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Resourceful Responses

The Adaptive Research University and the Drive to Market

A major challenge for contemporary public research universities is the need to affirm to the public and to the political community that the quality of higher education found at these largely autonomous institutions is of such import that it should be sustained by both public and private support. This challenge is made all the more difficult by the growing reluctance expressed by both state and federal policymakers to fund the university's educational mission at anywhere near the level university officials feel is required to sustain that mission. A further complication is the perception within a growing number of politically influential groups that research universities have largely eluded the beneficial effects of market-driven efficiency.

Our objective in this article is to examine how research universities are responding to this complex challenge in the connection between revenue generation and budgetary expenditure in a market-driven age. We argue that the response might involve a recognition that American research universities have a long record of institutional adaptation (Graham & Diamond, 1997). We examine funding and expenditure patterns during this decade and conclude that there is support for the argument that universities are adapting to the current climate by incorporating market-like behavior into their business plans. Specifically, we find noteworthy differences in behavior between institutions which experience enrollment declines and those that do not, and we find a strong relationship between increased reliance on particular sources of revenues

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and expenditures on student services, findings that seem to indicate market-like responses of public research universities to changing conditions.

Historical Context

American universities are distinguished by their relative autonomy as state institutions. Students of the American state formation draw attention to the strong tradition of locality and a corresponding skepticism of national institutions (Skowronek, 1982; Skocpol, 1995). In such a political culture, state universities have largely escaped the sort of control exercised by European ministries of education; indeed, the control exercised by subnational education departments as well. The great number of American state and private universities engendered fairly early on a competition for students and faculty and the expectation that universities could have a good deal of latitude in that competition. Of course, as we know, universities as autonomous institutions are complicated by their own internal organization as collections of semi-autonomous units. This strong tradition of decentralization within the state university may contribute to the capacity to innovate at the margins without appearing to deviate from traditional conceptions of what a university should be (Tierney, 1998).

In the current debate over the public research university, commentators are often too willing to use images from fashionable films, to describe universities metaphorically as great ships speeding along on a predetermined course, ships of such size that even when they see the iceberg of public discontent they are unable to avoid the crash in time. The reality is often that a public research university is more like a flotilla of ships of quite diverse size and function that, when taken as whole, might be more profitably understood as a fleet quite capable of engendering radical shifts in direction at the margin that allow steady adjustment at the center. It can be argued that American public research universities have in large measure prospered by adopting a strategy that embodies a potent, almost paradoxical, combination of continuity and radical change at the same time.

This has certainly been the case over the last half of this century. Indeed, public research universities are remarkably evolving blends of public and private initiatives. It is not surprising that these universities that are often regarded as agents of social and economic change, themselves, undergo change. In the decades since the end of the Second World War, American research universities have experienced dramatic changes in enrollment, research, and funding. These shifts are in part, of course, the result of changing societal expectations, but they can also be explained as

the result of the initiatives undertaken by the universities themselves. Public research universities have sought to position themselves to benefit from changing societal expectations and have in the process redefined the mission of higher education (Graham & Diamond, 1997).

Contemporary public research universities have undertaken a number of endeavors in the last fifty years. Three major endeavors stand out as demonstrating how universities have adapted to changing times and have helped to shape the direction that social and economic change has taken between the late 1940s and the 1980s: first, as institutions that educated an ever expanding middle class; second, as institutions that became the center for large-scale capital investment in research for industry, scientific inquiry, health care, and defense, among other areas; and finally as institutions that sought out students from communities in American society that had not previously attended college. In other words, universities moved to embrace the demographic diversity of American society and the drive to maintain the United States' central role in the world economy and in international security (see Sutton, 1994; Graham & Diamond, 1997).

The distinctive nature of American public research universities in each of these three transformations should not be underestimated. For example, the close association between research and the state university is not found to anywhere near the same extent in Europe or Asia (Graham & Diamond, 1997). The commitment to mass education at the university level came much later in Europe. That the scope of activities and roles taken by American universities is different than elsewhere in the world is useful in understanding the interplay between universities and the changing American society.

An illustration of the American research university's capacity not only to respond but to consolidate its role as an agent of change is the rise of the land-grant university. Over time, the university as an agent of agricultural improvement became transformed into the university as agent of economic and social change. From the Morrill Act to the GI Bill to the legislation of the Great Society era, it is clear that the public and policy makers alike have regarded higher education as an agent of change. Equally clear is the active engagement of research universities in adapting to changing conditions.

Market Appeal

It is this record of institutional adaptation that is prologue to our discussion of the challenges that have confronted the public research universities during the past decade. Beginning in the 1980s and continuing

into this decade, three growing concerns have emerged in higher education debates over the future direction of the university. This debate has been particularly intense in public research universities. The three specific issues that are being debated are: first, whether or not levels of federal research funding can be sustained; and second, whether or not enrollment in public research universities will be sustained or experience a decline; and finally, what the prospects for and the nature of state funding are in an era of tax cutting and competing demands for tax dollars (Graham & Diamond, 1997). These concerns, of course, have substantive implications for the future of universities as we have come to know them.

What has made this debate so interesting is that these concerns have arisen in an age that celebrates the market and is correspondingly skeptical of the state sector. A good deal of recent public policy debate in this country and abroad has called into question the nature and extent of state provision of a wide range of social and economic services. Historically, universities have come to see themselves as apart from society. Universities have long regarded themselves as unique centers for the generation and transmission of knowledge. Higher education has been traditionally seen as calling students to the universities and then sending them out to join the company of educated men and women.

In the past few decades, there has been a much greater willingness to draw parallels between universities and organizations found in the private sector. In 1974 Leslie and Johnson identified trends that marked a shift toward market-like behavior in higher education financing, but concluded that "the competitive market model is inadequate and inappropriate as a policy basis for higher education" (p. 78). Despite this admonition, the discussion of higher education as a market has continued to the point that it has become an unquestioned assumption in many discussions, especially among policymakers.

The growing fascination with market models in resource allocation in American higher education contributes to new ways of describing what it is that universities do, for example, by describing students as consumers and a student's education as a product (Chaffee, 1998). The use of such market imagery is appealing to some within universities and indicates the direction they feel higher education should be taking, but it is also deeply resisted by others, both on and off the campus. Critics of market approaches, especially for public research universities, argue that the quality of education is compromised by such strategies because they undermine the professional authority of the faculty and generate confused expectations for students as they attempt to understand what an education is meant to be. Perhaps more to the point is the fear that placing the research university in the market place compromises institu-

tional autonomy and academic freedom as it erodes the understanding of a university as independent and capable of observing the marketplace simply because it is not of it. Thus, the question most central to our analysis is how best to maintain the institutional autonomy of the public research university in an environment that increasingly allocates resources through market-like mechanisms.

The debate over the value of market strategies in the realization of the university mission should be understood, in part, as the most recent stage in the recurring debate over the how best to maintain institutional autonomy. It seems clear to us that the adaptability demonstrated by research universities over the course of this century has been driven by the commitment to sustaining autonomy within research universities. In other words, a commitment to autonomy contributes to a willingness to adjust not only to changing times, but also to help shape the conditions that can strengthen the position in society given to research universities.

Institutional Adaptability

We argue that debates about the nature and future of higher education are often confused by failing to recognize the inventive adaptability of research universities while preserving and enlarging their traditional mission. American public research universities have demonstrated remarkable adaptive powers over the past fifty years at least. They are *sui generis* institutions, being neither fully private nor public institutions. The semiprivate, semistate set of institutional arrangements is not the only organizational distinctiveness associated with higher education.

If one looks within the university, it is clear that specific units have long adapted to market-like behavior (Slaughter & Leslie, 1997; Tierney, 1998). Examples of this type of behavior include the competition for research funds and the spinoff of semiprivate research firms, the provision of financial aid and the competition for grants and contracts (Slaughter & Leslie, 1997), and student recruitment moving from a brisk four-year experience for eighteen-year-olds to life-long learning for professionals and the middle-aged. Such endeavors often operate in conjunction with other traditional sectors of the university and have had the consequence of weaving higher education into the fabric of American society at a greater depth than was the case even fifteen years ago.

When institutions of higher education engage in market-like behavior, the consequences of such behavior may or may not be beneficial. Privatization in Europe has shown that increasingly market-like behavior brings with it the specter of greater regulatory intervention. Those familiar with American higher education are well aware that market-driven

behavior exposes institutions to politically contested issues such as the rules of competition and fair practice. The discussion of the appropriateness of market-behavior in higher education is an important one; however, we limit our current discussion to an examination of the institutional adaptation in an age of markets rather than the merits and hazards of the marketplace per se.

Public and Private Support of Public Research Universities

Nowhere is the ever evolving complexity of the contemporary state university more clearly apparent than in its sources of income and its pattern of expenditure. Traditionally, state universities have received the bulk of their funding from the states. However, the federal government has been deeply implicated as a source of revenue in land-grant universities right from the beginning. It is clear today that the budgetary texture of universities is complex and reinforces the concept of the state university as a public/private hybrid. The fact that an eightfold differentiation of income streams into the state university is required for federal reporting is incontrovertible evidence of this complexity. Rather than simply "public" or "private," revenue is classified as coming from state appropriations, tuition and fees, government grants and contracts, private grants and contracts, investment and endowment income, educational sales and services, auxiliaries and service units, and where applicable, hospitals.

State universities may have diversified their income streams over the last fifty years (Brinkman & Morgan, 1994) but it is, of course, misleading to conclude that state appropriations have diminished in importance. Much of the income derived from research related endeavors is restricted in use to specific research activities. The majority of a public research university's budget typically cannot be used for the instructional mission of the university, and none of it can be used more flexibly than the portion made up from tuition, fees, and state revenues.

However flexibly they may be used, these important sources of revenues do come with certain concerns. An oft-quoted view in higher education is that students and their families should assume approximately one third of the cost of their education but that tuition rates should be set much higher than this and that student aid be used to offset the difference (Carnegie Commission, 1973). Acting on this recommendation, federal and state governments in effect created the market-like conditions that higher education now faces with little thought to the consequences of these conditions (Leslie & Johnson, 1974; Leslie & Slaughter, 1997). Admittedly, these conditions are made all the more complex

by the demands to expand educational opportunity to the least well off, the unstable nature of federal student aid, and the resistance of state agencies to sustain funding ratios between the student share and the state's share of the student's education (Hearn & Longanecker, 1985).

Clearly, the last two decades have seen an increasing willingness of government to rely on students to shoulder more of the burden of financing higher education (Hossler, Lund, Ramin, Westfall, & Irish, 1997). In its 1995 publication *The Condition of Education 1995*, the Education Department discussed the implications of this by noting the following:

- With the exception of public 2-year colleges, revenue per full-time equivalent (FTE) student in constant dollars increased at all types of higher education institutions between 1980 and 1992.
- However, while the revenue per FTE student increased, government appropriations fell (both in constant dollars and as a percentage of total revenue) at all types of institutions.
- For public institutions, which rely heavily on government appropriations, this fall was particularly large between 1990 and 1992.
- Even with significant increases in tuition revenue per FTE student, total revenue fell or remained steady over this period (Smith, 1995).

Though there are indications that the situation has improved somewhat since 1995 (Schmidt, 1997), it has been in this cold climate of decreasing government support that many universities have reluctantly moved to shift a greater share of the cost of education to students and their families as well as to intensify efforts among alumni and friends of the university to help defray the cost of education. In this search for revenue it is quite apparent that state policymakers are increasingly interested in how education takes place, to measure its effects on the students, and to seek to reduce costs by demanding accountability and efficiency. In other words, not only has the university sought to enlarge nonstate sources of revenue, but it has also been forced to react to demands from those in state government in order to hold on to existing state generated income. It has done so by arguing that the public research university not only provides an education of high quality but is the best judge of determining what constitutes a quality education (Chaffee, 1998).

In the last decade research universities both public and private have undertaken a number of initiatives aimed at improving both the quality and efficacy of undergraduate education. In many cases research universities have taken the lead in undergraduate educational change, and in other cases they have adopted programs often associated with smaller colleges. Perhaps one of the most widely accepted of these initiatives is

first-year programs designed to introduce the new student to a university education by linking library technologies, student affairs, learning skill programs in cohort programs that promote learning communities (Boyer Commission, 1998).

Other new initiatives focus on the efficient delivery of education and its consequences for the student. New technologies have been adopted in academic advising that assure that all students receive appropriate and timely advising and that allow students to track their academic progress on demand. Universities have also undertaken initiatives to review regularly and extend articulation agreements throughout a higher educational system or geographical region, and students can, as a result, transfer with greater ease from a community college or small liberal arts college to a research university. Assessment programs have been adopted by a large number of universities, many of which go so far as to track students and the skills and competencies they have mastered.

Taken as a whole these new initiatives respond to what universities believe that students want and suggest a new recognition of the students and their preferences at research universities. Although one might argue that such behavior is not necessarily market-like, we contend that it does in fact provide evidence of how public research universities have adapted their programs and services to be more appealing to students in an effort to be more competitive. That the rewards of such behavior include the enhancement of a university's revenues certainly allows us to characterize universities as engaging in market-like adaptation.

Quantifying Market-Like Behavior

To illuminate this discussion of how public research universities have adapted to changing conditions, we have chosen to analyze quantitatively market-like behaviors, specifically those that treat students as consumers of higher education. To this end, we have chosen to analyze data regarding enrollments, revenues, and expenditures from these institutions. The best source for this type of data is the Integrated Postsecondary Data System (IPEDS) of annual surveys, currently required of all institutions eligible for funding under Title IV of the Higher Education Act Amendment of 1987. Responding annually to a battery of surveys, these institutions provide information about institutional characteristics, headcount and FTE enrollments, revenues by source, and expenditures by function, among other things. These data have been collected since 1987.¹ IPEDS surveys employ standardized definitions that ensure a considerable amount of consistency in the responses over time and between different institutions. As a result, these data are frequently used to

understand trends in higher education and can be used to study behavior among colleges and universities, at least to the degree that "behavior" is accurately reflected in responses to questions about things like revenues and expenses.

In our analysis, we considered the population of American public universities classified as "Research University I" by the Carnegie Commission. IPEDS data are available for all but a few of these institutions. We note that this choice of the type of institution is interesting even beyond the scope of our previous discussion of institutional adaptability: Operating at one end of the continua for both size and diversity of mission, these institutions exhibit commonalities not found in any other Carnegie classification. Furthermore, these institutions are often characterized as being unwilling to change (Brooks, 1994), even though they are at the same time considered agents of change. Keeping these changing conditions in mind, we chose to focus on the recent past and, realizing the complexity of analysis necessary to interpret changes occurring over long periods of time, limited our analysis to changes seen over a recent and relatively stable period of time.

If, as we have discussed, public research universities have actually adapted to changing conditions by adopting more market-like behaviors, items of interest would include the changing conditions these institutions have faced and the kinds of behaviors they have adopted to deal with them. Many of these changing conditions are not directly reflected in IPEDS data (e.g., changes in public opinion, political aspects of state budgets, expectation of accountability, and increased efficiency). These data do, however, allow one to note changes in many other areas: enrollment, tuition and fees, revenues from private sources, expenses on student services, etc. It is important to realize the limited understanding of behavior that actually comes from such data and to caution that any results should be taken as preliminary evidence of certain behaviors, evidence that is best corroborated with further studies of this nature and with analysis of more direct measures of behavior.

In our analysis, we chose to focus on the contextualized relationship between expenditures on a wide range of student services and the percentages of revenues received from the state and from a combination of tuition, fees, and private sources. We contend that studying the expenditures on student services is a useful way to gauge the degree to which public universities increase the value of their offerings to their students (see Chaffee, 1998). Admittedly, a university could increase this value in any of a number of ways, but expenditures on student services, defined by IPEDS as being "funds expended for admissions, registrar activities, and activities whose primary purpose is to contribute to students' emo-

tional and physical well-being and to their intellectual, cultural and social development outside the context of the formal instructional program" (IPEDS, 1994), are expenditures that are made specifically on items that benefit students. This category of expenditures typically includes recruitment and orientation expenses and is therefore an even better measure of the degree to which public universities are engaging in market-like behaviors with regard to students.

The choice to combine tuition and fees and private gifts is prompted by our discussion and by a simple analysis of the level of control a public university has over particular revenue streams. Though not all public universities can set tuition, most have some flexibility over student fees and use tuition and fees as one way to make up for shortcomings in state appropriations. Private gifts, on the other hand, are negotiated, and might even be thought of as representing the most entrepreneurial kind of behavior in which public research universities will engage. Furthermore, many public research universities seek out private gifts in order to enhance undergraduate education. Combined, these two revenues create a useful conceptual understanding of the income public research universities are willing to ask from their various nongovernmental constituents or consumers.

To ensure a greater consistency among institutions, revenues and expenditures related to hospitals were removed before calculating percentages. In order to control for possible economies of scale related to enrollment and differences by level of study, factors such as size of institution and focus on undergraduate programs were considered by including total headcount enrollment and percentage of total headcount enrollment due to undergraduates.

Because the objective of this article is to describe how higher education has adapted to changing conditions, our analysis focuses on the changing behavior, as evidenced in changes in expenditures as well as changes in dependence on certain revenues and how they relate to changing conditions. We specifically considered the relationship between changing conditions and behavior over the period between the 1989-90 and 1994-95 fiscal years. This period was chosen for a number of reasons. The endpoint is consistent with the first analysis and represents the most recent data available. Furthermore, the span of time is neither too short to reflect changes in behavior nor too long to be encompassing too many changing social conditions. Finally, it represents a time in which the fortunes of public research universities changed dramatically in some ways while staying very much the same in others. During this time state revenues as a proportion of overall revenues fell substantially (from 39% in 1989-90 to 32% in 1994-95 for the 55 public RUIs in our sample). At the same time, enrollments in these institu-

tions increased on average for the first few years of this period, but then fell. By the 1994-95 fiscal year, total headcount enrollments at the public RUIs in our sample were on average only 57 students less than in 1989-90. Furthermore, the percentage of total nonhospital expenditures spent on research-related activities remained flat during these years: In both years, these universities dedicated an average of 20% of their total nonhospital expenditures to research with no institution increasing the level of this category of expenditures more than 5%.

In order to reflect changes over time, differences between percentages in the 1989-90 and 1994-95 fiscal years were calculated for the revenue and expenditure variables by simply subtracting the 1989-90 value from the 1994-95 value. This measure of change in the percentage of total expenditures for student services was seen to be the outcome variable, while changes in the percentage of total revenues from state appropriation and changes in the percentage of total revenues from tuition, fees, and private gifts were taken as explanatory variables.

Our model tried to reflect the fact that changes in percentages have different meanings based on the starting value of those percentages. For example, a 10% difference in a revenue source as a percentage of total revenues means something very different to an institution that had originally only received 10% of their revenues from that source than it would to an institutions that had originally received 50%. For this reason, values for the 1989-90 fiscal year for percentage of total revenues from state appropriations and from tuition and fees and private sources, and percentage of total expenditures for student services were included, in order to contextualize changes in these variables over time.

In developing our analytical model, the change in total headcount was initially considered as an explanatory variable, but was later used to divide our sample into two groups: institutions that had experienced a decline in enrollment ($n = 25$) and those that had not ($n = 30$). Though it could be argued that this variable should have been included directly in the model as a dummy variable, our particular use of this variable is well supported by our central argument. In short, changing conditions elicit changes in behavior, and the best way to study those changes is by studying groups affected by similar conditions.²

Based on the reasoning outlined above, the model used in our analysis was as follows:

$$\begin{aligned} \text{Change in the percent of expenditures on student services} = & \\ \beta_0 + \beta_1 & \text{Percent of revenue from state appropriations in 1990} \\ + \beta_2 & \text{Percent of revenue from tuition and private sources in 1990} \\ + \beta_3 & \text{Percent of total expenditures expended for student services,} \\ & \text{1990} \end{aligned}$$

- + β_4 Change in the percent of revenue from state appropriations
- + β_5 Change in the percent of revenue from tuition, fees, and private sources.
- + ϵ

This model was used to test the main hypothesis that *an increased reliance on tuition and fees and revenues from private sources would be positively related to an increased percentage of total expenditures that is expended on student services*, by observing the sign and significance of the estimate of β_5 . The model was run for the overall data set and separately for the institutions experiencing a decline in headcount enrollment and those that did not. While not directly testable by this model, we also propose the following secondary hypothesis, namely, that *a decline in enrollment will significantly affect the change in the percentage of total expenditures expended on student services*.

Results

The statistics in Table 1 summarize the statistics relating to the significance of these three analyses and indicate that our model is significant for all values of α larger than 1% not only for the overall data set, but for the two groups identified. Furthermore, the model does a very good job of explaining the variability in the change in percentage of total expenditures expended on students services, especially among the institutions that experienced enrollment declines: In this data set, the model explains a little more than two-thirds of the variance.

Of greater interest, perhaps, are the estimates of the model parameters obtained by these analyses. These are summarized in Tables 2, 3, and 4 and indicate that our main hypothesis is not rejected for the overall data set nor is it rejected for the data set of institutions with enrollment declines (for all values of $\alpha > 1.5\%$ and 0.15% , respectively). However, it is rejected for the data set of institutions without enrollment declines for all reasonable values of α . We contend that this difference indicates the effect of changing enrollments on the behavior of institutions, and

TABLE 1
Significance of regression analyses of behavior over time within institutions

Data Set (<i>n</i>)	<i>F</i> (<i>p</i> -value)	<i>R</i> ²
All institutions (55)	4.7064 (0.0014)	0.3244
Institutions with enrollment decline (25)	7.7663 (0.0004)	0.6715
Institutions without enrollment decline (30)	4.0475 (0.0083)	0.4575

TABLE 2

Summary of results in regression analysis of behavior over time within all institutions ($n = 55$)

Term	Estimate of β_i	P-Value
Constant	0.0038	0.5941
Percent of revenue from state appropriations, 1990	0.0011	0.9324
Percent of revenue from tuition and private sources, 1990	0.0020	0.9014
Percent of total expenditures expended for student services, 1990	-0.2614	0.0003
Change in the percent of revenue from state appropriations, 1990 to 1995	-0.0035	0.8734
Change in the percent of revenue from tuition, fees and private sources, 1990 to 1995	0.0700	0.0119

TABLE 3

Summary of results in regression analysis of behavior over time within institutions experiencing an enrollment decline ($n = 25$)

Term	Estimate of β_i	P-Value
Constant	0.0027	0.8235
Percent of revenue from state appropriations, 1990	-0.0267	0.3220
Percent of revenue from tuition and private sources, 1990	0.05524	0.0394
Percent of total expenditures expended for student services, 1990	-0.4792	0.0022
Change in the percent of revenue from state appropriations, 1990 to 1995	-0.0176	0.6269
Change in the percent of revenue from tuition, fees and private sources, 1990 to 1995	0.1828	0.0012

TABLE 4

Summary of results in regression analysis of behavior over time within institutions maintaining or increasing enrollment ($n = 30$)

Term	Estimate of β_i	P-Value
Constant	-0.0051	0.4094
Percent of revenue from state appropriations, 1990	0.0240	0.0257
Percent of revenue from tuition and private sources, 1990	0.0048	0.7351
Percent of total expenditures expended for student services, 1990	-0.0942	0.0438
Change in the percent of revenue from state appropriations, 1990 to 1995	0.0430	0.0213
Change in the percent of revenue from tuition, fees and private sources, 1990 to 1995	0.0084	0.6981

though it does not allow us to accept our secondary hypothesis outright, it at least vindicates our decision to divide the data set as we did.³

It is important to understand the differences between the analyses of the two groups of institutions. In the group that experienced an enrollment decline (see Table 3), the coefficients that are significantly different than zero are those associated with the change in the percentage of

total revenues from tuition and fees and private sources, the percentage of total expenditures expended on student services in 1989–90, and the percentage of total revenues from tuition and fees and private sources in 1989–90. The positive sign on the change in tuition/fees/private sources variable as well as on the 1989–90 tuition/fees/private sources variables seems to indicate that the reliance on this kind of revenue, both past and as changed over time, is positively related to greater expenditures on student services, at least among the institutions with declining enrollments. This result is consistent with our discussion of the willingness of institutions to change their behavior to meet changing conditions. As institutions are compelled to fund a greater share of the cost of education from nongovernment sources, they are also willing to expend more on one of those sources, namely, students.

In the analysis of the groups of institutions (see Table 4) which did not experience a decline in enrollments, the role of state revenues and the revenues from tuition and fees and private sources are exactly reversed. Indeed, even the signs on the coefficients for state revenues mirror those of tuition/fees/private sources in the other group. Again, although our main hypothesis is not supported by this group, this result is perfectly consistent with our primary argument. What is more, our analysis demonstrates another kind of market-like behavior: institutions that are at least maintaining their enrollments seem to react more to the “market” of state support. Increased dependence on this source of revenue is met with increased expenditures for students services, perhaps indicating institutional response to changing demands from legislators and the public for better student services.

These results must be accompanied by a number of caveats. First, revenue and expenditure data are imperfect indicators of conditions and behavior. It should be apparent that our analyses do provide evidence of a relationships between shifts in sources of revenues and areas of expense and perhaps provide one indication of what should be regarded as a broad comprehensive strategy of response to the challenges facing the state university at the end of the century.

Second, before simply concluding that these findings immediately support our hypothesis, it is important to consider artifactual or spurious effects that might explain our results. The kinds of variables we have used in our model are particularly prone to misinterpretation if they are not understood contextually. For example, a dramatic increase in revenues related to research would bring with it a dramatic increase in expenditures on research. *Ceteris paribus*, this would cause the percentages associated with all other categories of revenue and expense to decrease. However, we have shown that, on average, research expendi-

tures did not change over the period of time we studied, and that no institution experienced a dramatic increase in the percent of total expenditures expended for research activities. We therefore contend that our analysis is reasonably free of such problems and that the significant results we obtained are not due to structural artifacts.

Although we acknowledge that it is possible to incorrectly infer “cause-and-effect” relationships within our data, we believe that the consistency of the results obtained in our three separate analyses with what is considered reasonable economic behavior lends immense credence to our interpretation of these results.⁴ Furthermore, we think that our interpretations are well grounded in the history and literature of higher education (Halstead, 1991).

Conclusion

Some argue that at the core of the American public research university’s autonomy and growth has been its institutional adaptation to changing conditions. Indeed, public research universities have not just adapted but have served as a source of change in their capacity to define and realize their academic mission.

In this era of markets that celebrates competition, public research universities are clearly expected to adapt, and we have argued that this adaptation is taking place. Public research universities appear to have emphasized the place of the student in the rich environment that has come to characterize the modern public research universities.

The very process of market adaptation may enable research universities to seek out new opportunities for growth and contribute to the reaffirmation of institutional autonomy as they adapt their mission to changing conditions. For some, the pursuit of students as consumers by research universities is unsettling and a repudiation of the historic mission of these institutions. This lively new focus on students is reflective of the willingness to adapt that has long characterized American public research universities and has so frequently contributed to their success in changing times.

Notes

¹Similar but less comprehensive data (HEGIS) are available for the years 1965–1986.

²The effect of a decline in enrollment could have been tested statistically by including a dummy variable and interacting it with the other independent variables. This would have measured the effect of decreased enrollment on behavior in both the intercept term and on the slopes associated with the various independent variables, but would have been substantially more difficult to interpret. This model was, in fact, tested and was found to be significant with an *F*-value of 6.7810 and *p*-value of 0.0000. For brevity, the

more complicated model and the estimates of its parameters are not presented here, but are discussed in footnotes when appropriate.

³It should be noted that this result was supported by the analysis of the model discussed in the last footnote. In this model, the effect of the enrollment decline dummy variable was significant with respect to its interaction with the change in tuition/fees/private sources variable, the 1990 student services expenditure variable, and the 1990 state appropriation variable, at all values of $\alpha > 0.1\%$, 0.5% , and 5% , respectively. These results permit us to accept our secondary hypothesis on more statistically rigorous evidence than the observed differences between the analyses of the two groups of data. Furthermore, all interpretations of significance and parameter estimates made from the results of the analyses of the two groups of data are consistent with those that can be made from this model.

⁴We argue that alternative explanations of these results can be dismissed, given recent conditions, and can be logically refuted, given the differences in behavior between institutions that experienced enrollment declines and those that did not. Specifically, although we cannot directly refute that increasing the percentage of total expenditures expended on student services would cause research universities to raise tuition, it seems to us preposterous that these institutions would willingly do so during a time when they were being harshly criticized for high tuition rates. Even if this were true, it would be illogical for institutions that had consistent or increasing demand not to engage in this kind of behavior, even though it would be rational behavior from an economic standpoint, even as those institutions for which such behavior would be economically irrational were in fact engaging in it. Based on this, we contend that alternative interpretations would be both inconsistent with recent history and economically unfeasible.

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