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ABSTRACT

This paper estimates the effect of a $150 fee increase for the spring semester 1993 on within-year persistence at a large urban institution of higher education, the University of New Orleans (Louisiana). Institutional enrollment projections are estimated using price response measures for three populations (undergraduates 22 years of age and under, undergraduates over 22 years, and graduate students) derived from the 1987 National Postsecondary Student Aid Study. The paper tests whether knowledge of student price response characteristics from national measures can predict specific price response behaviors. From the national data, it was predicted that 77 percent of traditional age undergraduates, 75 percent of nontraditional age undergraduates, and 67 percent of graduate students would persist. At the University of New Orleans, traditional undergraduate persistence rate was 80 percent, nontraditional undergraduate persistence rate was 73 percent, and graduate persistence was 66.6 percent. Results demonstrate that student price response measures can be universally applied to various classes of higher education institutions, and that within-year price response trends for all three populations are consistent with national price response trends. (Contains 27 references.) (JDD)

Estimating the Enrollment Effects of a Mid-year Surcharge: Using National Price Response Measures in Institutional Planning.*

By

Mary Louise Trammell

Presented at Association for Institutional Research Annual meeting, May, 1994.

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Jean Endo
Editor
Forum Publications

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Introduction

The concept of student price response seems very applicable to enrollment planning in higher education (Hearn and Longanecker, 1985; Jackson and Weathersby, 1975; Leslie and Brinkman, 1988). However, applications of price response measures to enrollment projection have been criticized because the are inaccurate (Dresch, 1975; Hansen, 1983). Recent research, however, suggests that price response measures can be used to predict enrollment changes attributable to tuition and student aid, especially if the measures are current and are based on research that represents the characteristics of the population being studied.

The paper estimates the effect of a $150 fee increase for the spring semester 1993 on within-year persistence at a large urban institution. Since the institution did not make adjustments to aid packages, this analysis specifically examines how tuition increases influence enrollment changes. The populations examined are 1) undergraduates 22 years of age and under, 2) undergraduates over 22 years of age, and 3) graduate students. Institutional enrollment projections are estimated using price response measures for these populations derived from the 1987 National Postsecondary Student Aid Study (NPSAS-87) (Andrieu, and St. John, 1993; St. John, 1992; St. John, Andrieu, Oescher, and Starkey, 1994; St. John, Oescher, and Andrieu, 1992; St. John and Starkey, forthcoming). Thus, the paper in effect tests whether knowledge of student price response characteristics

from national measures can predict specific price response behaviors. Further, the estimations for Spring 1993 presented in the paper were actually developed in the Fall of 1992, as a graduate course assignment. Thus, the paper also illustrates that timely analysis of the effect of price change is possible.

BACKGROUND

Public higher education institutions are charged with preparation of a technologically educated workforce and the economic future of the state (St. John, 1990; Paulsen, paper, AERA Annual meeting, 1994). Thus, in theory at least, states and institutions should be sensitive to attrition rates because each student who leaves and does not return represents a loss of state investment in human capital and, more especially, institutional revenues. In an institution, with most of its students coming from the immediate area, the graduation rate has implications for the economic future of its immediate geographical area, and therefore, future enrollment stability. A high rate of attrition reflects poorly on the institution's ability to meet the educational and societal needs of its community.

In a period of eroding state support, attrition is perhaps a more serious problem, as 1) states with declining economies will find it difficult to develop external resources to replace tuition revenues (Hines, 1988), and 2) low graduation rates may effect funding decisions by the legislature. The 19% graduation rate of the subject university (the University of New Orleans) is the lowest among the five campuses of the Louisiana State University System. In 1991, UNO's appropriation

per full-time (fte) student ranked third lowest in the state Doctoral III category at $2,565 per fte student. UNO is the only Doctoral III institution in the LSU System.[1] To develop a method for assessing the effect of within-year price changes on attrition, it is necessary to review trends in research on persistence and on state support for higher education, as well as to consider background issues.

Persistence Research

Studies of persistence published in the 1980s considered the importance of institutional fit and academic integration, as emphasized by Tinto (1987), or the broader panoply of social and psychological influences outside the institution, as presented by Bean (Cabrera, Castaneda, Nora, and Hengstler, 1992). Tierney (1992) argues that with the growing ethnic diversity among student populations, a clash between institutional and individual cultural norms may contribute to the student's leave-taking. Neither Tinto (1987) nor Pascarella and Terenzini (1991), in their comprehensive study of college student life, concluded that receipt of financial assistance to be significantly influential on persistence.[2] Tuition pricing and receipt of financial aid, as influences on persistence, have not received serious

[1]Other Doctoral III institutions in Louisiana are in the Louisiana Board of Trustees System: Louisiana Tech, Grambling State University, Northwestern Louisiana University, and Northeastern Louisiana University (Toups, 1991).

[2]Tinto noted that receipt of financial aid may be influential in attainment; Pascarella and Terenzini (1991), after a review of the literature, concluded that "general financial aid has no statistically significant net effects on persistence and degree attainment". However, they agree that financial aid may be influential in helping students to persist at a rate equal to that of non-recipient students (p. 406).

analysis until recently.

The first national study of price response in enrollment decisions used data from the high school class of 1982 to examine year-to-year persistence (St. John, 1990). It concluded that the amount of tuition and aid have an impact on persistence. More recent studies, using the NPSAS-87 data base, have found that tuition charges and the amount of financial aid awarded have an influence on persistence (St. John, 1992a, 1992b; St. John, Oescher, Andrieu, 1992; St. John, Andrieu, Oescher, and Starkey, 1994). St. John, Oescher and Andrieu (1992) contend that within-year persistence may be more problematical for some students than year-to-year persistence, as some students may have only enough discretionary funds to attend for one semester per year. Other students may be unable to cope with unexpected fee increases that cannot be tolerated with limited resources. Models developed by Andrieu and St. John consider socio-economic variables such as ethnicity, sex, college characteristics, college attainment, family background, college characteristics, college attainment, other work, aspirations, and income group. The authors consider influences noted in earlier research by Terkla and Jackson (Andrieu, 1991), taking an integrative, comprehensive approach to the student choice question.

Institutions which rely heavily on tuition revenues for operating expenditures should be particularly sensitive to factors influencing student attrition. The university under consideration is an example of such an institution.

State Support of Higher Education

Louisiana has been dependent on oil and gas extraction and production revenues since the 1930s. The downturn of the oil and gas industry in the 1980s forced a major decline in the state economy. In the face of decreasing state tax revenues, which began in 1982, the legislature has cut appropriations to all higher education institutions. Louisiana spends less per fte than any of the fifteen states within the Southern Region Education Board jurisdiction and only 62% of the SREB average.[3] Regarding the study institution, state funding has been cut from 71% of its operating budget in 1980-81 to approximately 48% in 1992-93.[4] Furthermore, UNO's state funding ranked third lowest among Doctoral III institutions in the state at 59.1% of the SREB average (Toups, 1991).

State financing for higher education in Louisiana is among the lowest in the nation. Most public higher education institutions in the US have experienced erosion of state support in the 1980s and 1990s. Public support of colleges and universities began its downturn in the early 1980s when the conservative Republican administration shifted responsibility for higher education from the federal government to the states. This movement came at a time cost of attendance

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[3]SREB states include Alabama, Arkansas, Florida, Georgia Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

[4]Moore, Lonnie (1989). Exhibit IV-A, page 13.
Sixty-three percent of the state budget is constitutionally protected from cuts; therefore the unprotected areas with the largest budgets, higher education and health services, are vulnerable to absorbing most of the deficit.

was rising faster than inflation due to escalation of competitive faculty salaries, expense of developing research technologies, and increasing costs of administration and management (Hines, 1988).

Lobbying by special interests groups had become effective at the national level, but higher education advocacy groups, at the state level, are disorganized and institution based. The downside of decentralization has been that state institutions have to compete with one another for limited resources. At the same time federal agencies have cut support for research, facilities, and student financial aid. Additionally, public skepticism over rising costs and fiscal accountability has influenced legislatures to treat public institutions as a regulated industry. Political decisions about where to invest tax revenues have forced institutions to raise tuition to meet costs (Hines, 1988).

In the 1990s the rising costs of education will continue to be problematical for students and families as the average annual cost of public universities increased by 4.5% from 1990-91 to 1991-92, yet the median family income decreased by 2% (College Board, 1992). Trends in decreasing state support will continue. Of all four-year public institutions, 61% had a mid-year cut in 1991-92; 66% expect budget cuts in 1992-93; and 81% expect to increase tuition and fees. For the long-term outlook, 59% are planning for an increased reliance on tuition revenues for operating budgets (El-Khawas, 1992).

Institutional Background

Planned as a "low tuition" campus in the state university system, the subject institution is the only public four-year university in a metropolitan area of about 1,236,000 people. Over 95% of the 16,000 students commute to campus. About 12,000 are undergraduates, and 4,000 are graduate students. The university has raised tuition over 130% in current dollars from 1980 to 1990 while state appropriations have declined by 27% (Toups, 1991).

Tuition has increased yearly, with the largest increases occurring in 1986-87 (24%); 1987-88 (24%) and 1989-90 (21%) (Moore, 1989). In 1990, the university's fte tuition and fees, $1,886, were about 14% above the SREB median. Revenues from tuition now represents about 48% of the operating budget (Toups, 1991). Clearly the burden of educational cost has shifted from the taxpayer to the consumer (Hearn and Longanecker, 1985; St. John, in press).

ANALYSIS

This paper develops an institutional model for assessing the impact of a mid-year fee surcharge on persistence and confirms assumptions that student price response measures can be universally applied to various classes of higher education institutions (St. John, 1992b). The analysis demonstrates that within-year price response trends for traditional undergraduate, non-traditional undergraduate and graduate populations at the study institution are consistent with national price response trends (Andrieu and St. John, 1993; St. John, 1992; St. John, Andrieu, Oescher, and Starkey, 1994; St. John, Oescher and Andrieu, 1992).

A 7% reduction in state funding in Fall, 1992, prompted a $150 mid-year fee surcharge. The state's action and the institution's pricing decision served to exacerbate the continuing controversy over rising college costs. Student response to the surcharge reversed an average trend of gradual increases in the mid-year persistence rate for both undergraduate and graduate populations.

A four step process was used to estimate the effects of the price increase. First, recent studies were reviewed to develop a set of price response measures. Second, the measures were adapted to develop price response measures appropriate to the context. Third, a base estimate was developed, based on historical enrollment rates. Finally spring enrollments were estimated. All of these steps were completed during the fall semester in a paper for graduate course. Thus, this method could be used by institutions facing similar situations.

Analysis of Within-Year Tuition Increase

The proposed research model has adapted statistics from national student price response data to predict and assess the effects of a $150 within-year tuition increase on 1) undergraduates 22 years and under, 2) undergraduates over 22 year and 3) graduate students.

Several recent student price response studies using sequential logistical models have yielded more reliable results (higher pseudo R^2 and lower -2 L) than previous models. Logistical models designed with dichotomous variables have been used in a number of recent studies to assess the effects of tuition cost and

various forms of financial aid and aid packages on the decision to persist year-to-year and within-year. These studies have revealed that both populations are negatively responsive to within-year tuition increases, refuting earlier findings of negative response to increases occurring at the beginning of the academic year, but not within-year (Andrieu, 1991; St. John, Oescher and Andrieu, 1992; Somers, 1992).[5] The present study uses changes in probability measures (delta-p statistics), derived from the NPSAS-87 survey, to predict institutional enrollment for the spring of 1993.

From the NPSAS-87 sample, it was found when tuition is considered, the baseline probability that the average traditional undergraduate will leave at mid-year was 6%; for every $1000 in tuition differential, the probability increased by an additional 4.94% (St. John, Oescher, and Andrieu, 1992).[6] Non-traditional undergraduates are significantly more price sensitive. When tuition is not controlled for, fourteen percent of non-traditional undergraduates are likely to withdraw at mid-year; when tuition differential is $1000, an additional 10.3% are likely to leave (St. John and Starkey, in preparation).

Andrieu and St. John (1993) found that for the average graduate student, the baseline probability for mid-year departure is 3.6% For every $1000 in tuition

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[5]In 1992, Andrieu added tuition to a model created for The Influence of Background, Graduate Experience, Aspirations, Expected Earnings, and Financial Commitment on Within-year Persistence of Students Enrolled in Graduate Programs. Doctoral dissertation, University of New Orleans, 1991.

[6]Calculations for the NPSAS-87 survey are based on $1000 increases.

differential, the probability increases an additional 2.34%.

The Local Adapted Model

For each of the three student populations, delta-p statistics for base enrollments are adjusted for inflation (x 0.8085) and multiplied by 3 (to simulate elasticity) to reach an estimated normal attrition[7]. To adjust the estimated effect of $150 increase to national models (based on $1000), the number is multiplied by .15 (Table 1).

The average annual persistence rate increase for all undergraduates since 1989-90 is 1.67%; therefore, the estimated normal persistence rate would likely be 78.8%[8] Of the 6,285 traditional age undergraduates, 4,952 are likely to persist with no tuition increase. Of the 6,030 non-traditional age undergraduates, 4,752 would normally persist. Normal persistence rate for the graduate population would be 67.9%, or 2,711, representing an average three-year increase of .0833%.

Ten-Year enrollment history at the study institution.[9]

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[7]Elasticity simulation assumes that one-third of the potential higher education population actually attend.

[8]Undergraduate enrollment and persistence information for the ten-year period, 1982-83 to 1991-92, is not available for age groups, traditional and non-traditional.

[9]Source: Office of Institutional Research at subject university. Institutional data does not provide a breakdown by undergraduate age category (less than or greater than 22 years) for each of the ten years, therefore the fluctuations in enrollment and persistence for each subgroup cannot be determined.

An examination of normal fall to spring attrition for 1982-83 to 1992-93 (Table 2) shows a 5% decrease in undergraduate enrollment in 1986-87 when tuition increased by 24% (from $492 to $612). Enrollment remained steady the following year when tuition increased another 24% to $762. Undergraduate enrollment fell 4.4% in 1989-90 with a 21% tuition increase (from $776 to $943). However, in the fall of 1989, the university also imposed minimum academic standards for freshman class admission. Therefore, the effect of tuition increase alone cannot be determined.

Since 1989-90, undergraduate enrollments have remained relatively steady, with changes ranging from 1% to 2.4%. In looking at persistence, the percentage of undergraduates remaining for the spring semester has ceased fluctuation since 1989-90 and has increased on the average of 1.67% per year since entrance standards were imposed. There has been an overall persistence improvement of 8.3% in the ten year period.

Enrollment and persistence patterns for graduate students differ from those of undergraduates. In spite of tuition increases, graduate enrollments have steadily increased; 1992 enrollment is 58.6% greater than in 1982, from 2,518 to 3,993. Discounting the outlying 80.6% persistence in 1985-86, persistence rates have fluctuated from a high of 67.3% to 62.8%.

Expected attrition with a $150 mid-year tuition increase.

With the $150 mid-year tuition increase, if students follow patterns

predicted from national data, 77% or 4,839 traditional age undergraduates will persist; and 75.1% or 4,522 non-traditional age undergraduates will re-enroll in the spring. Among the graduate population, 67.05% or 2,677 will continue (Table 3).

Non-traditional age undergraduates are about twice as likely as those of traditional age to be influenced by a tuition increase. (-0.0374 versus -0.0180) (Table 1). Therefore, one may assume that the additional cost of tuition may not be worth the foregone earnings for this category. The implicit costs of education to this group are higher than to younger undergraduates (Leslie and Brinkman, 1988). Older undergraduates may have higher current earning potential and more financial obligations and do not consider the bachelor's degree as important to future earnings as do their younger colleagues.

Actual attrition with $150 tuition increase.

In the Spring, 1993 semester, traditional undergraduate persistence rate was 80.3 percentage points, which is 3.3 percentage points above 77 percentage points, the expected persistance rate. The persistence rate for all undergraduates declined by .3 percentage points, which reverses a three-year trend of average yearly increases of .0167 percentage points. Graduate persistence was 66.6 percentage points, or .45 of a percentage point below the expected rate. The percentage rate for graduate students declined by .50 of a percentage point which also reverses a small (.80 of a percentage point) three-year average increase.

Actual Developments

The actual total persistence rate was 74.3%, only 0.500 percentage points above the predicted rate of 73.8%, but 1.80 percentage points below 76.1%, the projected rate had the surcharge not been imposed (Table 3). The actual persistence rate for traditional undergraduates was 3.3 percentage points greater than predicted. For nontraditional undergraduates, the actual persistence rate, however, was 2.00 percentage points less than the predicted rate. The institutional measures for the two undergraduate populations is consistent with national measures which indicates that nontraditional undergraduates are more price sensitive than traditional age undergraduates. A high correlation between predicted (.6705) and actual (.6664) persistence rate for the graduate population further confirms the efficacy of applying national measures to institutional data. (Table 3).

Conclusion

Higher education institutions in the US have been experiencing a prolonged period of financial uncertainty since the early 1980s. In spite of the development of sophisticated models for the analysis and prediction of student choice behavior, few public institutions have used the available data for fiscal planning or enrollment management. Private institutions have done a better job of remaining competitive by instituting targeted student subsidies for disadvantaged students (St. John, 1991).

Three conclusions may be drawn from this study. Undergraduate and graduate student populations are negatively influenced by fee increases, especially when these are not offset by increases in student financial aid. Populations are effected differentially, with nontraditional undergraduates being more sensitive to fee increases than traditional age undergraduates.

Most importantly, this study found that price response measures developed from national student price response studies accurately predicted the effects of prices change. Thus indicating that national studies are useful in examining institutional data and in formulating enrollment management strategies. Enrollment managers have an important role to play in interpreting institutional data to create strategic plans for maximizing enrollments. In the face of continuing erosion of state support and increasing costs, public universities need to examine the effect of both year-to-year and within-year fee increases on total enrollment. Should fall enrollments and spring persistence rates continue to erode, some consideration should be given to making additional student financial aid available to encourage an increase in total enrollment to reverse the trend of declining tuition revenues.

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TABLE 1

Estimating effect of $150 fee surcharge on attrition in traditional undergraduate, non-traditional undergraduate and graduate students (based in national measures)

	Delta P Statistics (x8085,CPI)	Inflation Adjusted Cashflow Elasticities (x 3)	Conversion to Elasticity (x .15)	Adjusted to $150 Increase
Traditional Undergraduate[1]	-(0.0494)	-(0.0399)	-(0.1198)	-(0.0180)
Non-traditional Undergradute[2]	-(0.1027)	-(0.0830)	-(0.2490)	-(0.0374)
Graduate[3]	-(0.0234)	-(0.0189)	-(0.0567)	-(0.0085)

[1]St. John, Oescher, and Andrieu (1992)

[2]St. John and Starkey (forthcoming)

[3]Andrieu and St. John (1993)

TABLE 2

ATTRITION DATA FALL TO SPRING

	Fall Enrollments			Spring Enrollments					
Year	UG	Grad	Total	UG	%	Grad	%	Total	%
1992-93	12,315	3,993	16,308	9,456	76.8	2,661	66.6	12,117	74.3
1991-92	12,435	3,649	16,084	9,593	77.1	2,450	67.1	12,043	74.9
1990-91	12,219	3,103	15,322	9,222	75.5	2,087	67.3	11,309	73.8
1989-90	12,609	2,950	15,559	9,307	73.8	1,897	64.3	11,204	72.0
1988-89	13,190	2,886	16,076	9,514	72.1	1,863	64.6	11,377	70.8
1987-88	13,285	2,824	16,109	9,516	71.6	1,774	62.8	11,290	70.1
1986-87	13,277	2,806	16,083	9,867	74.3	1,786	63.6	11,653	72.5
1985-86	13,990	2,255	16,245	9,686	69.2	1,817	80.6	11,503	70.8
1984-85	14,106	2,554	16,660	9,955	70.6	1,756	68.8	11,711	70.3
1983-84	14,064	2,537	16,601	9,763	69.4	1,704	67.2	11,467	69.1
1982-83	13,608	2,518	16,126	9,368	68.8	1,690	67.1	11,058	68.6

TABLE 3

Spring, 1993: Predicted Enrollment of Continuing Students Without Fee Increase

	Traditional Undergraduate	Non-traditional Undergraduate	Graduate Student	Total
Headcount	4,952	4,752	2,711	12,415
Percentage	78.8	78.8	67.9	76.1

Projected Enrollment of Continuing Students with a $150 Fee Surcharge

	Traditional Undergraduate	Non-traditional Undergraduate	Graduate Students	Total
Headcount	4,839	4,522	2,677	12,038
Percentage	77	75.1	67.05	73.8

Actual Enrollment of Continuing Students

	Traditional Undergraduate	Non-traditional Undergraduate	Graduate Student	Total
Headcount	5,047	4,409	2,661	12,117
Percentage	80.3	73.1	66.6	74.3