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8 Public Choices in Public Higher Education

John M. Quigley and Daniel L. Rubinfeld

8.1 Introduction

Public institutions of higher education have grown in prominence in the United States over the past 200 years. By the mid-1980s, total public enrollments were roughly twice the level of private enrollments.[1] Important as they are, these aggregate trends mask the substantial and systematic state-by-state variation in public and private enrollments that is the primary focus of this paper.

The outputs associated with public higher education are notoriously difficult to conceptualize and to quantify. We therefore concentrate attention on input measures that can proxy for educational output: enrollments per capita and expenditures per student.

To a large extent, current enrollment levels reflect a historical set of decisions by state legislatures concerning the appropriate "supply" of public higher education. But they also depend on the demand for higher education by both residents and nonresidents. In this paper, we relate the 1985 statewide pattern of publicly provided higher education to the political conditions and choices that have confronted legislatures, along with the labor market conditions and other economic forces that affect students' (and families') demands for higher education.

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1. Public enrollments averaged 1,166,934 per state, while private enrollments averaged 620,871.

Section 8.2 provides the conceptual overview. We sketch out some of the alternative political-economic theories that might serve to explain the current pattern of student enrollments. Section 8.3 begins the empirical analysis by describing the statewide public enrollment pattern as it has developed historically and as it relates to other input and output measures (expenditures per pupil and a quality index). In this section, we flesh out the public-choice problem of the legislature which causes states to provide alternative packages of postsecondary education services. Section 8.4 describes the regression analyses that attempt to sort out the effects of legislative supply variables from the important demand-oriented variables. Some brief concluding remarks appear in the final section.

8.2 Why Public Provision?

Enrollment patterns are in part historically determined; additionally, they are intricately related to the availability of private institutions in or near each state. As a result, there is no single, simple theory that is likely to explain fully the variation in interstate public enrollment rates. In this section, we sketch out a number of alternative theoretical views that might help to explain the existing spending-enrollment pattern. The theories also serve to explain why states choose to provide subsidized higher education at all, in light of the economic evidence suggesting that most of the benefits of college training are fully captured by the graduates themselves.[2]

One approach emphasizes human capital and mobility. According to this view, states wishing to import valuable human capital will provide relatively high levels of public spending and enrollment opportunities, at least to the extent that they believe they can convince graduates of the public institutions to continue to reside in their states.

A second public-choice explanation concentrates on the political benefits associated with the provision of higher education. According to this view, politicians use logrolling to trade for forms of public higher education that benefit their constituencies. California's increased emphasis on the provision of two-year institutions is consistent with this view; logrolling may have led to the creation of a large number of new institutions in a sufficiently large number of legislative districts so as to make the entire educational package politically viable. This theory is also consistent with the Leviathan theory of big government, according to which political support by self-interested bureaucrats may be sufficient to cause the subsidized public sector to grow.

A third perspective (taken by Bowles and Gintis 1976, for example) suggests that subsidies to higher education are simply a means that the capitalist

2. See, for example, the discussion in Douglas (1977). He argues that the average private economic return on higher education has been falling and is just above the break-even point. This does suggest, however, that for the lower-paying professions, the return is negative, which might provide an additional motive for subsidizing higher education—especially two-year institutions.

class has of distributing state resources to the middle class. Karabel (1974) follows this line of reasoning to explain the emergence of two-year institutions as a means of keeping the working class "in their place." The growing emphasis on two-year institutions, especially in the West, could be consistent with this view, but the theory does not explain why such institutions have been so successful in other areas of the country.

Yet another explanation for higher-education subsidies relies on the inherent optimism of the lower and middle socioeconomic classes concerning their own prospects of moving up the economic ladder. This optimism, we believe, helps to explain the widespread historical support for assessing relatively low marginal tax rates on upper-middle-income individuals. In general, to the extent that lower- and middle-income groups are unusually optimistic, they may vote (directly or indirectly) to support subsidies which turn out ex post to be detrimental to their narrow "class interests."

Finally, it is important to recognize the rather unusual place that education plays in our society. To some, education is a form of private secular religion; as such it may receive substantial political support, regardless of the calculus of immediate benefits.

8.3 Interstate Variation in Public Higher Education

8.3.1 A Historical Perspective

Higher education in the United States was provided entirely through the private sector in the early years of the republic. Beginning with Harvard University in 1636, a total of nine private institutions had come into existence by the time of the American Revolution. The 75 years following the revolution was a period of great expansion, and by 1861 over 800 colleges had been founded. However, most of these colleges lacked either the faculty, students, or funding to survive; in 1900 only about 180 were in existence (Westmeyer 1985).

The first public institution of higher education was founded in 1816 (it is now the University of Virginia). At the time, there was little demand-side pressure, since relatively few students were completing college preparatory programs. However, the role of public institutions became far more important with the passage of the first Morrill Act in 1862, creating the land-grant colleges. The Morrill Acts (the second was in 1890) mandated support for at least one college devoted to agriculture and the mechanical arts in every state, with land and funds provided by the federal government. Some states used this support to expand existing colleges; others used it to establish new institutions.

Public institutions would most likely have been prominent earlier, were it not for the precedent of the *Dartmouth College* case of 1819. In that case, the U.S. Supreme Court ruled that states had no authority over private institutions

and that assumption of such authority amounted to a breach of contract with those institutions. If the court had ruled otherwise, it seems likely that instead of the subsequent proliferation of private institutions, states would have taken control of (and made "public") many existing institutions.

The next great expansion in the number of institutions of higher learning came after World War II, when the GI Bill facilitated great increases in enrollments. Since that war, enrollments have fluctuated, in part in response to economic and demographic changes.[3]

8.3.2 Variations in Public and Private Enrollments

Much of the empirical research on higher education has focused on enrollments, in both four-year and two-year institutions (see, e.g., Christensen, Melder, and Weisbrod 1975; Corazzini, Dugan, and Grabowski 1972; Corman 1983; Hopkins 1974; Hoenack and Pierro 1990). Enrollment studies, in turn, have tended to concentrate on the micro decisions of students (enrollment is related to income, tuition, and the opportunity cost of attending school) (see Feldman and Hoenack 1969; Galper and Dunn 1969; Kohn, Manski, and Mundel 1976; Mattila 1982; Sulock 1982; Weiss 1972). The "supply side" is usually given exogenously in terms of tuition, quality of schools, and state and federal support for public education. The only endogenous variable involves the decision rule for admitting students.

We take a broader view in this paper, emphasizing the legislative decision involved in providing a statewide system of public higher education. We use the level of student enrollments per 1,000 population in 1984–85 as a means of comparing the opportunities for public education across states. (Throughout the paper, enrollments per 1,000 population will be referred to as enrollment per capita.)[4]

The range and variability of public and private enrollments is striking. Per capita enrollments range from a low of 25.1 in Georgia to a high of 61.7 in Arizona (and 55.4 in California), with a mean of 39.3. The coefficient of variation is 20.8 percent. The variability of private enrollments is even greater, ranging from per capita enrollments as low as 0 in Wyoming and 0.32 in Nevada to enrollments as high as 40.5 in Massachusetts (and 35.8 in Rhode Island). In contrast to public enrollments, the coefficient of variation for per capita private enrollments is 78.2 percent.

Figure 8.1 shows how public enrollments per capita vary by region of the

3. For a more detailed description and analysis of the sources of enrollment changes, see Clotfelter (1991), chapters 1 and 5.

4. Enrollment per capita allows one to conceptualize education as benefiting all state residents. The alternative enrollment rate, as measured by the ratio of enrollments to population aged 18–30, focuses more directly on the choices that potential students make. This choice is unsatisfactory, since it fails to account for the fact that older students are a growing portion of college students. According to Corman and Davidson (1984), over 33 percent of college students were 25 and older in 1979, and the number is expected to increase to 43 percent by 1990. In any case, the results were essentially unchanged, whichever variable was utilized.

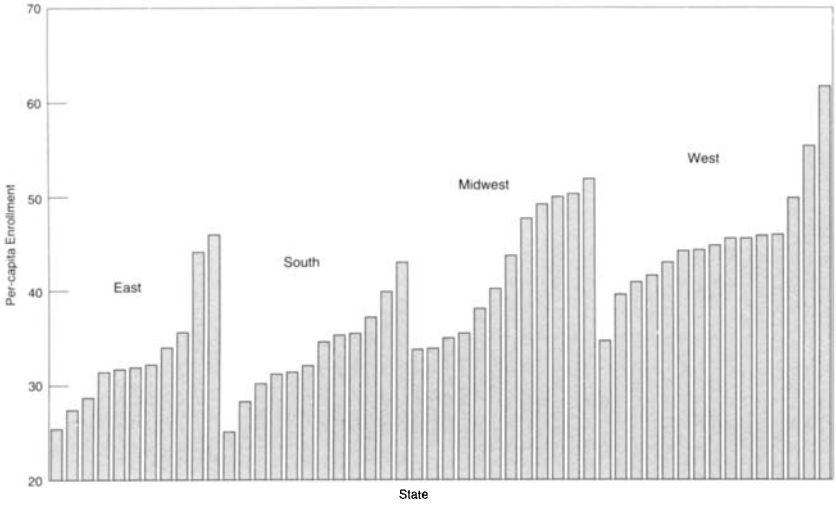

Fig. 8.1 Public enrollment per capita by region

country. (Each of the 50 states appears on the horizontal axis.) Clearly, the mean enrollment rate increases as we move from the East to the South, Midwest, and West. Within each region, however, there remains substantial variation. In the East, for example, enrollment rates range from a low of 25.4 in Pennsylvania to a high of 46.0 in Maryland. By contrast, the range in the West is from a low of 34.7 in Idaho to a high of 61.7 in Arizona.

There is also a pronounced regional pattern in private enrollments, as figure 8.2 shows. Per capita private enrollments are substantially higher in the East than elsewhere. Among the other three regions, enrollment rates are highest in the Midwest, followed by the South, and then the West. There remains substantial variation within the East, with the lowest private enrollment rate of 7.1 in Connecticut and the highest, 40.5, in Massachusetts. By contrast, with the exception of Utah in the West, there is relatively little within-region variation in private enrollment rates.

These important regional differences in higher education were largely historically determined, as figures 8.3 and 8.4 suggest. These figures describe enrollment rates by order of statehood, from 1st to 50th. The positive relationship between public enrollment and order of statehood, and the corresponding negative relationship for private enrollment rates, is immediately clear.[5]

From a cross-sectional viewpoint, one might view each state as making (or having made) a "public choice" about the mix of public and private enrollments to provide. (Alternatively, the legislature makes a public enrollment

5. When we attempted to sort out geography (region) from history (order of statehood) by examining the pattern of enrollment rates within region by order of statehood, we found no discernible relationship.

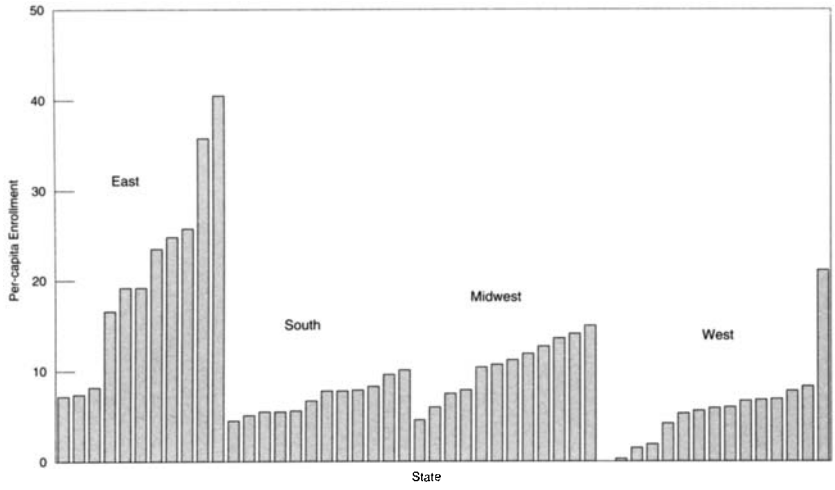

Fig. 8.2 Private enrollment per capita by region

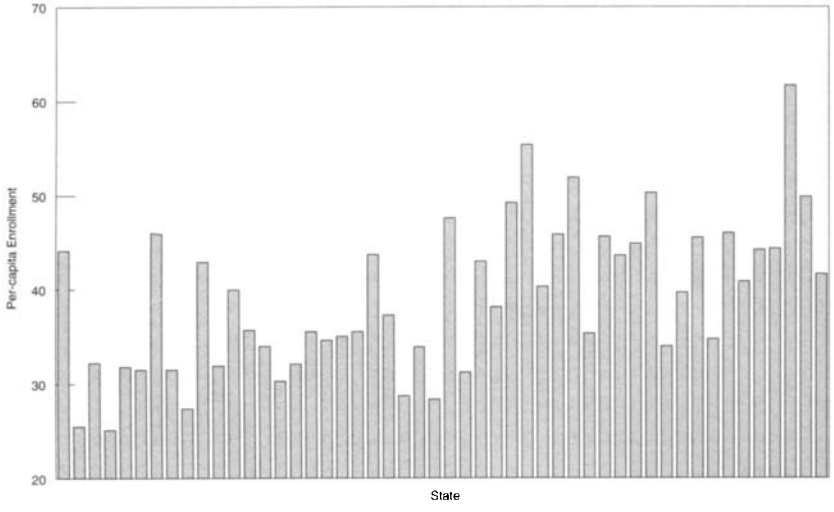

Fig. 8.3 Public enrollment per capita by order of statehood

choice, conditioned on the availability of private alternatives.) The enrollment trade-off is shown in figure 8.5. Overall, there is a negative relationship between public and private enrollment rates, ranging from the low-public, high-private extreme of Massachusetts to the high-public, low-private alternative of Arizona. The relationship appears to be nonlinear, as shown by the best-

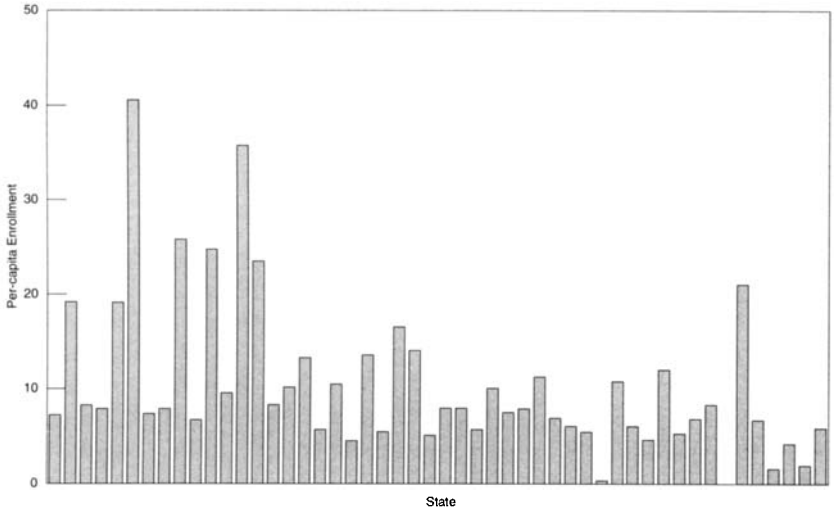

Fig. 8.4 Private enrollment per capita by order of statehood

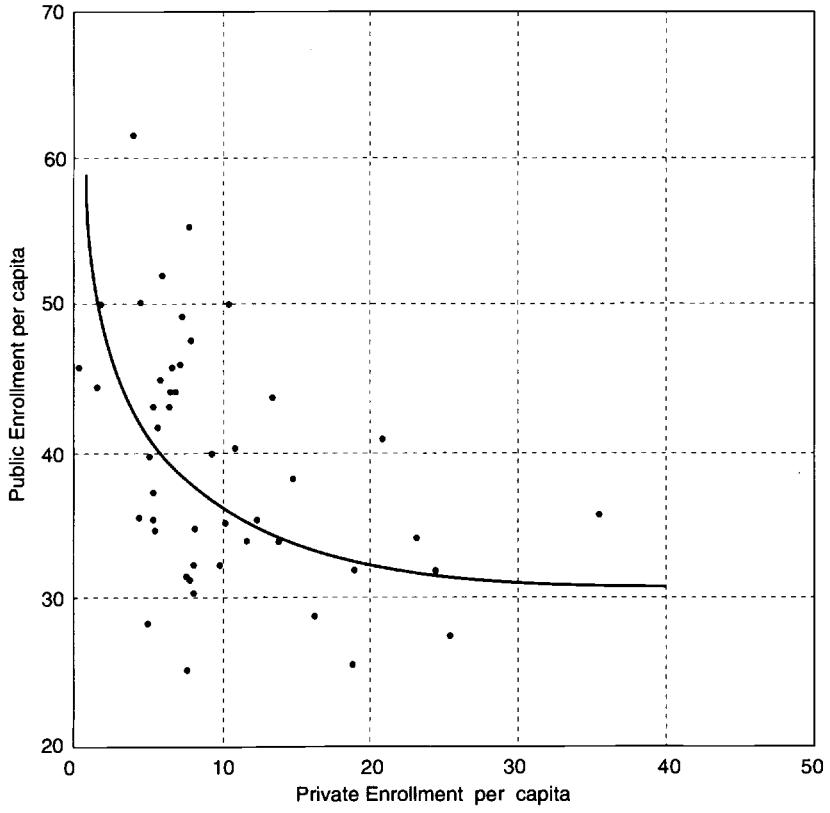

Fig. 8.5 The public-private education bundle

fitting hyperbola that appears in the graph.[6] The relationship would not be substantially changed if the South, where all enrollment rates are relatively low, were removed from the data set.

8.3.3 The Mix of Educational Opportunities

Within the public sector, states vary substantially in the mix of educational opportunities that they provide. Figure 8.6 provides one interesting perspective by illustrating the generally negative relationship between enrollment rates for two-year and four-year institutions. This pattern has come about as the result of a rapid increase in the enrollments in two-year institutions that occurred during the 1970s.[7] By 1980, 91 percent of students in two-year institutions were in public as opposed to private schools; the comparable figure for four-year schools was 67 percent (Grubb 1988, 301–2).

Four-year institutions should themselves be broken down into those that are primarily liberal arts teaching institutions (hereafter "colleges") and those that emphasize research and offer extensive programs of doctoral studies. Of the 1,993 four-year institutions in the United States, 150 are classified as research institutions; 38 percent of those are private and 62 percent public. Of the group of 1,843 colleges, 75 percent are private.[8]

Once again, the current mix of institutions reflects historical development. Institutions with graduate programs are a phenomenon of the last 100 years. Although the first Ph.D. was awarded at Yale in 1861, by 1930 only 2,024 Ph.D.'s had been awarded. Graduate enrollments increased more substantially, from 198 in 1878 to 2,382 in 1890, 9,370 in 1910, and 47,255 in 1930.

Two-year, or community, colleges are even more recent in their origin but have grown much faster. The first junior colleges were founded at the turn of the century, with 52 in existence in 1920, 610 in 1941, and 1,100 in 1970.

8.3.4 The Public versus Private Choice

There is, of course, substantial variation in the quality of both public and private institutions. To examine the quality issue, we rely upon the Gourman (1987) index measuring the proportion of rated institutions in each state classified as "strong" or "good."[9] The Gourman index is based on the opinions of a substantial number of individuals active in the field of higher education about the quality of faculty, students, individual departments within a school, school administration, and library facilities. While such a subjective measure should be viewed with some skepticism, it is reassuring to note that the Gour-

6. The regression estimated curve in figure 8.5 plots the relationship: log(public enrollment per capita) = 3.8959 − .1181 log(private enrollment per capita).

7. According to Grubb (1988), enrollments in two-year institutions grew at a rate of 11 percent per year during the 1970s, as compared to a 2 percent annual rate of growth for four-year colleges. The source is the *Statistical abstract of the United States*, table 260.

8. Of the 1,305 two-year institutions, only 28 percent are private.

9. An index of the number of institutions rated "good" and "strong" yielded similar results.

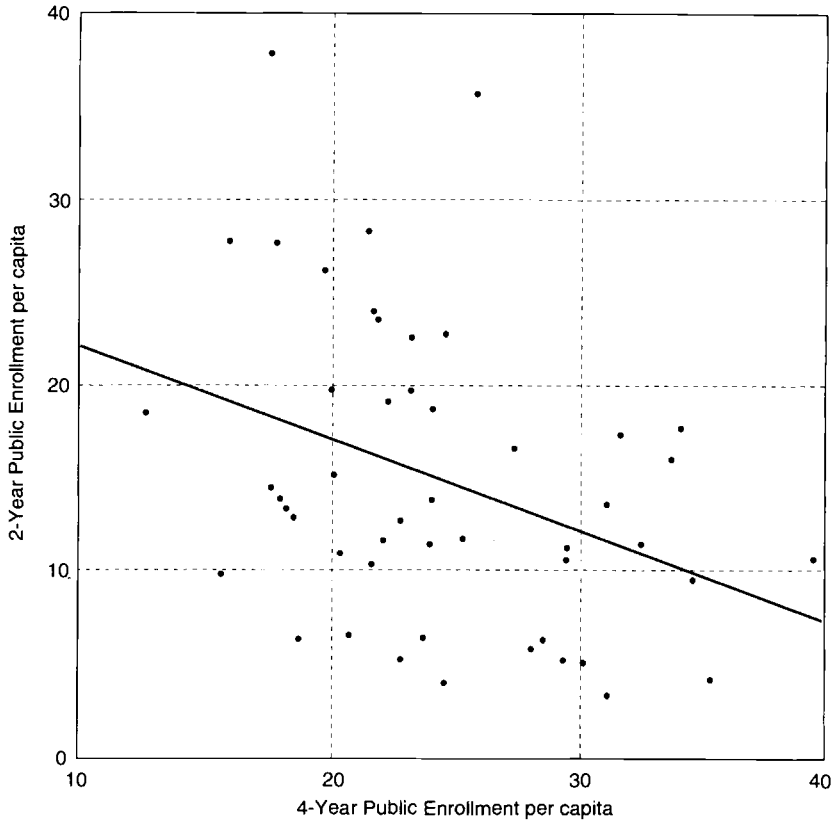

Fig. 8.6 The two-year–four-year public education bundle

man index is reasonably highly correlated with other objective measures of quality.[10]

According to our constructed measure of quality, Arizona, California, and Iowa have the highest-quality public institutions, and Colorado, Rhode Island, and Massachusetts the highest-quality private institutions.[11] Figures 8.7 and 8.8 show that there is a generally positive relationship between quality and enrollment rates; those states with institutions of the highest quality tend to have the highest enrollments.

The public choice between public and private, high- and low-quality insti-

10. Solmon (1973, table 1) found the overall Gourman index to have a correlation of .80 with average faculty salary; .62 with the SAT math score of enrolled students; .75 with the departmental research, instruction, and library expenditures; and .71 with basic expenditures.

11. The Gourman rating system considers all schools in a state. The quality index used here is unweighted. The results were quite similar when an index of the total number of highly rated schools was used in its place.

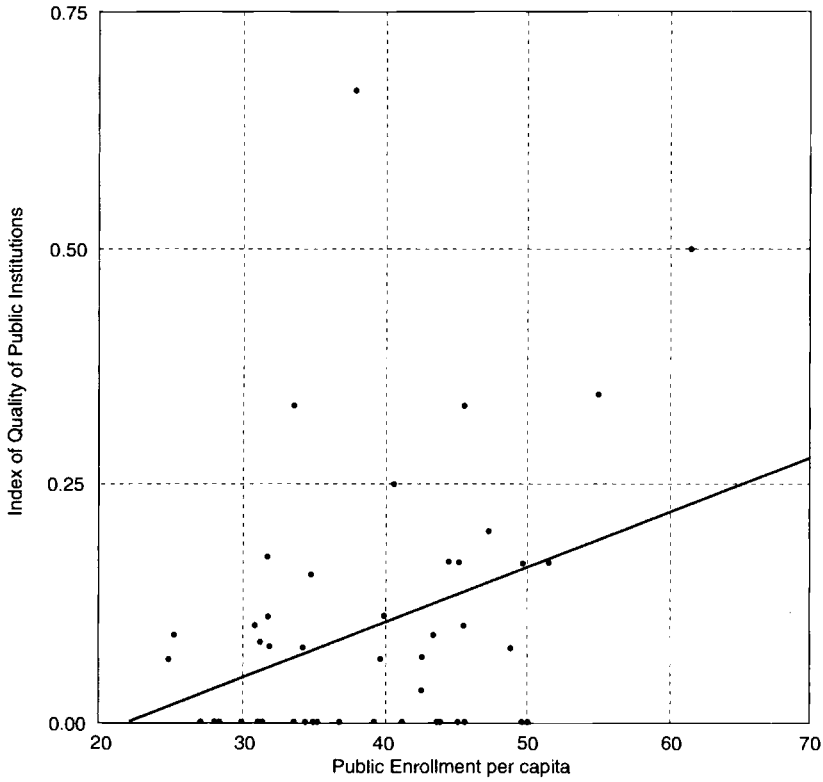

Fig. 8.7 Public enrollment per capita and institutional quality

tutions is more complex than any single graph can show. The listings in table 8.1 make this clear.[12] A group of 11 states, located primarily in the South, offer educational bundles consisting of low public and low private enrollments in schools that are not highly rated. A second group, 8 states primarily in the East, offer low public enrollment and high private–high-quality bundles. At the opposite end of the spectrum, a third group, 18 states located primarily in the Midwest and West, offer high public, often high-quality, but low private enrollment rates. Only 1 state, Illinois, would be classified as providing both high public and high private enrollment rates. The remaining 12 states lie someplace in between these sharply contrasting combinations.

An alternative measure of the quality of public and private institutions is given by an input to the educational production function: the dollar level of expenditures per student. Figure 8.9 shows that four-year private liberal arts colleges exhibit a clear, positive relationship between per student expendi-

12. This classification was accomplished by dividing each enrollment series into three approximately equal parts—high, moderate, and low.

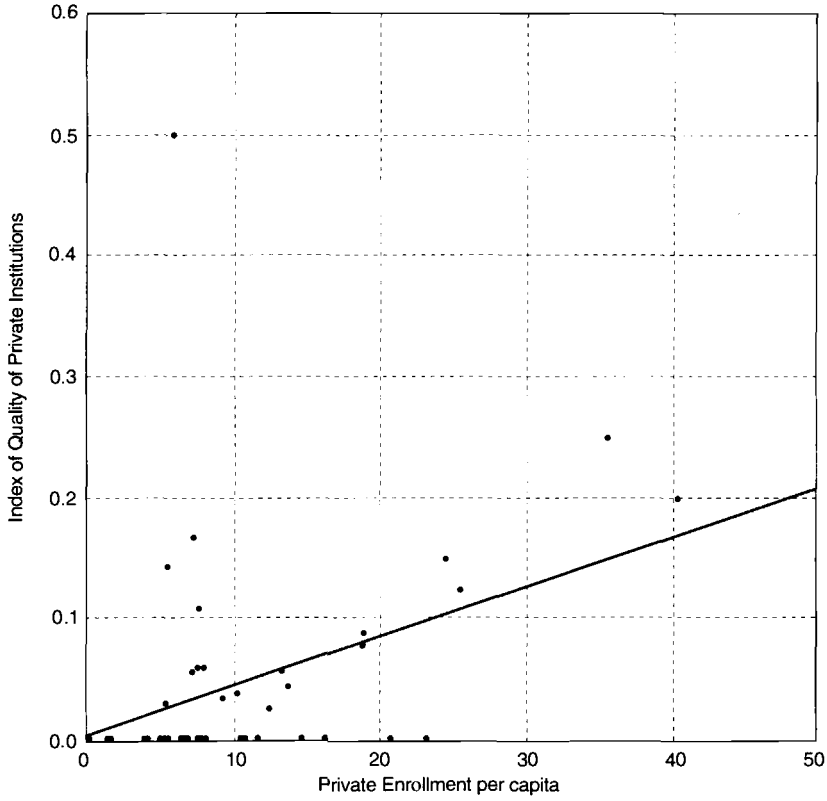

Fig. 8.8 Private enrollment per capita and institutional quality

tures and enrollment rates. Other things equal (e.g., tuition), this suggests that states with "better" schools have higher enrollments.[13] However, as figure 8.10 illustrates, the pattern is just the opposite for public education. Here we see a negative relationship between expenditures per student and enrollment rates.[14] The suggestion is that some states opt to offer a high-quality, low-quantity public education alternative, while others offer a low-quality, high-quantity combination.[15]

Part of the public-choice decision that a legislature must make is the (joint) choice of the level of tuition and the level of public subsidy. To measure the subsidy for all schools, we use the state appropriation per full-time equivalent

13. The same pattern holds for private four-year universities.

14. Alaska, with a per capita expenditure of $17,042, has been excluded as an outlier. The negative relationship is somewhat less pronounced when Alaska is included. Note, in addition, that the relationship is essentially the same when expenditures per full-time equivalent (FTE) student at four-year universities is related to four-year public enrollments per capita.

15. For two-year private institutions, there is no relationship between expenditures per student and enrollment rates, while for two-year public institutions, there is a slight positive relationship.

Table 8.1 **Classification of Enrollment by States**

	Private Enrollment		
Public Enrollment	Low	Moderate	High
Low	Alabama Arkansas Florida Georgia Hawaii Idaho Kentucky Louisiana Mississippi South Carolina West Virginia	Missouri New Jersey South Dakota Tennessee	Connecticut Maine **Massachusetts** New Hampshire **New York** **Pennsylvania** Rhode Island Vermont
Moderate	Montana	Indiana Iowa Minnesota North Carolina Ohio	Utah
High	Alaska Arizona **California** **Colorado** Delaware Kansas **Maryland** Michigan Nevada New Mexico North Dakota Oklahoma Oregon Texas Virginia Washington Wisconsin Wyoming	Nebraska	Illinois

Notes: States rated as having high-quality public institutions are underlined; those with high-quality private institutions appear in bold print. A state may rate high in both categories. A state has high-quality public or private education if two or more institutions are rated good or excellent.

student (SUPPB).[16] (See the Appendix to this chapter for the definitions of and data sources for variables presented hereafter.) For two-year schools and four-year colleges (excluding research universities), we calculated the subsidy

16. Unfortunately, we were unable to find direct measures of the subsidy per two-year and four-year student.

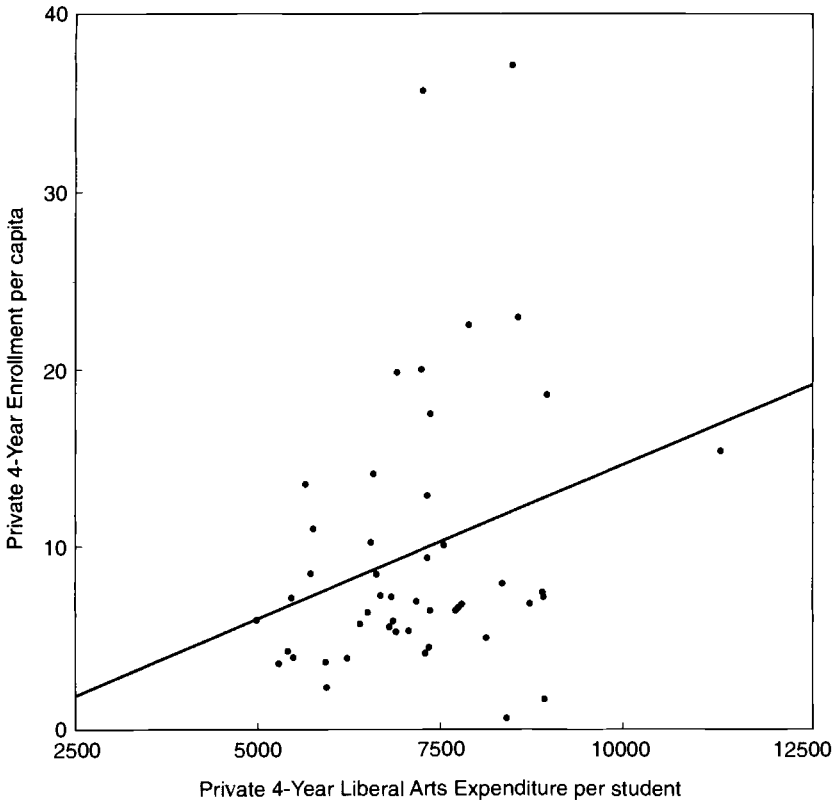

Fig. 8.9 Private four-year per capita enrollment and per student expenditure

per full-time student (SUPP2 and SUPP4) as the difference between per student expenditures and average per student tuition. Subsidies vary substantially among states. For two-year schools, they range from a low of $2,056 per student to a high of $6,590 (with a mean of $3,723); for four-year colleges, they range from $1,864 to $15,101 (with a mean of $4,412).

Tuition is a major component of the price of a public education to a prospective student.[17] Figure 8.11 shows a negative relationship between the tuition at two-year public institutions and enrollment rates; states with the lowest tuition (and, other things equal, the lowest subsidies) have the highest enrollment.[18] The pattern is the same with respect to tuition and enrollment at four-year colleges (see figure 8.12).[19]

17. But see Nerlove (1972) for a more complete discussion of the relationship between tuition and the price that efficiently allocates scarce resources.

18. Two-year public tuition was highest in Pennsylvania ($3,595) and Vermont ($2,525) and lowest in California ($250), North Carolina ($382), and Montana ($420).

19. Four-year tuitions ranged from a high of $3,547 in Vermont and $3,202 in New Hampshire to a low of $739 in Oklahoma and $740 in West Virginia. There is little relationship, however, between doctoral tuition and four-year enrollment rates.

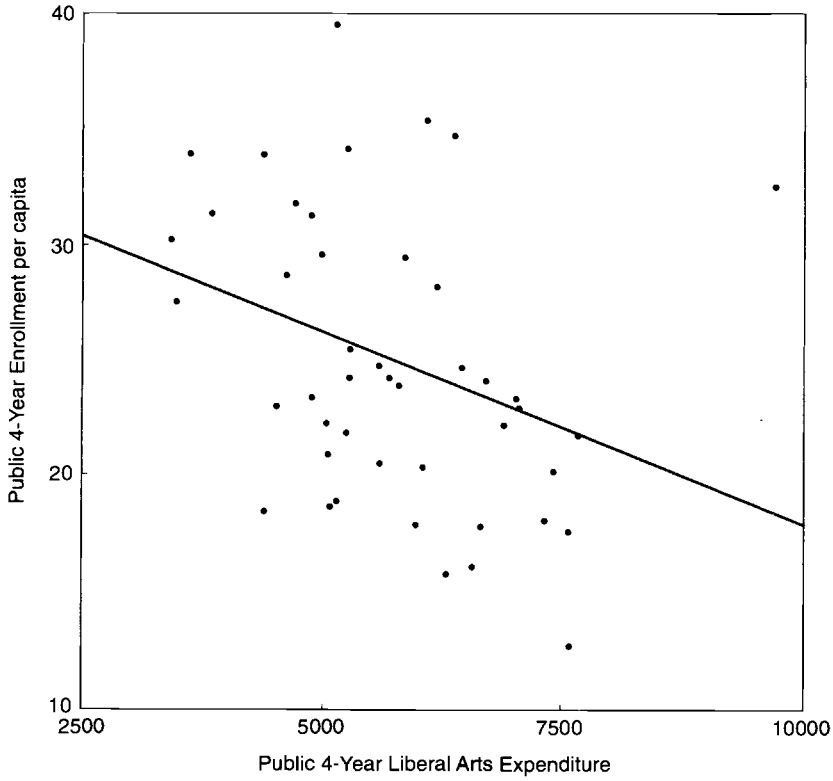

Fig. 8.10 Public four-year per capita enrollment and per student expenditure

The level of tuition and the subsidy represent two sides of a coin from a legislature's point of view; one can offer a low tuition and easy access to the system of higher education at a high budgetary cost, or one can cut budgetary costs by offering a high tuition. To see how these policy choices vary among states, we calculated the ratio of tuition to per student expenditures individually for both two-year and four-year nonuniversity public institutions. The variation in both was substantial. For two-year schools, the tuition-to-expenditure ratio varied from a low of 6.3 percent in California to a high of 63.6 percent in Pennsylvania (with a mean of 22.5 percent). For four-year colleges, the range ran from a low of 11.4 percent in Alaska to a high of 63.2 percent in New Hampshire (with a mean of 28.3 percent).

Interestingly, these tuition rates are positively correlated with private per capita enrollments (the correlation coefficient is 0.31 for two-year institutions and 0.29 for four-year colleges). Thus, legislatures in states with substantial private alternatives tend to charge higher tuition than do states with relatively little to offer in the private sector. These results are apparently supply-side rather than demand-side driven. Presumably, providing easy access to the

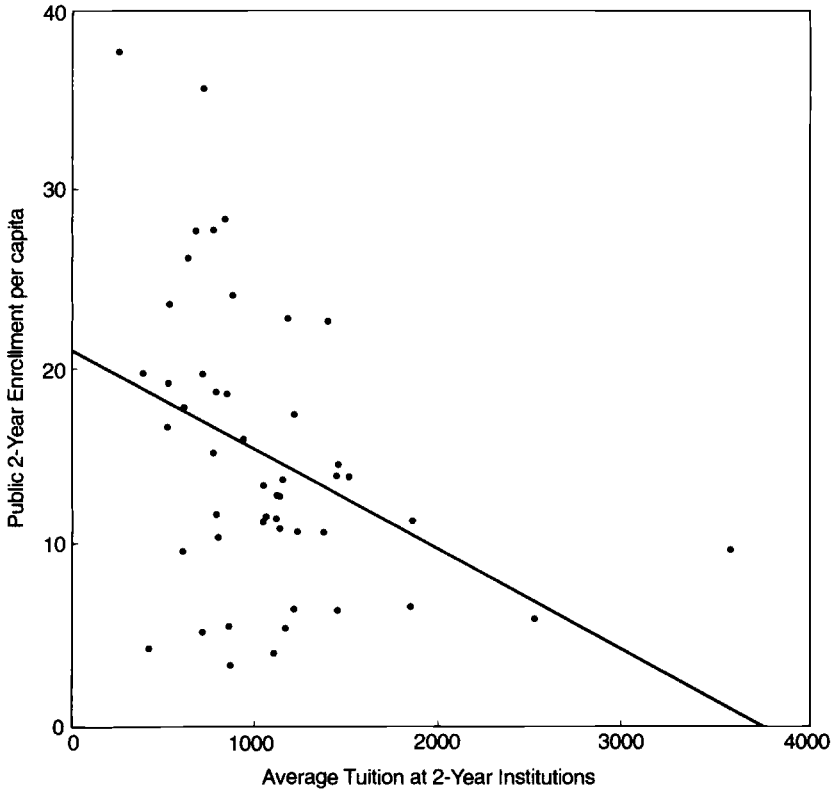

Fig. 8.11 Two-year public tuition and enrollment

public sector is most important in states whose residents have little in the way of in-state private-sector options.

Note the clear regional pattern to the levels of tuition charged by public systems of higher education. As the bar cart in figure 8.13 shows, public tuitions are lowest (and subsidies highest) in the West, while tuitions are at their peak in the East.[20] Public tuitions in all regions are small in relationship to private tuitions. Figure 8.14 illustrates this, along with the fact that private tuitions are at their peak in the East and are lowest in the South.

To pursue the public-private analysis along a further dimension, we distinguished between public tuition for state residents and nonresidential tuition. The general pattern can be seen in figures 8.15 and 8.16. The former shows the statewide variation in the ratio of residential tuition to expenditures per FTE student; the latter shows the comparable ratio for nonresidential tuition. Because of comparability issues, it is more instructive to make relative com-

20. The pattern is unchanged when we deflate tuition by a cost-of-living index.

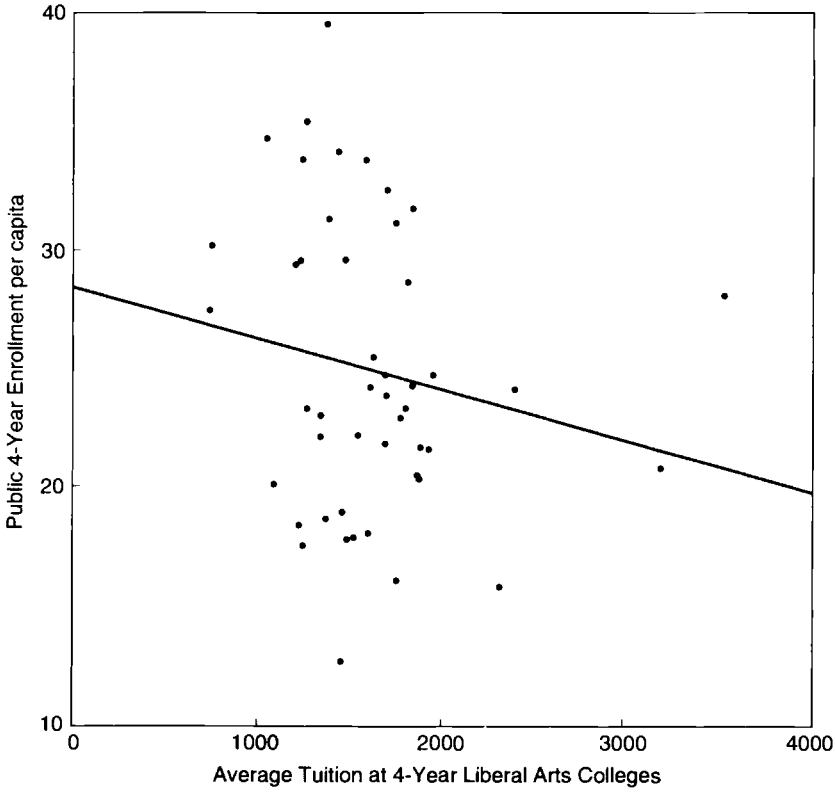

Fig. 8.12 Four-year public tuition and enrollment

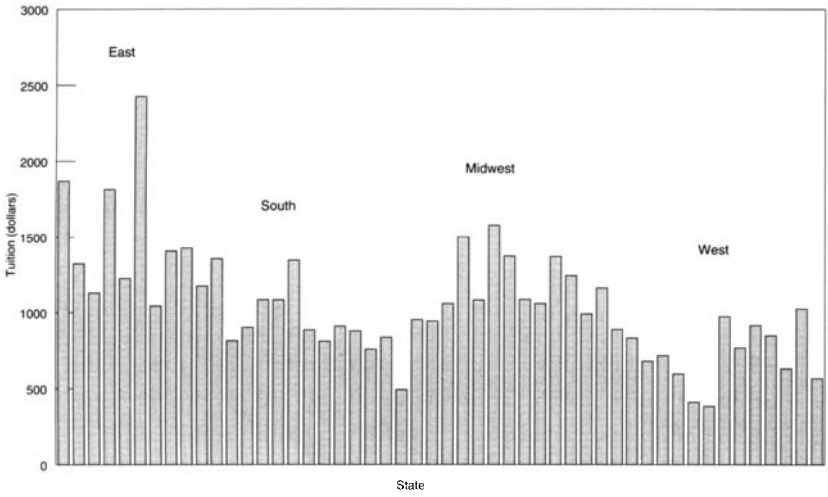

Fig. 8.13 Tuition at public institutions by region

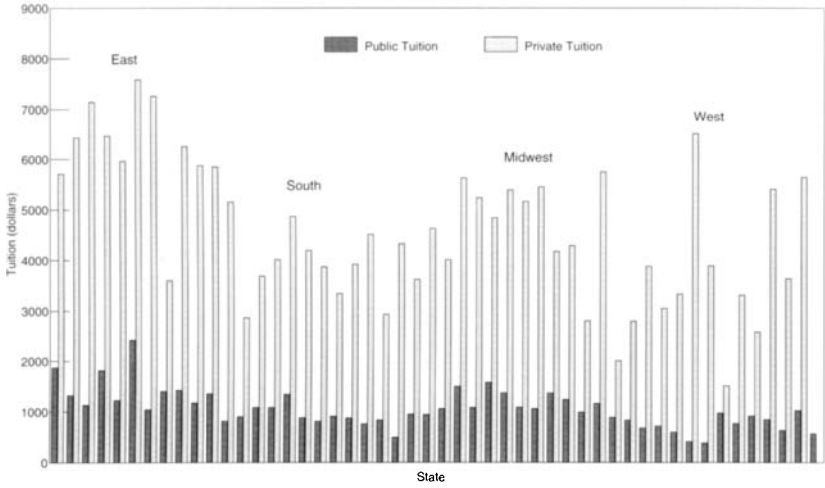

Fig. 8.14 Public and private tuition by region

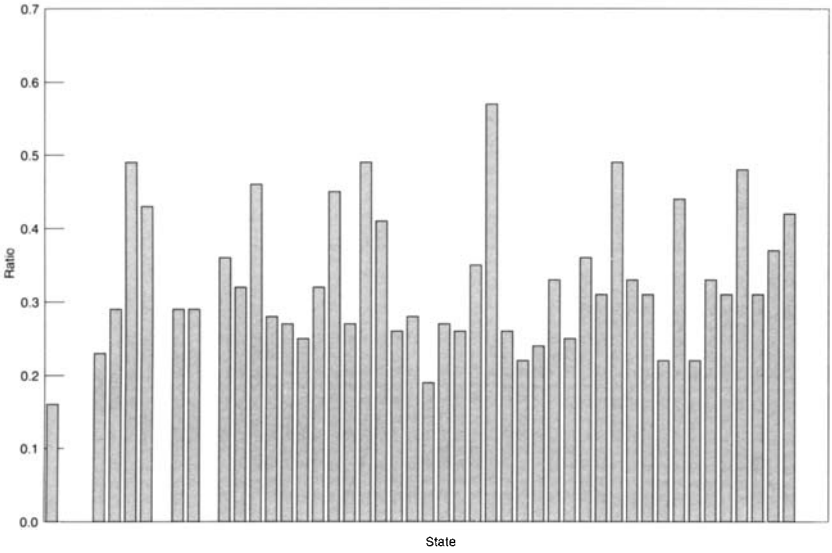

Fig. 8.15 Ratio of nonresidential tuition to expenditure per FTE public student

parisons than to reflect on the difference between these ratios and the full-funding fraction, 1.0.[21]

21. The former was given by TUITR/EXPLAPUB, the latter by TUITNR/EXPLAPUB. In both cases, we attempted to make the 1985 tuitions comparable to the 1988 expenditures, using the overall consumer price index to adjust.

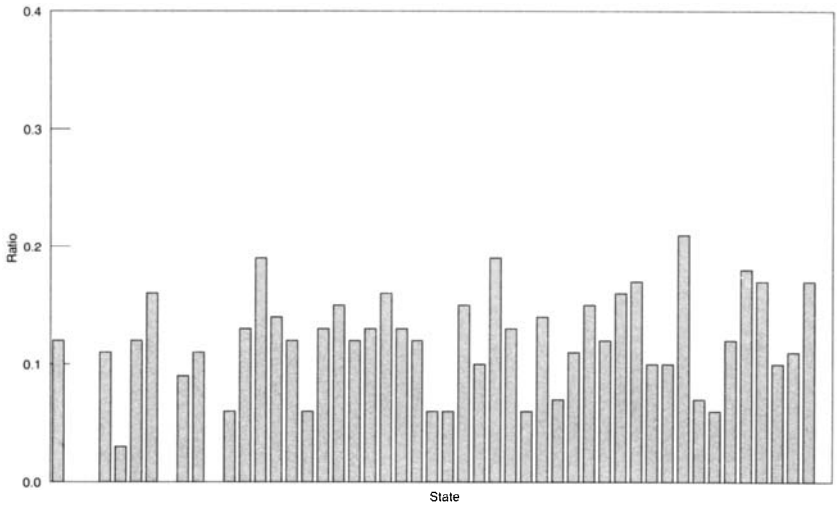

Fig. 8.16 Ratio of residential tuition to expenditure per FTE public student

There is substantial variation in the tuition ratios. Of the states reporting, resident tuition ratios are the highest in South Dakota, New Hampshire, and Indiana. The residential tuition ratios are several multiples higher than the states with the lowest tuition ratios—California, New Mexico, and Tennessee. Similarly, the highest nonresident tuition ratios occur in New Hampshire, Colorado, Massachusetts, and Oregon, while the lowest occur in Alabama, Missouri, South Carolina, and Tennessee. Overall, these two ratios are positively correlated as one would expect: states can generally be labeled as high-tuition or low-tuition states. One might expect to find that states use tuition rates (*a*) as a means of attracting talented out-of-state students who might choose to reside permanently in the state and (*b*) as a means of extracting payment from talented in-state students who might choose to leave the state after receiving a subsidized education. However, we found very little correlation between mobility and other demographic variables and the tuition ratio variables.[22]

Finally, we conclude this section with an unsettling, yet important, issue. We have carried out our statistical analysis on the presumption that there is a clearly defined distinction between public and private higher education. In fact, the distinction has always been a fuzzy one. The definition of what is public and what is private actually differs from state to state; the key distinction is *control,* not funding.[23] A public institution is publicly controlled

22. The exception is the proportion of the population that is black and the proportion that is Hispanic. Both were negatively correlated with both tuition ratios.

23. The distinction was a central issue in the *Dartmouth College* case, in which colleges, once chartered, were protected from state control. See Hofstadter and Smith (1961) for details.

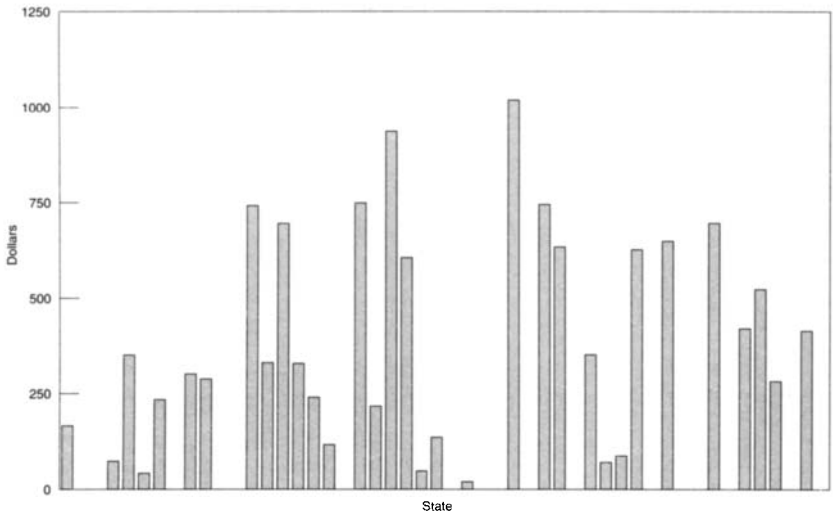

Fig. 8.17 Per student state support for private institutions

whether publicly or privately funded. Correspondingly, a private institution is privately controlled even if partly subsidized by public funds. As evidence of the confusion that would arise if funding were the source of the public-private distinction, examine figure 8.17. The bar graph illustrates the extremely wide divergence in per student public support for private institutions. Public support is very substantial in the eastern and midwestern states of New Jersey, Michigan, Maryland, and New York, yet essentially nonexistent in a large number of states, many of which are located in New England and the West. Overall, state public support for private higher education is highest in the Midwest and the East and lowest in the West. It is strongly negatively correlated with the mobility of the student population, a result consistent with the view that such subsidies may be most advantageous when given to a group of students that reside within the state.

Having discussed the relationships between enrollments and some of the important enrollment determinants, we now move to the statistical analysis of the statewide pattern of public enrollments.

8.4 An Econometric Model of Public Choices in Public Higher Education

The per capita public enrollment rate in a given state will be determined by the interaction of demand (students' choices) and supply (legislative choices). Further, both choices are highly dependent on the historical development of

private colleges and universities.[24] Unfortunately, the theories that we have sketched out do not provide us with a clear set of restrictions that allow us to identify demand and supply variables. We have attempted to make these distinctions, nevertheless, in order to relate our work to earlier literature and to provide some preliminary tests of the underlying theory. Caution should be used in reaching conclusions about structural parameters from the analysis that follows.

From the demand perspective, we expect the dependent variable, the per capita public enrollment rates (ENB), to be negatively related to the opportunity cost of getting an education, as represented by the unemployment rate (UNEMP), so that the coefficient of UNEMP would be positive. Similarly, as Hoenack and Weiler (1979) suggest, a higher unemployment rate may provide evidence of an increased value of a college degree (especially at a two-year school).

On the other hand, higher unemployment rates may be associated with lower family incomes, which would reduce the demand for higher education. We also expect the ENB to be positively related to the opportunity to find jobs. The number of service jobs per capita (SERV) provides one job-opportunity index. Given the employment trend away from manufacturing and toward the service sector, states with a higher proportion of service jobs are more likely, other things the same, to have job openings when economic conditions are good.[25]

With respect to the financing of public higher education, we expect enrollment rates to be negatively related to the direct out-of-pocket cost of education (average public tuition, TUITB, or the vector of tuition variables TCLAPUB [median tuition at four-year colleges] and T2YRPUB [median tuition at two-year public institutions]).[26]

Enrollments should also be positively related to the quality of public institutions in the state, as represented by the quality rating (QUALB) and by the level of expenditures per student (EXB). For all public schools—and two-year schools, where location is an important issue—we would also expect the cost of alternative private education (TUITV, or TCLAPRI—the median tuition at four-year colleges—and T2YRPRI—the median tuition at two-year institutions) and the level of competing private expenditures per student (EXV) to be relevant.

Finally, we have also included as a demand-determining variable the pro-

24. Thus, order of entry into statehood is highly correlated with enrollment rates. Order of entry is also highly correlated with a number of "demand" and "supply" variables. Consequently, we have chosen to present our results in terms of the latter. If order of statehood were added as an additional explanatory variable, it would be highly insignificant in both the demand and supply equations.

25. We found a host of other job-mix variables to be statistically insignificant and to have insubstantial coefficients.

26. Corman and Davidson (1984) relate enrollment rates in two-year and four-year colleges to tuition, unemployment, and income. Sulock (1982) has a similar analysis of community colleges.

portion of the population aged 18–24 (YOUNG). This variable not only measures the demand of the most relevant subgroup of the population but also has the effect of translating our dependent variable, enrollments per capita, into an enrollment rate per population aged 18 to 24.[27]

From the legislative supply perspective, we expect higher enrollment rates to provide direct social benefits of higher education to the state as well as benefits to legislators who are responding to the interest groups made up of potential students (and their families) and potential employers.[28] Thus, we would expect a positive relationship between the enrollment rate and income (INC) and the percentage of the population that is in the 18–24 age group (YOUNG).

We would also expect a positive relationship between the enrollment rate and the elasticity of the state's tax base (ELAST80);[29] a state is likely to find it politically easier to raise revenues to finance public education if state revenues are likely to increase substantially with growth (thus obviating the need to raise tax rates).[30] In addition, we expect a negative relationship between the relative price of goods in the state (PRICE) and the public subsidy to education (SUPPB).

Other variables that would arguably affect legislative supply are the proportions of the population that are black (BLACK) and Hispanic (HISP), as minority groups might provide political pressure, especially with respect to the provision of two-year educational opportunities; the proportion of the population that is located in metropolitan areas (METRPOP), since the more urbanized the population, the greater access that students are likely to have to public higher education opportunities, especially for two-year schools; and a measure of the mobility of the population (MOBIL), because the more mobile the population, the lower the proportion of public benefits that reach citizens of the state.[31] This effect of mobility is likely to be masked, however, by the fact that MOBIL also provides a measure of the recent growth in a state's population, which we would expect to be positively related to enrollment supply.

We have also included the (endogenous) level of public tuition in the legislative supply equation, but its effect is certainly ambiguous. On one hand, a higher tuition provides more revenue and therefore lowers the financial pressures on the state. (Part of this effect will be reflected statistically, by the inclusion of the state appropriations variable.) On the other hand, a lower tuition

27. The translation would be exact if the enrollment variables were in logarithmic form. Thus, $\log(ENB/POP) - \log(POP18\text{–}24/POP) = \log(ENB/POP18\text{–}24)$.

28. See Hoenack and Pierro (1990) for a recent application of interest group theory to the legislative supply of public higher education in Minnesota.

29. It is, of course, possible that ELAST80 could itself be affected by the enrollment rate. We found that making ELAST80 an endogenous variable did not change any results significantly.

30. Clotfelter (1976) tests a different version of the "fiscal illusion" hypothesis. He finds a very small, insignificant relationship between his measure of tax complexity (a Herfindahl index calculated using nine categories of taxation) and per capita expenditures on higher education.

provides greater opportunities for students of all socioeconomic strata to obtain a public education, an important goal for the state systems of public higher education. The former argument would be consistent with a positive coefficient on TUITB, while the latter would suggest a negative coefficient. Finally, we have chosen not to include a direct measure of private-sector alternatives in our supply equation; we see the private-public distinction as more of a demand-side phenomenon. Nevertheless, we have tested alternative models in which per capita private enrollment (ENV) does appear as an additional variable.

We believe that tuition and public expenditures per student are most reasonably specified as endogenous variables. We also wanted to allow for a nonzero error covariance between demand and supply equations. We therefore estimated the student demand and legislative demand equations using three-stage least squares (3SLS) as well as ordinary least squares (OLS), the latter for comparison purposes. All of the variables that appear in the regression analyses are defined in table 8.2. The OLS and 3SLS results for overall enrollment rates are given in tables 8.3 and 8.4.[32] Results that are specific to two- and four-year institutions appear in tables 8.5 and 8.6. These were estimated using seemingly unrelated estimation, to account for the expected negative cross-equation negative error correlation.[33]

8.4.1 Student Demand

As expected, public tuition has a negative effect on the enrollment rates. The price elasticity of demand is about -0.20, obtained from the three-stage least squares regression, and suggests that overall student enrollment demand is price insensitive. Note, however (from table 8.5) that student demand for two-year enrollment has a substantially higher price elasticity, one that is consistent with several earlier studies. (Obviously, four-year enrollment is very insensitive to price; the elasticity is -0.04.) Finally, note that overall public enrollment is a substitute for private enrollment, since the sign on the private tuition variable is positive. (The cross-price elasticity, however, is quite low.)

Many of the other variables in the demand equation had the expected effect on enrollment demand. Higher per student expenditures and quality both increase student demand substantially. Consistent with the view that public and private education are substitutable to some extent, we find that higher private expenditures, tuition held constant, are associated with lower public enrollments.[34]

31. Clotfelter (1976) finds a negative relationship between mobility and per capita public expenditures. He measures mobility by the probability that a recent graduate living in a given state will move out of the state during at least one five-year age period during his or her working lifetime.

32. The residual correlation between demand and supply equations was 0.65.

33. The correlation was -0.38 in the demand system and -0.53 in the supply system.

34. A measure of the quality of private institutions had essentially no effect on enrollment demand and was dropped from the regression.

Table 8.2 Definition of Variables in Regression Analyses

Endogenous variables:	
ENB	Public enrollment per capita in 1984
ENB4	Four-year enrollment per capita in 1984
ENB2	Two-year enrollment per capita in 1984
EXB	Public expense per capita, 1984
EXPLAPUB	Comprehensive and liberal arts: total expense per FTE student, 1988 (median), public
EXP2YR	Two-year: total expense per FTE student, 1988 (median), private
EXP2YRB	Two-year: total expense per FTE student, 1988 (median), public
TCLAPRI	Comprehensive and liberal arts tuition, 1988 (median), private
TCLAPUB	Comprehensive and liberal arts tuition, 1988 (median), public
T2YRPRI	Two-year tuition, 1988, private
T2YRPUB	Two-year tuition, 1988, public
TUITB	Average undergraduate tuition and fees, 1985, public
Student demand:	
EXPLAPRI	Comprehensive and liberal arts: total expense per FTE student, 1988 (median), private
EXP2YR	Two-year: total expense per FTE student, 1988 (median), private
EXV	Expense per capita, 1984, private
QUALB	Percentage of institutions rated good or excellent in Gourman report
SERV	Percentage of population employed in service industries
TUITV	Average undergraduate tuition and fees, 1985, private
UNEMP	Unemployment rate
YOUNG	Percentage of population 18 to 24
Legislative supply:	
BLACK	Percentage of population that is black
ELAST80	Elasticity of combined income and sales tax liability
HISP	Percentage of population that is Hispanic
INC	Median family income, 1979.
MOBIL	Percentage of residents of state in 1980 that were not residents in 1975.
METRPOP	Percentage of population in metropolitan areas
PRICE	Geographical price difference
SUPPB	State appropriation per FTE public student, 1988–89.
SUPP4	State appropriation per FTE four-year public student, 1988 (EXPLAPUB – TCLAPUB)
SUPP2	State appropriation per FTE two-year public student, 1988 (EXP2YRB – T2YRPUB)
Other variables:	
ASSC	Percentage of population receiving associate of arts degree
C	Constant
BACH	Percentage of population receiving bachelor's degree
DOCT	Percentage of population receiving doctoral degree
EAST	CT, DE, ME, MD, MA, NH, NJ, NY, PA, RI, VT
MAST	Percentage of population receiving master's degree
MIDW	IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, SD, WI
ORDER	Rank order of entrance into statehood
SOUTH	AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV
WEST	AK, AZ, CA, CO, HI, ID, MT, NV, NM, OK, OR, TX, UT, WA, WY

Table 8.3 **Student Demand for Public Enrollment**

Variable	Ordinary Least Squares	Three-Stage Least Squares
C	14.69	24.11
	(20.71)	(22.54)
TUITB	−0.0085*	−0.0076*
	(0.0025)	(0.0038)
EXB	0.078*	0.087*
	(0.019)	(0.027)
EXV	−0.014	−0.0051
	(0.011)	(0.011)
QUALB	6.58	2.45
	(6.27)	(6.51)
TUITV	0.0012	0.00068
	(0.00080)	(0.00075)
YOUNG	1.14	−65.18
	(162.23)	(194.78)
UNEMP	−3.71	−9.85
	(49.87)	(42.83)
SERV	116.08*	98.12*
	(32.45)	(28.71)
Adjusted R^2	.63	.68
Standard error of regression	5.03	5.16

*Coefficient is more than twice its standard error.

Table 8.4 **Legislative Supply of Public Enrollment**

Variable	Ordinary Least Squares	Three-Stage Least Squares
C	−9.35	−6.67
	(17.47)	(16.74)
TUITB	−0.0097*	−0.011*
	(0.0025)	(0.0038)
INC	0.0020*	0.0018*
	(0.00048)	(0.00044)
YOUNG	261.19*	277.56*
	(116.73)	(109.43)
ELAST80	8.17*	7.22*
	(2.63)	(2.51)
PRICE	−0.20	−0.20
	(0.14)	(0.14)
MOBIL	0.13	0.13
	(0.14)	(0.13)
BLACK	−3.67	−4.74
	(10.16)	(9.17)
HISP	21.59	9.89
	(13.45)	(13.16)
METRPOP	2.87	1.55
	(4.12)	(3.47)
SUPPB	−0.0023*	−0.0014
	(0.00091)	(0.00094)
Adjusted R^2	0.58	0.53
Standard error of regression	5.28	5.67

*Coefficient is more than twice its standard error.

Table 8.5 Student Demand for Two- and Four-Year Enrollment

Variable	Two-Year	Four-Year
C	−16.23	−15.10
	(23.50)	(21.66)
TCLAPUB	0.00082	−0.0012
	(0.0023)	(0.0021)
T2YRPUB	−0.0050*	−0.00097
	(0.0024)	(0.0022)
EXPLAPUB	0.0026*	−0.0018*
	(0.00088)	(0.00082)
EXP2YRB	−0.0024	0.0026
	(0.0014)	(0.0013)
TCLAPRI	0.00040	−0.0013
	(0.0013)	(0.0012)
T2YRPRI	−0.0012	−0.00081
	(0.00094)	(0.00086)
EXPLAPRI	0.00078	−0.00047
	(0.0015)	(0.0014)
EXP2YR	0.00062	0.00070
	(0.00069)	(0.00064)
YOUNG	115.44	260.89
	(158.33)	(145.91)
QUALB	17.64*	−4.24
	(6.57)	(6.06)
UNEMP	20.31	32.39
	(59.04)	(54.41)
SERV	87.97	106.24
	(107.44)	(99.02)
Adjusted R^2	0.34	0.021
Standard error of regression	6.01	5.54

*Coefficient is more than twice its standard error.

We find, as expected, that the number of service jobs per capita is positively related to enrollments. Surprisingly, the sign on the unemployment rate variable is negative. This could reflect the fact that individuals cannot afford the cost of education. More likely, however, this is the result of averaging, since the unemployment rate is positively related to enrollment rates in both the two-year and the four-year enrollment regressions of table 8.5.

Finally, the percentage of the population that is age 18 to 24 is positively correlated with demand in the overall ordinary least squares regressions and in the two-year and four-year regressions. The sign change in the two-stage least squares regression is puzzling, although it presumably results from the correlation of the unemployment variable with several of the instruments used (e.g., METRPOP).

8.4.2 Legislative Supply

In the two-stage least squares regression, legislative supply is negatively related to the level of public tuition per student, as well as to the level of

Table 8.6 Legislative Suply: Two- and Four-Year Enrollment

Variable	Two-Year	Four-Year
C	18.00	−5.12
	(22.26)	(16.90)
TCLAPUB	0.0031	0.0021
	(0.0019)	(0.0015)
T2YRPUB	0.0063*	−0.00044*
	(0.0019)	(0.0014)
TCLAPRI	0.00024	−0.0010
	(0.00076)	(0.00056)
T2YRPRI	−0.0011	−0.00025
	(0.00055)	(0.00042)
INC	0.00146*	0.00096*
	(0.00049)	(0.00037)
YOUNG	−93.04	312.41
	(130.02)	(96.43)
ELAST80	7.09	1.02
	(3.01)	(2.07)
PRICE	−0.39*	−0.19
	(0.18)	(0.13)
MOBIL	−0.23	0.14
	(0.16)	(0.12)
BLACK	29.22*	−26.53
	(11.42)	(8.55)
HISP	86.29*	−23.31*
	(19.48)	(15.09)
METRPOP	6.76	−5.58
	(4.36)	(3.38)
SUPP2	−0.00044	
	(0.00095)	
SUPP4		−0.00035
		(0.00044)
Adjusted R^2	0.50	0.50
Standard error of regression	5.10	3.82

*Coefficient is more than twice its standard error.

appropriation per student. The former result is difficult to interpret; given the difficulties of identification, it could merely reflect the negative relationship between student demand and tuition. In any case, it is consistent with a pattern in which states that choose to support public education by providing for high enrollments also support education by offering relatively low tuitions. The latter result suggests that legislatures recognize the direct trade-off between offering a low subsidy to a large number of students and offering a higher subsidy to a smaller group. The elasticity of -0.15 is similar in magnitude to the elasticity of student demand, suggesting that legislatures and students are only mildly cost-sensitive.

We also find that higher-income states offer substantially higher enrollments, as do states whose populations tend to be centered in metropolitan

areas and that have substantial Hispanic populations (the Southwest). However, states with substantial black populations (including the South) tend to offer lower levels of public enrollment.[35]

Finally, the elasticity of the tax base is, as expected, a positive and highly significant determinant of enrollment rates, a result that is consistent with the view that states' budgeting decisions are sensitive to the political ease with which taxes can be raised. (PRICE and YOUNG also have the expected effects.)

When we look at the two-year/four-year breakdown of enrollments from the legislative point of view, we find that two-year enrollment rates are very sensitive to tuition rates (at two-year schools), while four-year enrollments are much less so (in relation to four-year college tuition).[36] Other distinctions worth noting include the effect of mobility (the more mobile the population, the lower the two-year enrollments, other things equal) and the state appropriation (a positive but very small correlation between appropriations and four-year enrollments).

The most important difference between the two- and four-year enrollment equations lies with the race variables. Both BLACK and HISP (and also a related variable, METRPOP) have substantial positive effects on two-year enrollment rates. This may reflect the fact that black and Hispanic populations have formed effective interest groups in terms of achieving access to public higher education in a number of states; the result is consistent with the analysis of Grubb (1988). The result is surprising; however, it does not seem spurious—there is a negative but small simple correlation between the percentage of blacks in a state and the per capita enrollment in two-year institutions.

Also surprising is the substantial negative relationship between BLACK and HISP and four-year enrollments. The result for blacks may reflect to a substantial degree the fact that black populations are highest in the South, where four-year enrollments are low. However, the strong relationship between the Hispanic population and four-year enrollments is surprising to us, since the overall simple correlation between the two variables is essentially zero.

8.4.3 Expenditures

As a final exercise, we attempted to explain the statewide variation in expenditures on public higher education. The first column in table 8.7 describes overall per capita expenditures, while the second relates to per student expenditures on two-year and four-year colleges. In addition to some of the con-

35. When we allowed for a direct interaction between legislative supply and private-sector alternatives by including ENV as an explanatory variable, we found the coefficient to be negative and marginally significant in the ordinary least squares regression, and negative and insignificant when two-stage least squares was used.

36. The two- and four-year equation system was estimated using seemingly unrelated regression. The cross-equation residual correlation was -0.31.

Table 8.7 Public Per Capita Expenditures

Variable	All Higher Education	Two-Year and Four-Year College
C (two-year)	2.09	2.92
	(1.90)	(1.69)
C (four-year)		3.24
		(1.68)
LSUPPB	0.088	0.26*
	(0.15)	(0.11)
BACH	−0.020	0.10
	(0.040)	(0.028)
ASSC	0.016	−0.10*
	(0.051)	(0.044)
MAST	−0.058	−0.19
	(0.12)	(0.11)
DOCT	0.29	0.18
	(0.65)	(0.58)
LINC	0.31	0.21
	(0.38)	(0.24)
YOUNG	17.98*	7.77*
	(4.50)	(3.00)
ELAST80	0.25*	0.21*
	(0.095)	(0.069)
LPRICE	−0.97*	0.141
	(0.44)	(0.37)
MOBIL	−0.0030	−0.0033
	(0.0040)	(0.0035)
LENB	0.41	
	(0.32)	
LEN2/LEN4		−0.17*
		(0.042)
Adjusted R^2	0.71	
Standard error of regression	0.15	0.20

*Coefficient is more than twice its standard error.

trol variables that we used in the supply-demand equations, we have included five additional variables. The first is an endogenous variable, the enrollment rate, which reflects the effect of size on per capita expenditures: a negative elasticity would suggest that there are scale economies associated with the provision of higher education, whereas a positive elasticity could reflect the additional scope of programs associated with larger enrollments. The remaining four variables are included to reflect the degree mix of the students attending public institutions.

The equations in table 8.7 were estimated using two-stage least squares and three-stage least squares, respectively. A number of variables, shown with a prefix L, were introduced in logarithmic form to allow for the direct estimation of elasticities. For the two-year and four-year schools, the most important

program-mix variable was the percentage of students receiving associate of arts degrees, the usual two-year degree offered. In addition, the percentage receiving master's and doctor's degrees had the expected negative effect on spending; surprisingly, however, there was no relationship between per student expenditure and the percentage of bachelor's degrees offered.

It is not unexpected to find a strong positive relationship between state appropriations and expenditures, nor perhaps to find a similar relationship between the elasticity of the tax base and spending (the coefficient of ELAST80 was high in both expenditure equations). It is more surprising, however, to find a relatively low income elasticity of demand for higher education (expenditures), although our elasticity of .31 overall is higher than that found by Clotfelter (1976).

Note also that the price variable had the expected negative effect in the overall equation, but not when the model was restricted to two-year schools and four-year colleges. The migration variable had a negative coefficient in both equations, consistent with the view that a more mobile population leads legislatures to spend less money per pupil on public higher education, other things equal.

8.5 Concluding Remarks

Our analysis of the statewide patterns of public enrollments and expenditures has emphasized the close link between the public and private sectors. Because private higher education was dominant in the first 100 years of our history, public higher education developed in its shadow. As a result, public higher education enrollments and spending have been highest primarily largely in the West and Midwest, where private educational opportunities have historically been limited.

When seen from a cross-sectional point of view, this historical pattern shows up as a negative relationship between public and private enrollment rates. A group of primarily eastern states offer a high private enrollment (often high-quality), low public enrollment bundle of higher education opportunities, while a substantial group of primarily western and midwestern states offer high public (often high-quality), low private enrollment rates. The important exception to this general rule is the South, where most states offer low public, low private (and generally lower-quality) enrollment bundles.

What light do our empirical results shed on the alternative theories of public choice that we sketched out at the beginning of the paper? The human capital and mobility approach is supported, but only weakly, by the negative coefficient on the mobility variable that we obtained in the two-year institutions equation (table 8.6) and by the negative coefficients in the per capita expenditure equations (table 8.7).

There is also some support for the second public-choice explanation, in which politicians use logrolling to trade for forms of public higher education

that benefit their constituencies. The growth of two-year institutions is consistent with this view; logrolling may have led to the creation of a large number of new institutions in a sufficiently large number of legislative districts so as to make the entire educational package politically viable. Note, however, that there is only very mild empirical support for the Leviathan perspective on the growth of government; in the legislative supply equation, we find higher enrollments and higher expenditures to be positively related to the elasticity of the tax base.

The growing emphasis on two-year institutions, especially in the West, is also consistent with the view that public education is a means of distributing state resources to the middle class. But this theory does not explain why such institutions have been so successful in other areas of the country.

A clean, convincing test of these and other theories that explain public choices in public higher education awaits further research. We hope that this paper has helped to mark the way.

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Appendix
Sources and Definitions of Variables

Variable	Definition/Explanation	Source*
ASSC	Percentage of population receiving associate of arts degree/number of earned associate degrees	18
BACH	As ASSC, but bachelor's degree	18
DOCT	As ASSC, but doctoral degrees	18
EAST	Northeastern region/Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont	8
ELAST80	Elasticity of combined income and sales tax liability/income elasticity of the sum of personal income and sales tax liabilities	14
ENB	Enrollment in public institutions per capita, 1984/students whose programs of study are creditable toward a bachelor's or higher degree and also undergrads in one–, two–, three–, or four–year occupational programs which are not chiefly creditable toward a bachelor's degree, per capita	1
ENB4	Enrollment in four-year public institutions, per capita, fall 1984	1
ENB2	Enrollment in two-year public institutions, per capita, fall 1984	1
ENTERO	Order of statehood	1
ENV	Enrollment in private institutions per capita, 1984/as ENB	1
ENV4	Enrollment in four-year private institutions, per capita, fall 1984	1
ENV2	Enrollment in two-year private institutions, per capita, fall 1984	1
EXB	Total expenditures per FTE student, 1988, in public institutions/median of reported institutions	3
EXPLAPRI	As EXPLAPUB, but private	17

*See listing below for numbered list of data sources.

EXPLA-PUB	Total expenditures per FTE student, 1988, in comprehensive and liberal arts public institutions/median of reported institutions	16
EXP2YR	Total expenditures per FTE student, 1988, in two-year private institutions/median of reported institutions	17
EXP2YRB	As EXP2YR, but public	16
EXV	As EXB, but private	3
INC	Median family income, 1979/median money income of families	9
MAST	As ASSC, but master's degrees	18
METRO-POP	Percentage of population in metropolitan areas/percentage in 1 of 261 metropolitan statistical areas and 20 consolidated metropolitan statistical areas	10
MIDW	Central region/Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin	8
MOBIL	Percentage of residents of state in 1980 that were not residents in 1975/only includes residents over five years of age in 1980	9
PRICE	Geographical price differences/cost of government index, 1988: prices and wages that would be paid for a fixed market basket of public services	15
POV	Poverty normalized/percent of children 1–18 years old below poverty line, 1980	15
QUALB	Proportion of high-quality public institutions/percentage of Gourman-rated public institutions rated strong or good, rating based on size, quality of faculty, depth and breadth of curriculum, athletics, etc.	5
QUALV	Proportion of high-quality private institutions/as QUALB	5
SERV	Percentage of population employed in service industries, 1980/ratio of service employees to population	12
SOUTH	Southeastern region/Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Missis-	8

	sippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia	
SUPP	State appropriation per FTE private student, 1988–89	15
SUPPB	State Appropriation per FTE public student, 1988–89	15
SUPP4	State appropriation per FTE comprehensive or liberal arts student, 1988 (EXPLAPUB − TCLAPUB)	16
SUPP2	State appropriation per FTE two-year public student, 1988 (EXP2YRB − T2YRPUB)	16
TCLAPRI	As TCLAPUB, but private	17
TCLAPUB	Tuition in comprehensive and liberal arts public institutions, 1988/median of reported institutions	16
T2YRPRI	As T2YRPUB, but private	17
T2YRPUB	Tuition in two-year public institutions, 1988/median of reported institutions	16
TUITB	Average undergraduate tuition and fees, public, 1985/mean tuition and fees by students enrolled	3
TUITNR	Tuition of nonresidents, 1979–80/average tuition of nonresidents as undergraduates in public institutions	20
TUITR	Tuition of residents, 1979–80/average tuition of state residents as undergraduates in public institutions	20
TUITV	Average undergraduate tuition and fees, private, 1985/mean tuition and fees by students enrolled	3
UNEMP	Proportion unemployed, 1980/percentage of labor force not employed	11
WEST	Western region/Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, Washington, Wyoming	8
YOUNG	Proportion of college-age population/percentage of population in 1980 and 18- to 24-year age range	9

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Comment

Helen F. Ladd

Spending on public higher education represents a substantial component of many state budgets. In 1989, spending on higher education accounted for 20 percent of total direct general spending by states and exceeded 25 percent in 11 states. Given its significance for state budgets, state legislators must continually grapple with issues such as how much public higher education to provide, of what kinds, at what quality, and at what price to students.

John Quigley and Daniel Rubinfeld vividly describe the tremendous variation in state policies toward higher education. They show, for example, that states in the West typically provide extensive access to public colleges and universities (as measured by enrollments per 1,000 population) while states in the East typically rely less on public provision in favor of private provision. Consistent with this finding is a negative relationship between public and private enrollments. Tuitions for public universities as a share of public spending vary across states from a low of 6.3 percent in California to a high of 63.6 percent in Pennsylvania, and the quality of public education varies from very high (according to one source) in states such as Arizona, California, and Iowa to low in many southern states. The mix between two- and four-year colleges also varies across states, with a generally negative relationship between two-year and four-year enrollment rates.

This variation raises a variety of interesting questions about the "legislative supply decision," which is the central focus of the Quigley and Rubinfeld (henceforth QR) paper. In examining public choices in public higher education, the authors have taken an exploratory approach. They have intentionally avoided the traditional format of presenting and then testing a particular theory. The result is a paper with a tremendous wealth of information, a model that tries to sort out the supply-side determinants from the demand determinants of enrollments, and a few reflections about alternative theoretical views that might be consistent with the enrollment patterns they observe. I have no difficulty with the authors' decision not to test specific theories (the theories they discuss in section 8.2 are all quite general and hard to test with any precision). However, as I discuss below, the paper's lack of focus leaves room for additional speculation about the underlying objective function of state legislatures and research focused on specific policy-related questions.

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Descriptive Results

Three major conclusions emerge from the descriptive section of the paper. The first has already been mentioned, namely, the tremendous variation in policies across states. The second is that public higher education differs quite notably from that controlled by the private sector. Major differences include the significantly lower tuitions at public universities and the large presence of community, or two-year, colleges. (Another major difference not discussed by QR is the higher proportion of in-state students. In my home state of North Carolina, for example, the legislature limits the percentage of out-of-state students to 8 percent, while the proportion of such students at Duke University, a private institution, is about 85 percent). These differences suggest that public and private higher education are not perfect substitutes and that, as we try to model the legislative supply decision, we need to think quite carefully about the nature of the service being provided.

The third conclusion to emerge from the descriptive analysis is that decisions about higher education are heavily path dependent and reflect cultural and historical factors that are hard to model. The observation that private colleges and universities emerged before public institutions of higher education makes it unsurprising that older states rely more heavily on private than on public education and that the reverse is true for younger states. Somewhat surprisingly, QR seem to ignore this key role of history in the model they present in the following section of the paper. The notion that 1985 levels of variables such as income, employment, tuition, and unemployment are the key determinants of 1985 levels of public enrollments seems inconsistent with the story they tell in the first section. Consequently, I would be much more comfortable with a panel data set that would allow them to focus on how changes in the explanatory variables affect changes in enrollments or other variables during, say, a 20- or 25-year period. Assembling a panel data set of this type, however, would be a formidable task.

The QR Model

One of the authors' contributions is to shift the primary focus away from expenditures onto a more appropriate measure of the supply of higher education, namely enrollments. Although enrollments are a measure of inputs, QR argue that they are a reasonable proxy for output. Even this measure, however, is not without its problems. Presumably, the legislature does not control enrollments directly. Instead it controls variables such as admissions policy (e.g., admission to all applicants meeting some minimal standard), the amount of resources in the educational system, and tuitions which, together with student demand, determine enrollments. Nonetheless, the use of enrollments can be viewed as a reasonable first step in understanding public choices about higher education.

The starting point for QR's demand equation appears, quite sensibly, to be a model of investment in human capital. That is, students weigh the costs of attending college against the benefits. Costs are measured by tuition and foregone opportunities as proxied by the unemployment rate. However, the unemployment rate could be a proxy for other variables as well and actually enters some of the estimated equations with an unexpected positive sign. Benefits are measured by an index of quality, expenditures per pupil, and jobs in the service sector. The low skill requirements of many service jobs make me question how well this variable proxies job opportunities for college graduates, but at least it enters the equation with the expected positive sign. In addition, the equation appropriately includes the cost of alternatives and the proportion of the population in the relevant age range. Alternatively, we could view higher education as a consumer good. According to this approach, family income should be in the demand equation. Similarly, the racial mix of the population may also belong in the equation. I suspect that these variables were excluded from the demand equation purely for purposes of identification.

The specification of the supply side also raises questions, some related to included variables and others to important variables that are missing. The equation correctly includes the income of state residents and a measure of their mobility, but both deserve further refinement. Because students from the highest-income families probably choose private colleges and those from the lowest-income households often do not attend college, the demand for public institutions most likely emanates from the middle class. This observation suggests that the equation should include measures of the distribution, as well as the level, of income. With respect to the mobility variable (measured as the proportion of residents living in the state less than five years), the authors point out that the sign should be negative unless it picks up the effects of population growth, in which case it should be positive. The obvious question then becomes, why not control for growth directly in order to sort out the two effects?

Missing from the supply equation is the education level of the state population. Presumably, the proportion of the population with college degrees could be an important indicator of tastes for public services. Another variable missing from the equation is the supply of private-sector alternatives. The omission of this variable is surprising, given the centrality of the public versus private trade-off that emerges from the descriptive analysis. The presence of private-tuition variables in the demand and some of the supply equations helps, but I am not convinced that the tuition variable alone captures the full effect of private universities on public enrollments.

Three main results emerge from the model. The first is the low price elasticity of demand for higher public education. According to the model, this elasticity is $-.20$ overall and close to 0 for four-year colleges. These estimates seem low relative to the consensus from other studies of about $-.70$. In addition, the extreme inelasticity for four-year colleges poses a puzzle of why

states do not raise tuitions. A second result is the role of the elasticity of the tax base. I must admit that I am suspicious of the causal link between the elasticity of the tax base and enrollments, since it runs directly counter to recent work by Feenberg and Rosen (1987), whose careful study based on panel data provides no support for the hypothesis that the elasticity of the tax base affects state spending. I suspect that the QR finding reflects a simultaneity problem: states that provide above-average supplies of public higher education may happen to be those with elastic tax structures.[1] Finally, the race variables affect two-year and four-year enrollments quite differently. The greater the proportion of blacks and Hispanics, the greater the two-year enrollment but the lower the four-year enrollment. Why minority groups would push for two-year but oppose four-year institutions is surprising and deserves further analysis.

What Might We Learn from Additional Work on this Topic?

Additional work on the supply of public higher education could take two different approaches. The first would be to start with a more explicit objective function. Three possible objective functions come to mind. First, in order to promote state economic development, legislators could be trying to maximize the enrollment of state college–age residents. If this were the goal, they would be indifferent between private and public enrollments. Alternatively, in order to garner voter support, legislators may be interested in maximizing enrollment in public institutions. Through the vehicle of public education, they transfer resources to many middle-class residents in the form of in-kind subsidies. Finally, state legislators may be motivated by the desire to maximize political support from employees of state institutions. Working through the implications of each of these objective functions might well lead to equations that can be more precisely specified than those of QR and that yield specific testable hypotheses.

Second, additional work could focus on some of the policy-related questions raised by the wide variation across states in the provision of public higher education. The first set concerns the relationship between public and private colleges and universities. The second set concerns tuition policies, and the third concerns the mix of public enrollments between two-year and four-year institutions. QR provide descriptive information on these questions, but their model provides little explanation of the differences across states.

Substitutability between Public and Private Options

Why do some states provide extensive systems of public higher education, while others do not? The simple answer suggested by QR's descriptive analy-

1. QR assert that the finding remains when they make the elasticity variable endogenous, but further exploration of this finding is warranted.

sis is that states will provide more public education the fewer are the private-sector opportunities in the state. For example, the New England states, which have many high-quality private universities and colleges, have chosen to provide limited amounts of higher education through public institutions, while the reverse is true in many western states. But this answer is insufficient since it does not explain how states with private institutions are able to resist the pressure for public education. As illustrated by QR, private education is not the same as public education, especially in terms of tuition. To think about the effect of private institutions on public institutions, consider how legislators in South Carolina might respond if a wealthy donor established a new, high-quality private university in that state. Given the differences between public and private education, it is entirely plausible that state legislators might not change their support of public higher education at all. Thus, the first interesting question is the extent to which the presence of private institutions affects the provision of public institutions.

Despite the puzzles about public-private substitutability that emerge from the descriptive part of the paper, QR hardly address this issue in the modeling portion of the paper. As noted earlier, neither the quantity nor the quality of private-sector options is included in the public-sector supply equation. Consequently, the QR model can provide no insights about how legislators adjust their support for public colleges in response to the differences in private institutions. Additional work in this area would be useful.

A related question concerns the responsiveness of private enrollments to changes in the quality and quantity of public opportunities. The current state budget crunch has forced many states to reduce appropriations for public higher education and to raise tuitions. To the extent that public and private education are substitutes, one would predict that the deterioration in the public-sector options induced by the budget crunch would lead to increased demand for private-sector options. To determine the magnitude of this response, the level of enrollments in the private sector would need to be modeled explicitly as a function of, among other variables, the quality, quantity, and price of public-sector options.

Tuition policy

Why do tuitions at public universities vary across states? Why, for example, does North Carolina charge low tuitions and Michigan high tuitions? The difference in the average income of residents in the two states probably provides a substantial part of the answer. However, even if income differences account for a large portion of the cross-state variation in tuition policy, one would still want to explore the reasons why income matters. What goals are legislators trying to achieve in providing low-price public colleges and universities? Are they keeping the price low to transfer resources to middle-income taxpayers or because they believe low tuitions will foster economic growth? Taken at its face value, the QR conclusion that the price elasticity of demand for four-year

colleges is zero suggests that maintaining low tuitions at four-year colleges has no effect on enrollments and consequently may have little impact on the supply of human capital in the state. Additional insights about goals might also emerge from a close examination of the ratio of in-state to out-of-state tuitions and about admissions policies. In any case, there is room here for more research.

In addition to understanding more about the variation in tuition levels across states, it would be desirable to learn more about the political or budgetary pressures that induce states to increase tuition at public universities. It would also be interesting to find out how, if at all, the structure of tuitions is changed as tuitions are raised. A comparative analysis of changes in tuition policies during both the 1990–91 recession and the 1981–82 recession might produce some interesting insights into the political economy of tuition changes.

Composition of Public Systems

Finally, it would be worthwhile to try to understand more about the composition of public systems. QR describe the recent dramatic growth in two-year colleges. Why did they grow faster in some states than in others? Again, a better understanding of the objectives of state policymakers would be helpful. Related to the two-year/four-year mix is the more general question of how states allocate funds among the different parts of the university system. How are flagship campuses treated relative to other campuses? Are there swings in support over time for flagship campuses and, if so, why? In this regard, it might be interesting to look at the role graduates of state schools play in the state legislature. More generally, one might investigate the lobbying power of employees in state higher education. Presumably, once a state system is set up, the education establishment provides a natural lobbying group in the form of state employees.

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