However, there has been little research that examines the empirical relationship between the teaching performance of institutions of higher education and the sources of funds. This paper makes use of teaching quality ratings based on student surveys as a measure of performance.

While student satisfaction is only one of many possible measures of academic performance, it is still an important measurement of educational performance. Students purchase education for many reasons. Higher education can be thought of as both a pure consumption good and as an investment in human capital. Students expect to obtain satisfaction from the consumption of the good and/or higher future earnings as a result of the consumption of the good. It is important to measure both the consumer satisfaction and consumer investment returns from the consumption of the good. The data in this paper focus on student satisfaction and not investment returns. The results confirm that the source of educational funds is related to students' perception of educational quality in an important manner.

2. University performance, behavior and the source of funds

2.1 Tuition vs. private subsidies

Smith's observations were based on a comparison of the educational system of Scotland, where masters' incomes were highly dependent on the number of students they could attract, with that of England, where schools were supported primarily by large endowments. Smith believed the latter system destroyed both the incentives to teach well and to teach useful subjects.¹ A related argument is that private donations are used to produce attributes desired by donors but not by students.² In some cases private donors or foundations may require that universities conduct certain activities or make specific changes that reduce educational quality.

Modern arguments concerning educational funding have been more accepting of private subsidies as a substitute for tuition. A university's ability to use endowment funds to ignore market demands is reduced if the institution requires expansion or if educational costs are rising. The competition for new donations forces the school to compete on those margins that attract additional donations. If donations are related to teaching quality, then a greater reliance on private donations may increase teaching quality (Friedman and Friedman (1979)). If the increased spending is devoted to those attributes that improve educational quality, then it should also lead to improved performance.

2.2 Tuition vs. public subsidies

The modern version of Smith's argument against endowments has been refocused on the influence of public subsidies to higher education. Friedman and Friedman (1979),

Alchian (1968), and West (1995) argue that government funding has a negative effect on educational quality for reasons similar to Smith's opposition to private endowments. However, supporters of government subsidies to public education argue that the subsidies increase the quantity and quality of education provided. In addition to insulating faculty and administrators from the forces of the market, public subsidies may have effects on educational quality (e.g. Stubblebine (1965), Peltzman (1973), and Lindsay (1976)).

The ultimate impact of government funds is dependent on the political environment in which they are determined. State government funds for higher education come primarily through direct appropriations to state institutions. The subsidy allows these institutions to set tuition levels below the average cost of providing the education. In order to satisfy the preferences of the median voter, state legislators have an incentive to make education available to as many of their constituents as possible.³ While the subsidies may successfully increase educational access, they are likely to decrease the average quality of education. Local government funding is predicted to have similar effects because the nature of the funding and the incentives of local politicians are similar. It is important to note that a decrease in teaching quality does not mean that these subsidies do not achieve their purpose. Public subsidies may also increase the quality of education on other margins even if they result in lower teaching quality.

Federal government funds to higher education are normally in the form of grants from government agencies and not direct federal appropriations. Therefore, the pressures to increase the number of students and provide the education desired by the median voter are likely to be less intense. However, an increased reliance on federal funds will reduce the reliance of student based revenue sources. The most common criticism of federal

funding is that teaching quality is lowered as the increased research activity diverts attention away from undergraduate teaching (e.g. Anderson (1992)). An alternative argument in favor of increased federal funding for research is that teaching and research activities are complements. If less than the optimal level of research would take place in the absence of such subsidies, then subsidizing research may increase teaching quality. Again, even if these subsidies decrease teaching quality, they may promote other valuable social goals or increase educational quality on other margins.

There are three potential effects of private and public subsidies to higher education. The subsidies will likely increase the total resources devoted to education, which may improve teaching quality. However, if these subsidies allow administrators and teachers to be less responsive to student desires, then the quality of teaching may decrease as a result of higher subsidies. Finally, if these subsidies are designed to satisfy the goals of private donors or politicians and not educational goals, then there is no reason to expect them to improve teaching quality. In fact, these alternative goals may not be consistent with increased teaching quality.

3. The data

The Princeton Review produces an annual *Student Advantage Guide to the Best 310 Colleges* that rates colleges on many attributes. Two of the ratings given for each college are “profs interesting” and “profs accessible.” These ratings are based on the average student response to the questions, “In general how good are your instructors as teachers?” and “In general, how accessible are your instructors outside the classroom?”. The numerical rating reported in the *Student Advantage Guide* is a number assigned to

each institution by the *Princeton Review* staff based on student responses to a multiple response on-campus survey.⁴ Each school is given a score between 0 and 100 with the scores representing the traditional academic grades (90-100 A, 80-89 B, etc.). The measure is based upon but is not the actual student responses. Surveys were initially conducted annually at each institution. However, the high degree of correlation between annual responses led the *Princeton Review* to survey each campus at least once during the three years preceding the publication of the survey. Table 1 presents the summary statistics for the two teaching quality variables. Both variables range from 60 to the upper 90s with a mean of 80.

Insert Table 1 About Here

Admittedly, the measure of teaching quality used here concerns the current students' satisfaction with narrowly defined aspects of teaching. However, these measures allow us to focus on attributes of education — classroom teaching skills and the level of student and faculty interaction — that are valued by students but may not be associated with standardized test scores or future earnings. While this aspect of teaching quality is more consistent with Smith's discussion, the results should be considered in conjunction with other analysis that considers alternative measures of academic success. That the teaching quality data is only available for a non-random subset of all colleges and universities also limits the generalization of this analysis.⁵ However, a sample composed of those institutions where teaching is thought to be more highly valued seems appropriate in this case.

The 1997 edition of the *Student Advantage Guide* reports data from the previous academic year (1995-1996) for 310 colleges determined by *The Princeton Review* to be the best based on teaching quality and other attributes. In addition to the survey data, the student-faculty ratios for each school were obtained from the *Student Advantage Guide*. The average institution in the sample had 13.34 students per faculty member.

The *U. S. Department of Education* conducts an annual survey of sources and uses of funds for institutions of higher education within the Integrated Postsecondary Education Data System (IPEDs). All of the financial data (revenues, expenditures, and tuition) were taken from this source. Complete and reliable financial data were available for the 1994-1995 academic year for 299 colleges that were included in the teaching survey.⁶ Table 1 provides information on the average tuition per student, teaching expenditures per student and the sources of funds. On average, tuition is the most important source of revenues for the schools in the sample. The second most important source, auxiliary enterprises, is also a student revenue source (dorms, food service, bookstores, etc.).

IPEDs contains revenues and expenditures by institutional total. The sample contains a variety of types of institutions. For example some of the institutions operate large-scale graduate programs while other institutions focus on undergraduate education. In an attempt to ensure that these differences are not captured by other variables, institutional type is specifically controlled for in the analysis. The sample is broken into four types based on the highest level and types of degrees offered: doctoral degree granting institutions, masters degree granting institutions, liberal arts colleges, and specialty schools (arts, music, engineering, etc.). These classifications are based on

Carnegie Classifications that were obtained from IPEDs.⁷ Table 1 indicates that 44.1% of the institutions grant doctoral degrees, 38.8% are liberal arts colleges, 12.4% offer a master's degree as the highest level of offering, and 4.7% are specialty schools.

4. The model and results

In order to test the relationship between educational quality and the non-tuition sources of funds, the 'profs interesting' and 'profs accessible' variables are regressed on the sources of funds variables, dummy variables for institution type, and the institution's age. The percentage of total dollar revenues from tuition is omitted from the model to avoid the problem of linear dependence among the financing variables.

The results presented in Table 2 indicate that a greater reliance on private sources of income and endowment income have a positive impact on the teaching quality variables. A greater reliance on endowment income is associated with increased teaching quality. A one per-cent increase in the ratio of endowment income to tuition revenues increases the teaching ratings by 17 and 19 points. Other private sources of income have a similar effect but it is only significant for the 'profs interesting' rating. The inability to separate private donations from private contracts may obscure the full effects of private giving.

Insert Table 2 About Here

A greater reliance on state and federal government funding is negatively and significantly related to the teaching quality variables.⁸ The coefficient estimates indicate

that a similar increase in the ratio of federal government funding has a larger negative influence than an increase in the ratio of state government funds. However, given the greater average reliance on state government funds and larger variation in this reliance across the institutions in the sample, the degree of reliance on state government funds is responsible for a much larger share of the actual variation in teaching quality ranks across institutions.

The percentage of funds that come from auxiliary enterprises and other revenue sources have a positive and significant effect on teaching quality. The effects are significant for the accessibility measure. The auxiliary revenue sources come primarily from the students. Hence, schools that rely more heavily on funds from student housing, bookstores, campus dining and related student services are more sensitive to meeting student demands. Other revenues come from many sources so their influence is more difficult to interpret. Hospital revenues are negatively related to teaching quality but the effect is not significant.

Liberal arts colleges claim to devote greater attention to teaching undergraduate students. The results suggest that this is true; a liberal arts college is expected to have ratings that are five to six points higher than non-liberal arts colleges. Specialty schools have lower teaching ratings on average but the effect is only significant for the 'profs accessible' variable. Institutions offering doctoral degrees have significantly lower teaching ratings. The presence of a doctoral program may signal a greater ability of faculty members to substitute research and consulting activities for undergraduate teaching. Classes at these institutions may be taught by less experienced graduate students instead of regular faculty members. There may also be other characteristics of

these institutions not directly related to graduate students that are responsible for the lower ratings. The age variable is not significant suggesting that age has little effect in conjunction with the other independent variables.

One potential problem with using students' perceptions to measure quality is that the students' ratings may be based on their expectations. Students at less prestigious institutions may have lower expectations concerning teaching quality. In order to control for this problem, the average tuition per student is added as an explanatory variable. The average tuition paid by students is positively and significantly related to performance. With the exception of the state government financing variable, the financing variables that were significant in the original specification are still significant and exhibit similar effects. There is a collinearity problem with tuition and state government revenues that may explain the lack of significance as tuition is significantly lower at state supported institutions.

An alternative explanation for these results is that they are not measuring the effects of financing but the total expenditures of the institution. In order to check the robustness of these results, the student-faculty ratio and teaching expenditures per student variables are included in the model as independent variables⁹. The student-faculty ratio is negative and significant in for both teaching quality measures while teaching expenditures are positively and significantly related to performance. This suggests that student satisfaction with teaching quality is related to student-faculty ratios. The results for the public subsidy variables are the same with the additional controls. However, the private giving variable is no longer significant in "profs accessible" model and the endowment income variable is no longer significant in the "profs interesting" model.

To the extent that the estimates for the other expenditure variables differ, it is possible that the expenditure variable and the student faculty ratio may also be influenced by the sources of funds. For example, if higher endowment income results in lower student-faculty ratios and higher teaching expenditures per student, then this procedure may obscure the full effects of endowment income. In any case, the primary results concerning the effects of educational financing are not driven by differences in resources. The results for the specification including average tuition are similar except that the teaching expenditures variable is no longer significant. This is not surprising in that higher tuition is generally associated with higher teaching expenditures.

5. Conclusions

As suggested by Smith, the results presented in this paper do find a relationship between revenue sources and teaching quality. However, a greater reliance on private funding and endowment income does not lead to lower teaching quality ratings as predicted. The results suggest private subsidies allow schools to be more selective and to devote more resources to individual students. Recent studies of higher education (McPherson, Schapiro and Winston (1993), Clotfelter (1996)) indicate that many elite institutions have attempted to do exactly this in recent years. These results suggest that such efforts increase teaching quality as predicted by Friedman and Friedman (1979).

Increased reliance on either state or federal government funding is associated with teaching quality. Consistent with the predictions of Stubblebine (1964) and Lindsay (1976), educational policy outcomes decided in the political market place are not likely to achieve the outcomes desired by the ultimate consumers of the subsidized good. In

addition, by reducing the correlation between an institution's ultimate success and the satisfaction of the students, the government may allow the institution to pay less attention to student demands. However, these results should be interpreted with some caution. An increased reliance on either state or federal funding may be related to other institutional characteristics not controlled for in the analysis. These characteristics, and not the sources of funding, may be the primary influences driving student satisfaction.

The public policy implications of these results are dependent on the purpose of educational subsidies. If the goal of government policy is to increase the quality of education, then alternative policies may be needed. However, if increasing access to education or enhancing basic research is the primary goal of public subsidies, then alternative programs may not be necessary. However, student perceptions of teaching quality are significantly impacted by the source of educational funds.

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Table 1

Summary statistics

	Mean	Standard deviation	Minimum	Maximum
Institutional characteristics				
'profs interesting'	79.74	12.09	60.00	99.00
'profs accessible'	79.78	12.05	60.00	98.00
Student-faculty ratio	13.34	3.73	6.00	27.00
Age	132.27	49.49	27.00	360.00
Teaching expenditures	\$7,753	\$5,259	\$1,765	\$47,677
Tuition	\$11,297	\$5,709	\$692	\$26,453
Institution type				
Liberal arts college	0.388	0.488	0.000	1.000
Doctoral institution	0.441	0.497	0.000	1.000
Master's institution	0.124	0.330	0.000	1.000
Specialty institutions	0.047	0.212	0.000	1.000
Sources of funds (as a % of all revenues)				
Tuition	44.3%	20.5%	2.4%	80.2%
Endowment income	6.0%	7.9%	0.0%	69.2%
Private giving	7.4%	5.4%	0.0%	40.0%
Federal grants	8.2%	7.0%	1.0%	35.4%
Federal appropriations	0.3%	1.7%	0.0%	27.6%
State grants	1.6%	1.7%	0.0%	9.2%
State appropriations	9.3%	15.8%	0.0%	56.2%
Local grants	0.2%	0.7%	0.0%	5.8%
Local appropriations	0.0%	0.4%	0.0%	6.3%
Auxiliary enterprises	13.9%	6.1%	0.0%	42.9%
Independent operations	0.9%	6.1%	0.0%	79.7%
Hospital revenues	3.3%	10.8%	0.0%	65.6%
Sales & services	1.6%	3.9%	0.0%	35.9%
Other sources	2.9%	3.2%	0.0%	41.0%

Table 2

The relationship between teaching quality and the source of educational funds

[illegible]

Notes to Table 2: The financing variables are measured as a percentage of all institutional revenues. The state, federal and local government variables represent the total of appropriations, grants and contracts from that source. The government variables also include financial aid expenditures from these sources. Eliminating financial aid expenditures from the total does not alter the important results.

Notes

¹ Smith's view was not universal among the classical economists. See West (1964) for further discussion.

² See Lindsay (1976) and the discussion later in this paper for a similar argument with regard to public subsidies.

³ In related works Sisk (1981) and Sav (1987) find that state supported schools are more successful at enrolling but not graduating minority students. Lower graduation rates are a more likely outcome than lower graduation standards because the faculty retains control over graduation standards and they have little incentive to reduce the standards.

⁴ See *The Student Advantage Guide to The 310 Best Colleges* (1997) for more details concerning the survey. The *Princeton Review* claims that the survey is conducted randomly. However, they also admit to advertising that they will be on campus, which suggests that they may not receive an unbiased group of respondents. It is not obvious whether or not this process creates an upward or downward bias in response. However, as long as the process is consistent across institutions there is no reason to expect a bias across institutions.

⁵ There are several different organizations that rate colleges and universities using various criteria. However, they usually either do not rate all colleges and universities or rate different groups using different criteria. One exception is the *Gourman Report*, which provides a single numerical rating for over 1200 undergraduate colleges and universities. While the rating is directly comparable across colleges and universities, it is not useful for our purposes because the ratings are based in part on the sources of the college's financing. The same is also true of less inclusive ratings.

⁶ Financial data was actually available for 302 institutions but the U.S. Naval Academy and U.S. Military Institute were eliminated from the sample because the requirement to serve in the military upon graduation implies an implicit tuition cost that is difficult to calculate. Deep Springs College was also eliminated because all students are required to work instead of paying tuition and because it offers only a two-year non-degree program. Of the remaining eight schools for which IPEDs data is not available, two are Canadian Universities, two are colleges within larger universities, and four are specialty art or music schools. IPEDs financial data was not available for the 1995-96 academic year when this research was initiated. All estimates in the paper have also been produced using the 1992-1993 and 1993-94 financial data instead of the 1994-1995 data. The results are similar suggesting that having the data from 1995-1996 IPEDs would not significantly alter the results. In addition, given that each school is surveyed once in a three-year period, the 1994-1995 financial data is actually in the middle of the sample period.

⁷ Doctoral granting institutions include Carnegie classifications 11 (Research Universities I), 12 (Research Universities II), 13 (Doctoral Universities I), 14 (Doctoral Universities II). Master's universities include Carnegie classifications 21 (Master's I) and 22 (Master's II). Liberal arts colleges include Carnegie classifications 31 (Baccalaureate I) and 32 (Baccalaureate II). The specialty institutions include schools of art, music, and design (Carnegie Classification 56), schools of business and management (Carnegie Classification 55), and schools of engineering and technology (Carnegie Classification 54). Specialty schools may offer advanced degrees.

⁸ The local, federal, and state expenditures variable includes funds for student financial aid. The results are very similar if the aid component is excluded.

⁹ Using total expenditures per student instead of teaching expenditures per student produces similar results.