

RETHINKING PUBLIC EDUCATION[†]

The Origins of State-Level Differences in the Public Provision of Higher Education: 1890–1940

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In recent years, the publicly controlled sector has accounted for about 67 percent of all students in four-year institutions of higher education, whereas in 1897 the figure was only 22 percent.¹ The transition was early and swift, however, for on the eve of the United States' entry into World War II almost 50 percent of all students were in public-sector institutions. Thus, by 1940 more than 60 percent of the century-long expansion in public-sector enrollments (four-year) had already taken place. The relative rise of public higher education occurred decades before the rapid postwar acceleration of college enrollments and is apparent even without including community colleges.

Differences across states in public-sector enrollments and in public support for higher education were considerable in the past but narrowed markedly after 1950. In 1929, enrollments in publicly controlled institutions averaged 6 per 1,000 residents in the Mountain

and Pacific states, but only 0.8 per 1,000 residents in New England. State and local spending on higher education was \$2,057 per 1,000 inhabitants in the Mountain states, but just \$458 per 1,000 inhabitants in New England. In 1900 the cross-state coefficient of variation of public-sector enrollments per capita was 1.14, but this fell to 0.60 by 1929 and stands today at about 0.21. The convergence for the private-sector figure was far less (0.88 in 1900 and 0.70 in 1994). Changes in the cross-state variation in spending per capita and in public-sector tuition are similar.

Despite the potent forces of market integration (Caroline Hoxby, 1997), many higher-education indicators exhibit substantial long-term persistence. A strong relationship exists at the state level between private-sector enrollments per capita today and those in 1900 ($\rho = 0.64$). A strong correlation ($\rho = 0.46$) also exists between public higher-education spending per capita today and the year of statehood (see also John M. Quigley and Daniel L. Rubinfeld, 1993). States admitted earlier have stronger private sectors and less well-supported public sectors, and the relationship is more complex than a simple difference between the Northeast and the Far West.

Both the public and private higher-education sectors evolved in the 1890–1940 period. Fundamental changes in the creation and diffusion of knowledge, such as the specialization of disciplines, the professionalization of many occupations, the secularization of higher education, the increased role of research, and the ascent of the “university” form, altered the industrial structure of higher education. These changes increased the scale and scope of institutions and gave a productivity advantage to certain public-sector institutions.

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¹ In the interest of brevity, all citations for recent data are U.S. Department of Education (1996) and “today” means 1994. For all other data sources, see Goldin and Katz (1998). The share of total enrollments accounted for by publicly controlled institutions in 1994 was 78 percent when two-year institutions are also included. The term “public sector” in this paper means “publicly controlled sector.”

Thus history matters in understanding the higher-education industry. We look here at the origins of state-level differences in support for public-sector higher education. We address why higher-education enrollments increased more in the public than in the private sector long before the great advance in college enrollments and why certain states historically have provided more generous support to their public institutions of higher education.

I. The Evolution of Higher Education to 1940: Supply and Demand Factors

The relative growth of enrollments in public-sector institutions was but one part of a larger set of changes that swept knowledge creation and diffusion around the turn of the 20th century (see Laurence R. Veysey, 1965). During the early to mid-19th century, institutions of higher education were often staffed by a handful of faculty, each of whom taught several subjects. The diffusion of the scientific method, practically oriented courses, the "lecture" method of teaching, and disciplinary specialization fundamentally altered the knowledge industry (see e.g., Alexandra Oleson and John Voss, 1979). An intricate division of labor began to permeate higher education, and with it came greater economies of scale in the production of higher-education services. But more important to the story at hand is that the diffusion of knowledge became closely bound up with the *creation* of knowledge. Research became the handmaiden of teaching that we believe it is today.

Three additional changes, somewhat separate in their causes, added to the altered structure of the higher-education industry and to the relative growth of the public sector. One was the secularization of the college. A second was the growth of professional schools. The last, and most important, was the emergence of an overarching, umbrella organization known as the "university" and the integration of professional schools into it.

A "university" is not just a department store of education services brought together for the benefit of its student-clients. Rather, the modern university is a production center in which the research of one part enhances

the teaching and research of the other parts. The "university" form was an organizational innovation enabling the exploitation of technical complementarities among its various components. The public sector had a disproportionate share of universities early in the period under study, and they grew faster than did those in the private sector before World War II. The fact that the publicly controlled sector was disproportionately established in the university, research-oriented form gave it a substantial advantage before 1940.

Certain universities had, as well, the capacity to bestow reputation on new divisions in untried areas, such as business schools, and in areas plagued by claims of quackery, as were medical schools in the wake of the 1910 Flexner Report. Thus, the university came to have all three types of characteristics: those of the "department store," the "integrated factory," and the "brand name."

An essential ingredient in the changing nature of higher education was the enormous increase in the supply of potential clients after 1910 with the rise in graduation rates in American high schools. In 1910, less than 10 percent of young Americans graduated from public and private secondary schools, but by the mid-1930's about 50 percent did in most states outside the South (Goldin, 1998). Moreover, the increase was greater in states having well-functioning public higher-education institutions. High-school graduation rates expanded more rapidly from 1910 to 1928 in states with larger public-sector undergraduate enrollment rates in 1910 (Goldin and Katz, 1997).

II. Changes in the Structure of the Higher-Education Sector

Educational institutions, in both the public and the private sectors, expanded in scale and scope in the half century before 1940.² In 1897 the median private institution had 128 students, and the median private student was in

² We exclude, in this discussion, all independent teachers' colleges, two-year colleges, and students in the preparatory departments of higher-educational institutions.

an institution with 505 students. In the public sector these two measures were 242 and 787. Publicly controlled institutions in 1897 were, on average, larger than private ones, but they were not very much larger, and the largest were private. By 1923 the average institution in both sectors had grown substantially, but public-sector institutions had grown far more. The median private institution had 357 students, and the median student in the private sector was in an institution with 1,685 students; the public-sector numbers were 1,225 and 3,950. The average public-sector institution grew by a factor that was 1.8 times the corresponding factor for the private-sector. By the 1920's, public-sector institutions of higher education had become large, research-oriented universities.

Anecdotal evidence, bolstered by quantitative results given below, suggests that, in states having a concentration of economic activity by industrial-output, farm-product, mining, or oil interests, the public sector invested heavily in training and research. Wisconsin did research on dairy products, Iowa on corn, Colorado and other Western states on mining, North Carolina on tobacco, and Oklahoma and Texas on oil exploration and refining (Nathan Rosenberg and Richard R. Nelson, 1993). States subsidized the training of professionals for whom they perceived a need. In 1923 engineers were 15 percent of all students in four-year public institutions but only 5.4 percent in the private sector, and 60 percent of all engineers were trained in the state sector. State institutions of higher education attained the status of "university" to a greater extent than did privately controlled institutions, for they had all the component parts *and* state research funds when funds were less available elsewhere.

III. What Accounts for the Relative Growth of Public Higher-Education Institutions?

From 1897 to 1940 the fraction of students in publicly controlled institutions increased from 0.22 to just below 0.5 including junior colleges, and to around 0.45 excluding them. From 1933 to 1990 the series, which includes teachers' colleges but excludes junior colleges, increased from around 0.5, just before

World War II, to 0.67 in 1990.³ The full century, then, experienced an relative increase in public-sector enrollment from 22 percent to 67 percent of total enrollment.

What accounted for the relative growth in public-sector enrollment? Our evidence is consistent with two complementary interpretations. One emphasizes the changed structure of the higher-education industry, whereas the other features the increased supply of potential college students stemming from the high-school movement.

The more novel of the explanations we offer is that the application of the scientific method and the increased division of labor and specialization in higher education disproportionately benefited certain types of institutions. Those that had access to research funds were initially large and diverse, were nonsectarian, and had both reputation and a long-purse were in the best position to prosper from the changes. Most public-sector institutions, and some in the private sector, were so situated and thus flourished and expanded relative to others in the wake of various "technological" changes that shook higher education from around 1880 to 1910.

Consider one example of the phenomenon we believe to have operated (see also Goldin and Katz [1998]). In the late 19th century a large fraction of individuals in engineering, law, business, medicine, agricultural science, and chemistry were trained primarily on-the-job. But by the 1920's, the value of professionals with extensive formal training had greatly increased. In the case of engineering and other applied sciences, the technological shock can be thought of as the use of formal science in industry. In the case of medicine, it can be thought of as the application of the scientific method. Because public institutions were set up, in part, to produce goods and services of value to the state's citizens and because these often took the form of research, public-sector

³ Joseph E. Hight (1975) computes a similar statistic for 1927-1972, but because his data do not contain the previous 30 years, he emphasizes the relative increase of the public sector after 1947 rather than seeing a greater increase before.

institutions could produce various types of training at lower cost than could most private institutions. Thus public institutions expanded their production of technical students relative to liberal-arts students and thereby expanded their share of all students relative to the private sector.

Even though private institutions were not all research institutions, they had something else to sell to prospective students. Some of the new professions, like business, and those under suspicion, like medicine, needed the reputational quality of the older private institutions. Thus some private institutions also expanded after the "technological shock."

Various facts are consistent with our story of the relative expansion of public-sector institutions from 1890 to 1940. No private institution of note was founded after 1900, whereas several had been in the 1890's (e.g., Stanford, the University of Chicago, California Institute of Technology). Something had changed around the turn of this century that erected a barrier to the opening of new institutions of higher education, particularly private ones. That barrier, we speculate, was the large size, reputation, and research resources required to be competitive with the state universities and with some of the older and more established private institutions. One piece of evidence that is consistent with the first hypothesis, but not with the second, is that expenditures per student increased more in the public than in the private sector from 1897 to 1923 (whereas expenditures were equal in 1897, the public-to-private ratio was 1.5 in 1923).⁴

An alternative, complementary, explanation for the rise in the public share of higher-education enrollment concerns the high-school movement that swept much of the nation between 1910 and 1940. Even though a smaller percentage of secondary-school graduates continued to college in 1925 than in 1905, more of those who did demanded the practical, applied, and scientifically oriented programs offered by state universities. Also, more of the newer graduates were less able to

afford private-sector tuition. Even though the explanation is a compelling one, the cross-state correlation of the high-school graduation rate in 1928 and the public share of higher-education students (among state residents) in 1931 is weak ($\rho = 0.17$). We can explain about half of the total change in the public share of higher-education enrollment from 1897 to 1940 on the basis of the cross-section relationship, leaving substantial room for the alternative hypothesis.

IV. What Explains Public Support for Higher Education?

State and local support to public higher education doubled from 1902 to 1940 as a fraction of all state and local expenditures (U.S. Department of Commerce, 1975 [series Y 684-85]), and the fraction of all students attending public-sector institutions also doubled over the same period. But public funding for higher education and access to public colleges and universities varied substantially among states throughout the period. The greatest levels of support were in the West, and the lowest were in the Northeast. What explains the differences among states and regions?

The determinants of the log of state and local per capita higher-education spending in 1929 are explored in the regressions of Table 1. The public-choice decision to provide support for higher education is likely to be affected by the level and distribution of wealth or income in a state, community stability and homogeneity, and the importance of industries that capture localized benefits of state institutions. Column (i) indicates a strong positive relationship between automobile registrations per capita and state support for higher education. A one-standard-deviation increase in this variable (0.32) is associated with a 0.4-log-point (49-percent) increase in state spending per capita on higher education. Auto registrations per capita in this period is a summary measure of both the level and distribution of wealth, since it is essentially a count of the fraction of individuals wealthy enough to own a car. Thus it represents the share of voters sufficiently wealthy to believe their children could attend college. The shares of employment in mining, manufac-

⁴ We compute these differences in a regression that includes controls for region and institution type (see Goldin and Katz, 1998).

TABLE 1—DETERMINANTS OF STATE SUPPORT FOR HIGHER EDUCATION, 1929

Independent variable	Regression		
	(i)	(ii)	(iii)
Log automobile registrations per capita, 1930	1.306 (0.278)	1.06 (0.274)	
Log agricultural income per agricultural worker, 1900			0.339 (0.153)
Fraction Catholic, 1910, 1926*	-0.631 (0.584)	-0.628 (0.542)	-1.09 (0.515)
Fraction of labor force in mining, 1930	4.14 (1.59)	2.38 (1.62)	
Fraction of labor force in manufacturing, 1930	2.47 (1.57)	3.05 (1.47)	
Fraction of labor force in agriculture, 1930	1.73 (0.848)	1.45 (0.793)	
West (West North Central, Mountain, and Pacific)	0.803 (0.261)	0.782 (0.243)	
South (South Atlantic, East South Central, West South Central)	0.753 (0.244)	0.667 (0.229)	
East North Central	0.493 (0.206)	0.386 (0.195)	
Private college enrollments per 1,000 residents, 1900		-0.258 (0.0952)	-0.294 (0.115)
Year of statehood $\times 10^{-2}$			0.503 (0.202)
Constant	-1.68 (1.79)	-0.115 (1.76)	-3.88 (3.43)
R^2 :	0.759	0.798	0.645
Mean squared error:	0.322	0.298	0.371
Number of observations:	48	48	48

Notes: The dependent variable in all regressions is the log of per capita revenues of higher-education institutions from state and local governments. Numbers in parentheses are standard errors.

* The 1926 figure is used for columns (i) and (ii); the 1910 figure is used for column (iii).

idiosyncratic engineering needs. The states of the Northeast (the base group) have far lower public support for higher education than do other regions, even including controls for wealth, industrial structure, and social makeup (fraction Catholic).

The regression in column (ii) of Table 1 adds enrollments in privately controlled institutions in 1900 as a proxy for the historical importance of private colleges and universities in each state. A substantial presence of private universities in a state in 1900 has a significant and depressing effect on public support of higher education in the state in 1929, but the inclusion of the variable does not markedly alter the impact of the others. The difference between private-college enrollments per 1,000 residents in Massachusetts and Iowa in 1900 (3.35 vs. 0.99) implies a decrease in per capita spending on higher education of 61 log points (84 percent).

In column (iii), we more fully explore, how state "initial" conditions, circa 1900, affected the expansion of public support for higher education (as measured in 1929). States with high agricultural income per worker at the turn of the century, a low share of Catholics, more recent statehood, and initially weak private universities provided more public support for higher education in 1929. We have also found a negative effect on public-college enrollments as a share of state population in 1929, from a strong early presence of private colleges (Goldin and Katz, 1998). Furthermore, greater access to public colleges, measured by lower tuition, is associated with a higher overall college enrollment rate (public and private) of state residents in 1929, even conditioning on per capita wealth and the high-school graduation rate. Thus, access to public higher education did not just affect enrollments in the publicly controlled sector. It also increased college matriculation overall.

Thus newer states, with a high share of well-to-do families and scant presence of private universities in 1900, became the leaders in public higher education by 1929 and remain so today. The tradition of stronger private universities and lower support for publicly controlled universities in the Northeast also continues to the present.

turing, and agriculture are also positively related to state support for higher education. These sectors may have lobbied effectively for research support at state institutions, or state legislators may have believed that the social return on public expenditures was high in a state with concentrations of agricultural products, unique manufacturing outputs, or

V. Concluding Remarks

The public sector in higher education rose relative to the private sector from the late 1890's to 1940. All institutions of higher education grew in scale and scope during those 50 years, and these changes have been associated with increased demand for professional training and enhanced complementarities between research and teaching. Public-sector universities were well placed to take advantage of these changes. The expanded pool of students produced by the high-school movement increased the demand for higher education among middle-class Americans. States more recently admitted to the Union and those with a lower preexisting presence of privately controlled institutions had greater public-sector expansions and became leaders in support for higher education.

The major state-level factors we identify that encouraged support to public higher education are a high level of wealth broadly distributed, the presence of business and commercial interests having large, unified, and concentrated demands for practical research, a late year of statehood, and a low early presence of private institutions. Differences across states in the relative role of the public sector in higher education that emerged during 1890–1940 persist today, despite the increased national scope of the market for higher education. But even though state rankings today are similar to what they were in 1930, the proportional differences in state spending on higher education and public enrollment per capita were far greater in the past.

REFERENCES

- Goldin, Claudia.** "America's Graduation from High School: The Evolution and Spread of Secondary Schooling in the Twentieth Century." *Journal of Economic History*, 1998 (forthcoming).
- Goldin, Claudia and F. Katz, Lawrence.** "Why the United States Led in Education: Lessons from Secondary School Expansion, 1910 to 1940," National Bureau of Economic Research (Cambridge, MA) Working Paper No. 6144, August 1997.
- . "Public and Private Higher Education: An Exploratory Study, 1890 to 1940." Working paper, National Bureau of Economic Research, Cambridge, MA, 1998 (forthcoming).
- Hight, Joseph E.** "The Demand for Higher Education in the U.S., 1927–72; The Public and Private Institutions." *Journal of Human Resources*, Fall 1975, 10(4), pp. 512–20.
- Hoxby, Caroline M.** "The Changing Market Structure of U.S. Higher Education," Working paper, Harvard University, 1997.
- Oleson, Alexandra and Voss, John, eds.** *The organization of knowledge in modern America, 1860–1920*. Baltimore, MD: Johns Hopkins University Press, 1979.
- Quigley, John M. and Rubinfeld, Daniel L.** "Public Choices in Public Higher Education," in Charles T. Clotfelter and Michael Rothschild, eds., *Studies of supply and demand for higher education*. Chicago: University of Chicago Press, 1993, pp. 243–78.
- Rosenberg, Nathan and Nelson, Richard R.** "American Universities and Technical Advance in Industry," CEPR Publication No. 342, Stanford University, 1993.
- U.S. Department of Commerce, Bureau of the Census.** *Historical statistics of the United States from Colonial times to 1970*. Washington, DC: U.S. Government Printing Office, 1975.
- U.S. Department of Education, National Center for Education Statistics.** *Digest of education statistics 1996*. Washington, DC: U.S. Government Printing Office, 1996.
- Veysey, Laurence R.** *The emergence of the American university*. Chicago: University of Chicago Press, 1965.