Shifts in Doctorate Output: History and Outlook

Charles V. Kidd

During the 1970's, the combined effects of a sharp reduction in the rate of increase of doctorate output (*1*) and a further decrease in the proportion of doctorates awarded by the top public and private universities (*2*) will generate severe and continuing problems of institutional adjustment. Between 1970 and 1979, the total annual output of doctorates will increase only moderately, and the proportion of all doctorates granted by the top public and private universities may well fall from 65 percent of the total in 1969 (as compared with about 85 percent in 1960) to 55 percent or less in 1979. As a consequence, many departments within the top 60 universities will be faced with very slowly rising, static, or declining enrollment in and completion of doctoral programs.

The 1960's

The most dramatic and significant aspect of doctorate production in the 1960's was a tripling of output from about 10,000 in 1960 to about 30,000 in 1969 (Table 1), a rate of increase that obviously will not be sustained in the 1970's. (As a point of comparison, the number of baccalaureate degrees granted somewhat more than doubled from 1960 to 1969—from 400,000 to 833,000.) Even the number of doctorates awarded by the top 30 private universities in the 1960's, the figure that expanded least rapidly, more than doubled. Shifts in the proportions of doctorates produced by different types of universities generated little strain because output from each type was increasing quite rapidly.

Over the decade, the big relative shifts (*3*) in doctorate production were from the top 30 private universities (down from 39 to 27 percent) to the public universities below the top 30 (up from 9 to 24 percent) (Table 1). The latter group produced 7.1 doctorates in 1969 for every one produced in 1960. Even though the doctorate output of public universities expanded faster on the average than that of private universities, this was not true of all universities in the two groups. For example, output at the universities of Rochester, Syracuse, Case Western Reserve, and Johns Hopkins increased by a larger factor than output at such universities as Oregon State, Wayne State, Ohio State, and Iowa State (Table 2).

It is often assumed that most of the increase in doctorate output in the 1960's was accounted for by universities not in the top 60. This is not the case. Because the top 60 universities still produce about two-thirds of all doctorates, they accounted for most of the increase (61 percent) in doctorate output in the decade, even though their rate of increase was relatively modest (Table 3). It is also often assumed the increases in doctorate output during the 1960's were accounted for in large part by universities that began granting a doctoral degree after 1960. The fact is that these universities accounted for only 5 percent of the increase.

The output of Ed.D.'s, which accounts for about 20 percent of all doctorates, is often thought to be concentrated in less prestigious universities in the public group. If so, this would help account for the relatively rapid increase in the doctorate output of these institutions in the 1960's (*4*). However, the output of Ed.D.'s, like output in all fields, is concentrated in the top universities: 42 universities produce 70 percent of all of the Ed.D.'s; of these, 24 are in the top 60 universities. Therefore, the rapid increase in Ed.D.'s granted over the decade did not contribute substantially to the rapid relative increase in degrees granted by the less prestigious universities within the public group.

While the reasons for the sharply increased output of doctorates during the 1960's have been thoroughly analyzed elsewhere (*5*), the reasons for the differential growth of different types of institutions have not been reviewed with equal care. Among the contributing factors, these were significant:

1) The well-established public and private universities had already attained a critical mass of students in many departments and were not under a strong internal pressure to expand, as were other universities.

2) Every aspect of the public universities expanded at a greater rate than those of private universities, and graduate education was a part of this expansion.

3) Job opportunities for Ph.D.'s in virtually every field increased rapidly, in both academic and nonacademic employment. Degree candidates generated pressures on universities to expand. Even with the rapid expansion of top-ranking universities, the rapidly rising demand for degrees encouraged developing universities to establish new degree programs and to expand existing ones. The universities below the top 50 or 60 could expand more rapidly from a small base of enrollment and degrees than could those universities that started with a large base. The need for teaching assistants, the quest for prestige, and commitments to newly recruited faculty led many universities to skim the cost of new doctoral programs from the rapidly rising revenue base generated by increasing undergraduate enrollment.

4) The sharp increase in state budgets for support of universities in the 1960's (from about $900 million per year at the beginning of the decade to about $3.0 billion at the end of the decade) provided funds that enabled university administrators, reflecting the spirit of the times, pressures from faculty, and their own propensities, to expand existing graduate programs and to establish new ones.

5) A relatively less important factor was that public universities were, on the whole, under greater pressure to expand graduate enrollment in order to provide teaching assistants for the rapidly growing undergraduate group.

The author is executive secretary of the Association of American Universities, 1 Dupont Circle, Washington, D.C. 20036. This article is adapted from a paper given at the annual meeting of the Western Association of Graduate Schools in Tempe, Arizona, on 6 March 1972.

6) Federal funds for universities were much more widely dispersed at the end of the decade than at the beginning. One cause of this dispersion was that significant proportions of the federal funds were deliberately programmed to encourage the establishment of new graduate programs, and this had the effect of encouraging relatively greater expansion among universities that did not have the highest reputations.

Over the decade of the 1960's, the proportion of federal funds (total federal obligations, both research and nonresearch) going to the top ten public and top ten private universities declined markedly, from 45 to 25 percent. At the same time, the proportion of funds going to those below the top 60 universities increased from 25 to 50 percent (Table 4).

When one looks not at the distribution of all federal funds, but at the distribution of the *increase*, the significance of the public universities is striking. Three-quarters of the increase went to public universities, and 55 percent of the increase went to public universities below the top 30. Not only was the distribution of funds over the years shifting heavily toward the public universities below the top 30, but the total amount of federal funds was rising rapidly—from about $1 billion in 1960 to about $3.5 billion in 1969. As a consequence, the public universities below the top 30 received about $1.5 billion in federal funds in 1969, as contrasted with $0.3 billion in 1960.

The 1970's

The first question to be asked in attempting to forecast output of doctorates by type of institutions is, How many doctorates will be awarded in 1979? No one knows, but one can estimate reasonable lower and upper limits.

For a lower limit, one would assume a continuing downward pressure on graduate enrollment as a result of such factors as student disenchantment with graduate study, widespread apprehension among potential graduate students that a doctoral degree will not help much in getting a better job, declining support for individual graduate students, the reduced prestige of and esteem for graduate work and advanced degrees in the eyes of the past supporters and defenders of doctoral training, and tight budgets for graduate departments in both public and private universities in the years ahead. If one were to assume that such forces as these will be very strong over the next few years and that they will not be substantially offset by other forces, there would be leveling and then declining enrollment in graduate school, increased drop-out rates for graduate work, and a higher proportion of graduate students settling for a master's degree. Translating these forces into figures, it is plausible that as few as 35,000 doctoral degrees would be

Table 1. Doctorate output of all U.S. universities in 1960 and 1969 (numbers are rounded). [Source: U.S. Office of Education, *Doctor's Degrees Conferred by All U.S. Institutions: by State, Academic Field, Sex, and Institution, 1960–61 through 1969–70* (Government Printing Office, Washington, D.C., 1972)]

Universities	Year				Doctorates in 1969 as a multiple of doctorates in 1960
	1960		1969		
	No. (1000's)	Percent	No. (1000's)	Percent	
Top 60	8.4	83	20.3	67	2.4
Top 30 public	4.6	44	12.1	40	2.6
Top 30 private	3.8	39	8.2	27	2.2
All other	2.2	17	9.6	33	4.4
Public	1.0	9	7.1	24	7.1
Private	1.2	8	2.5	9	2.1
All public	5.6	53	19.2	64	3.5
All private	5.0	47	10.7	36	2.2

Table 2. The 56 universities granting more than 1000 doctorates during the 1960's, in descending order of the percentage of increase in degrees granted between 1960 and 1969. [Source: U.S. Office of Education, *Doctor's Degrees Conferred by All U.S. Institutions: by State, Academic Field, Sex, and Institution, 1960–61 through 1969–70* (Government Printing Office, Washington, D.C., 1972)]

Public universities ($N = 35$)	1969 output as multiple of 1960	Private universities ($N = 21$)	1969 output as multiple of 1960
Arizona	7.7		
SUNY	5.9		
Oregon	5.8		
Tennessee*	5.8		
Texas A & M*	5.6		
Oklahoma*	4.7		
Utah*	4.5		
Florida State	4.4		
Oklahoma State*	4.1		
Missouri*	4.0		
Maryland	3.9	Rochester	3.6
Michigan State	3.5	Syracuse	3.5
Kansas	3.4	Case Western Reserve	3.3
Colorado	3.2	Johns Hopkins	3.2
North Colorado*	3.0		
Oregon State*	3.0		
Washington	3.0		
Rutgers	3.0		
Florida	2.9		
Texas	2.8	Pittsburgh*	2.8
Wayne State*	2.8	Duke	2.8
Nebraska*	2.7	Southern California	2.7
North Carolina	2.6	Northwestern	2.6
Purdue	2.5		
Minnesota	2.5		
Louisiana State*	2.4		
Ohio State	2.4		
Indiana	2.3	Stanford	2.3
California	2.3	Catholic*	2.3
Wisconsin	2.3		
Pennsylvania State	2.2	Harvard	2.2
Iowa	2.2	Pennsylvania	2.2
Iowa State	2.0	Cornell	2.0
Michigan	1.9		
Illinois	1.9	Boston*	1.7
		Chicago	1.7
		Princeton	1.7
		N.Y.U.	1.7
		Cal. Tech.	1.7
		M.I.T.	1.6
		Columbia	1.4
		Yale	1.4

* Not among the 60 universities ranked highest for this article.

granted in 1979. Such a low figure seems unlikely, but let it be accepted as the lowest hypothetical figure (*6*).

While it is too soon to assess all of these movements, it does appear that graduate enrollment is in fact leveling off at a faster rate than has been assumed by those who anticipate marked increase in the production of doctorates by 1980. The changes in graduate enrollment have been as follows (*7*): in 1969, a 7 percent increase over 1968; in 1970, an 8 percent increase over 1969; in 1971, a 1 percent increase over 1970; in 1972, a 2 percent increase over 1971.

These changes and other factors have led deans of graduate schools to forecast a total of 31,400 doctorates in 1975–76, a substantially lower figure than had been predicted earlier by most observers (*8*). A particularly significant aspect of the deans' forecasts is that the 5 percent increase which they forecast between 1970 and 1976 would result from a 7 percent decline in the output of the top 60 universities and a 12 percent increase in the output of other universities. Even if the deans' estimates are low, it is clear that the leveling off of enrollment will dampen the output of doctorates 4 to 7 years in the future.

As an upper limit, one could assume that the projections of doctorate output based on past graduate enrollment trends (of the kind made by the National Science Foundation and by Allan Cartter) are close to the mark. The assumptions leading to the production of about 45,000 doctorates in 1978–79 are stated elsewhere and need not be repeated here (*5*). Accordingly, I take 35,000, 40,000, and 45,000 as low, medium, and high forecasts of doctorate production in 1978–79.

For the foreseeable future, all kinds of universities will be under pressure to consolidate, retrench, prune, and economize. However, the important question for this article is the relative growth of private and public universities during the 1970's and the position of universities with higher reputations relative to other universities (*9*).

The first assumption for consideration here is that the distribution of doctorate output among institutions in 1979 will be the same as it was in 1970 (Table 5, assumption A). It is possible that the strong forces which led to the relatively greater expansion of doctorate output among public institutions, and particularly among the developing public institutions, during the 1960's have run their course. One consideration supporting this view is that the prospective job market may tend to protect the more prestigious universities against declines in their share of total doctorates. As one experienced observer has noted (*10*, p. 496), "The same disincentives that are presumed to reduce graduate enrollments [poor job prospects] should operate selectively to impose relatively greater reductions on doctoral programs in fields where there is the least likelihood of employment. This then would be favorable to the well-established programs with good reputations in a given field and disadvantageous to newer, smaller, less well known programs."

Another factor supporting this view is the reduction in the rate of growth of state expenditures for universities and widespread pressures against the establishment of new doctoral programs or the expansion of existing ones.

However, while it is possible that the relative shifts in output of doctorates that occurred in the 1960's will be stopped, this seems highly improbable to me. After all, in 1900 all doctorates in the United States were granted by 15 universities, and during each decade of the century the proportion of degrees granted by the relatively small group of universities with the highest reputations has declined. Some reasons for believing that the proportion of doctorates granted by public universities will continue to increase and that the increase will be most pronounced among those below the top 60 are as follows:

1) The strong trend of the 1960's toward a wider distribution of all federal funds to universities will continue as nonresearch expenditures increase in relative and absolute significance and as relatively less emphasis continues to be placed on very large defense, space, and atomic energy contracts with relatively few large universities.

2) To a greater degree than public and private universities with the highest reputation, public universities with less than the highest reputation may be under internal pressures to expand enrollment in doctoral programs. In addition, this group will probably receive relatively more favorable treatment from the state legislatures, even if all public universities are put on austerity budgets for the remainder of the decade.

3) Admission to the graduate schools of the top 60 universities will continue to be influenced primarily not by the number of applicants, but by the financial capacity of these universities to support the required superstructure and to provide the required financial assistance to students.

4) Federal support of graduate students will not return to the peak levels of 1968. The reduced level of federal fellowships and traineeships will depress graduate enrollment in both public and private universities with high reputations more than it will in others because a higher proportion of students in the top 60 depend on federal support.

Taking factors such as these into account, I assumed two additional distributions of doctoral degrees by type of institution in 1979 (Table 5, assumptions B and C). Under assumption B, the percentage of doctorates granted by the top 60 universities would continue to decline (from 65 to 55 percent), while the proportion granted by the "all other" public group would expand from 26 to 38 percent. Under assumption C, the percentage of doctorates granted by the top 60 universities would fall from 65 to 47 per-

Table 3. Increase in doctorate output in the 1960's (numbers are rounded). [Source: U.S. Office of Education, *Doctor's Degrees Conferred by All U.S. Institutions: by State, Academic Field, Sex, and Institution, 1960–61 through 1969–70* (Government Printing Office, Washington, D.C., 1972)]

Universities	Increase, 1960 to 1969	
	No. (1000's)	Percent
Top 60	11.9	61
Top 30 public	7.5	39
Top 30 private	4.4	22
All other	7.4	39
Public	6.1	31
Private	1.3	8

Table 4. Percentage distribution of federal funds to colleges and universities in 1960 and 1969. [Sources: National Science Foundation, *Federal Support to Colleges and Universities 1963–66* (Government Printing Office, Washington, D.C., 1967); *Federal Support to Colleges and Universities 1966–69* (Government Printing Office, Washington, D.C., 1970); 1960 estimated by the author]

Universities	Public and private (%)		Public (%)		Private (%)	
	1960	1969	1960	1969	1960	1969
Top 10	45	25	38	18	50	37
Second and third 10	30	25	24	20	35	39
Below top 30	25	50	38	62	15	24

cent. This would represent a decline somewhat greater than that of the 1960's for this group (from 83 to 65 percent). The percentage of degrees granted by the "all other" public universities under assumption C is assumed to increase from 26 to 47 percent over the decade. These two distributions, as can be seen, are not derived from any mathematically consistent pattern of changes, but are simply statements of distributions that might exist if shifts in the 1970's took the same direction they did during the 1960's, but moderately so (assumption B) or more strongly so (assumption C).

The three assumptions of total doctorate output (35,000, 40,000, and 45,000) in 1979 are then distributed in accordance with the percentages in Table 5, thereby producing assumptions about absolute numbers of output (Table 6) and changes in output (Table 7).

If only 35,000 doctorates were awarded in 1979, there would be an absolute decline in the output of the top 60 universities, unless the relative shifts characteristic of the 1960's ceased. However, the output of the "all other" public universities would increase no matter what assumption is made as to the shift in the proportion of degrees granted by various types of universities.

If 40,000 doctorates were granted in 1979, the output of the top 60 universities would increase, unless their relative share of doctorate output were to decline more in the 1970's than in the 1960's (assumption C). However, the increases in this group would be quite moderate compared with the increases during the 1960's. Under all assumptions, the output of the "all other" public universities would increase sharply.

If total doctorate output were 45,000 in 1979, the output of all types of universites would increase, no matter what shifts in relative output are assumed. The sole exception is the top 30 private universities, whose output would decline if the proportionate shifts of the 1960's away from this group were to be more marked in the 1970's (assumption C). The output of the "all other" group would expand under all assumptions, and the "all other" public universities would increase by about 65 percent, even if there were no further proportionate shifts in output among groups of universities (assumption C).

Table 5. Distribution of doctorate output in 1960, 1970, and 1979 (projected, with alternate assumptions).

Universities	1960 (%)	1970* (%)	1979 (%)		
			Assumption A	Assumption B	Assumption C
Top 60	83	65	65	55	47
Top 30 public	44	39	39	34	30
Top 30 private	39	26	26	21	17
All other	17	35	35	45	53
Public	9	26	26	38	47
Private	8	9	9	7	6

* As compared with 1969, a slight percentage shift from the "top 60" and toward the "all other" group is assumed.

Table 6. Doctorate output in 1960, 1970, and 1979 (projected, with alternate assumptions). Numbers are rounded.

Universities	1960 (1000's)	1970 (1000's)	1979 (1000's)		
			Assumption A	Assumption B	Assumption C
		35,000 total output (5,000 increase)			
Top 60	8.4	20.4	22.9	19.3	16.5
Top 30 public	4.6	12.2	13.8	11.9	10.5
Top 30 private	3.8	8.2	9.1	7.4	6.0
All other	2.2	9.6	12.1	15.7	18.5
Public	1.0	7.1	9.1	13.3	16.5
Private	1.2	2.5	3.0	2.4	2.0
		40,000 total output (10,000 increase)			
Top 60	8.4	20.4	26.0	22.0	18.8
Top 30 public	4.6	12.2	15.6	13.6	12.0
Top 30 private	3.8	8.2	10.4	8.4	6.8
All other	2.2	9.6	14.0	18.0	21.2
Public	1.0	7.1	10.4	15.2	18.8
Private	1.2	2.5	3.6	2.8	2.4
		45,000 total output (15,000 increase)			
Top 60	11.9	20.4	29.2	24.8	21.2
Top 30 public	7.5	12.2	17.5	15.3	13.5
Top 30 private	4.4	8.2	11.7	9.5	7.7
All other	7.4	9.6	15.8	20.2	23.8
Public	6.1	7.1	11.7	17.1	21.2
Private	1.3	2.5	4.1	3.1	2.6

Table 7. Changes in doctorate output between 1970 and 1979 (projected).

Universities	Increase 1960 to 1969 (1000's)	Output in 1970 (1000's)	1979 (1000's)		
			Assumption A	Assumption B	Assumption C
		5,000 increase by 1979 (35,000 total output)			
Top 60	11.9	20.4	2.5	− 1.1	− 3.9
Top 30 public	7.5	12.2	1.6	− 0.3	− 1.7
Top 30 private	4.4	8.2	0.9	− 0.8	− 2.2
All other	7.4	9.6	2.5	6.1	8.9
Public	6.1	7.1	2.0	6.2	9.4
Private	1.3	2.5	0.5	− 0.1	− 0.5
		10,000 increase by 1979 (40,000 total output)			
Top 60	11.9	20.4	5.6	1.6	− 1.6
Top 30 public	7.5	12.2	3.4	1.4	− 0.2
Top 30 private	4.4	8.2	2.2	1.2	− 1.4
All other	7.4	9.6	4.4	8.4	11.6
Public	6.1	7.1	3.3	8.1	11.7
Private	1.3	2.5	1.1	0.3	− 0.1
		15,000 increase by 1979 (45,000 total output)			
Top 60	11.9	20.4	8.8	4.4	0.8
Top 30 public	7.5	12.2	5.3	3.1	1.3
Top 30 private	4.4	8.2	3.5	1.3	− 0.5
All other	7.4	9.6	6.2	10.6	14.2
Public	6.1	7.1	4.6	10.0	14.1
Private	1.3	2.5	1.6	0.6	0.1

Concluding Observations

It does not seem plausible that the powerful forces which produced the shifts of the 1960's toward the "all other" public and away from the top 30 private universities will disappear during the 1970's (*11*). Given the unknowns involved in making projections of doctorate output, a range from 35,000 to 45,000 in 1979 seems reasonable, with an increasing probability that actual output will be at the lower end of that range.

Accordingly, the most probable development would seem to me to be continuing shifts of doctorate output in the directions characteristic of the 1960's, but at a moderated rate (along the lines suggested by assumption B), with doctorate output between 35,000 and 40,000. This would mean more than a doubling of the output of the public universities below the top 30 (from 7,100 in 1970 to 15,200 in 1979). On the other hand, the output of the top 30 private universities in the 1970's would remain just about constant (from 8,200 to 8,400), whereas their output more than doubled during the 1960's (from 3,800 to 8,200); the output of the top public universities would increase by only about 12 percent (from 12,200 to 13,600).

The implications of such shifts would be less drastic for students than for the universities themselves. It appears that students will have a wider choice over the coming decade as the number of strong departments continues to increase. However, the nearly static or declining levels of total doctorate output in the top universities, both public and private, would probably mean particularly sharp cuts in specific graduate departments. The decay of outstanding departments, accompanied by no compensatory gains to society and avoidable by a relatively small investment, would be a loss to the nation. Denying some of the most able students the opportunity to study in the foremost departments is not a prospect to be taken lightly.

Turning to the universities themselves, it is clear in retrospect that the remarkable shifts of the 1960's came about with little strain because the doctorate output of all types of universities was increasing rapidly. The certainty that the rate of increase of doctorate output will be substantially lower in the 1970's (recalling that three times as many doctorates were produced in 1969 as in 1960) will cause a further shift in the distribution of output by type of university. This shift will generate institutional difficulties that were not encountered in the 1960's, even though the proportionate shifts in that decade were more drastic than those I foresee for the 1970's.

The top group of universities, particularly the private ones, will face continuing, severe problems. These include relative inflexibility, rising costs, and a relative decline in capacity to attract the best faculty and the best students. In addition, they may encounter grave difficulties in controlling costs. With relatively little or no expansion, many of them may have departments whose first-rate teaching capacity is underutilized, with resulting cost escalation. Many departments may gradually shrink below the size required for effective interaction among students and faculty, with resulting declines in the effectiveness of teaching. Nevertheless, they will probably remain the strongest centers for research and graduate training, especially in the traditional disciplines. They will probably continue to train a high proportion of university teachers in many fields. But the general prospect for the 1970's would appear to be an elevation of the relative quality of the universities that expanded most rapidly during the 1960's and a relative decrease in the eminence of the universities that have had the highest reputations.

Academic flexibility is generally associated with growth rather than with a static or contracting situation; change with expansion poses fewer threats to careers and status, and adding something new does not necessarily require dropping something old. Strong and effective pressures for change will be exerted on graduate departments during the 1970's—change in the nature of doctoral programs and degrees, change to allow diverse timing and sequences of study, change to adapt the content of doctoral training in order to train better teachers and to train for more kinds of nonacademic jobs. The departments best able to adapt will be those that are expanding, and these departments will be found primarily in the "all other" public group.

As far as faculty members are concerned, most of the new jobs will be in the "all other" group of universities. In the top 60 universities, particularly in the top private ones, there would be small net increases in requirements to teach graduate courses. There would be relatively fewer younger faculty members, and promotions would be relatively slower. As a result of the greater relative availability of jobs, faster promotion, and a greater degree of innovation, the attractiveness of many universities in what is now regarded as the second layer would increase. The universities in this group that are still growing will be in a fine competitive position to attract both superior faculty and graduate students, but those that have reached a plateau may tend to stagnate.

The prospective shifts in absolute and proportionate output of doctorates have implications for both state and federal governments. For state governments, the primary message is that the major universities should be assured of adequate funds for sustaining their outstanding graduate departments.

With respect to the federal government, the prospective situation further emphasizes something that has already become clear—that is, the existing statutory base for support of graduate students and graduate education should be reconsidered and restated. The existing rationale was developed at the height of the Cold War. The major goal was to increase doctorate output to meet specific shortages; although other goals existed, this need to train people for specific areas emphasized by federal programs was dominant. Establishment of new departments was rewarded. Continuing shortages of all kinds were foreseen, particularly of teachers at all levels. The terms of existing legislation reflect these goals. The task of establishing the number of graduate departments required to turn out the number of doctorates that the nation needed has been accomplished. Now the needs are different. There are shortages of doctorates in few and small fields, and it looks as if shortages in the future will be confined to the health area and some relatively small, specialized fields. Therefore the rationale for federal support of graduate education is anachronistic. It is unfortunate that the recent comprehensive legislation (the Education Amendments of 1972) did not contain the kind of thorough reworking of the philosophy and content of federal fellowship support that is called for.

The goals with highest priority now are to halt the steady decline in federal fellowships and traineeships, to consolidate the gains of the 1960's by ensuring that the quality of the system is sustained and increased, to protect

the capability of the best departments to continue to produce outstanding students and research, to remove race and sex barriers to graduate education, to shift the production of doctorates appropriately in response to long-range needs, and to modify the content and goals of graduate education.

References and Notes

1. U.S. Office of Education, *Doctor's Degrees Conferred by All U.S. Institutions: by State, Academic Field, Sex, and Institution, 1960–61 through 1969–70* (Government Printing Office, Washington, D.C., 1972). Doctoral degrees in this article include such degrees as Doctor of Education, Doctor of Juridical Science, Doctor of Public Health, and the Ph.D. degree in any field whatever. Excluded are the professional degrees—chiropody, podiatry, dentistry, medicine, optometry, osteopathy, veterinary medicine, and law.
2. Any ranking of universities that purports to measure either quality or reputation for quality is controversial. Those institutions that are ranked high by a given method tend to think that the method is objective and valid. Those that rank low tend to criticize both the basis for rating and the usefulness of rating universities by any method. Despite the deficiencies of any method of ranking, I thought that it would be worthwhile to select a method and then measure changes in doctorate output among groups. Readers may choose for themselves the extent to which they wish to equate reputation for quality with quality. I developed institutional rankings by assigning values to the departmental ratings for each institution appearing in Roose and Andersen [*A Rating of Graduate Programs* (American Council on Education, Washington, D.C., 1970)] and combining these values to produce an institutional value. (I will send the details of the procedure for ranking to anyone who requests them. My guess is that the trends shown in this article would hold true no matter what method of ranking were used, and I hope that others test this out.) This method of ranking should not obscure the fact that there are many excellent departments in universities which do not have a large number of excellent departments and that there are many departments which are not of the highest excellence in universities with a reputation for excellence. The top 30 public universities are Arizona, State University of New York (Buffalo), California (Berkeley), California (Davis), California (Los Angeles), California (San Diego), Colorado, Florida, Florida State, Illinois, Indiana, Iowa, Iowa State, Kansas, Maryland, Massachusetts, Michigan, Michigan State, Minnesota, North Carolina (Chapel Hill), Ohio State, Oregon, Pennsylvania State, Pittsburgh, Purdue, Rutgers, Texas, Washington (Seattle), Virginia, and Wisconsin. The top 30 private universities are Brandeis, Brown, Bryn Mawr, Calfornia Institute of Technology, Carnegie Mellon, Case Western Reserve, Chicago, Claremont, Columbia, Cornell, Duke, Emory, Harvard, Johns Hopkins, Massachusetts Institute of Technology, Northwestern, Notre Dame, New York University, Pennsylvania, Princeton, Rice, Rochester, Rockefeller, Southern California, Stanford, Syracuse, Tulane, Vanderbilt, Washington (St. Louis), and Yale. The top 30 public and the top 30 private universities will be referred to as the top 60 universities in this article.
3. Different motives are often ascribed to groups of institutions with different growth patterns. Universities that expanded rapidly can be considered either as responding particularly well to a national need or as opportunistic. Conversely, those that expanded relatively slowly can be considered either as being concerned that rapid expansion would dilute the quality of their graduate programs or as being relatively unconcerned with meeting national needs for more highly trained people. The data are not intended to imply that any group of institutions lacked concern either with quality of education or with meeting the needs of society.
4. Contrary to a widely held belief, expansion in the social sciences and in the arts and humanities was somewhat greater proportionately (by factors of 2.7 and 2.8, respectively) and absolutely than was expansion in the physical and biological sciences. Those fields that increased by more than the average factor (2.8) were engineering (4.3), education (3.8), and mathematics (4.2). However, there seems to be no connection between these shifts and the changes in the proportionate distribution of output by type of university.
5. A. Cartter, *Science* **172**, 132 (1971): "I could imagine Ph.D. production leveling off in the late 1970's at about 40,000 to 45,000, but I would doubt any more radical adjustment" (p. 137); *Science and Engineering Doctorate Supply and Utilization, 1969 and 1980* (National Science Foundation, Washington, D.C., 1971), p. 26. Others have forecast as many as 60,000 or 70,000 doctorates by 1978–79 [D. Wolfle and C. Kidd, *Science* **173**, 784 (1971)]. It is generally agreed that these forecasts, which by and large simply extrapolate the growth rates of the 1960's through the 1970's are now implausible. New needs of society, as well as internal pressures, may indeed generate broad new demands for persons with a doctoral degree, a fact that might push output above 45,000 in 1978–79. However, if this new demand develops, it will not raise the output of doctorates much by 1979. It takes a long time to redesign graduate programs and still longer to produce people with new kinds of training.
6. The primary reason for believing this to be too low is that doctorate output in 1971 was 31,000, and output in 1972 will approach 35,000 (National Research Council, Office of Scientific Manpower, unpublished data). Given the fact that graduate enrollment increased rapidly until 1970, which establishes a base for increases in doctorate output through 1975, it seems improbable that there will be no further increases in annual output between 1972 and 1975. Thus, given a 1975 level above 35,000, it seems unlikely that graduate enrollment would decline and attrition would increase over the period of 1972 to 1975 to the extent necessary to hold doctorate output down to 35,000 in 1979.
7. Educational Testing Service, *Report on the Council of Graduate Schools—Graduate Record Examinations Board 1971–1972 and 1972–1973 Surveys of Graduate Enrollment* (Educational Testing Service, Princeton, N.J.).
8. Council of Graduate Schools, "Report on the CGS doctorate production survey" (press release, 3 May 1972).
9. For the purpose of this article, the specific institutions included in each group of universities in the future is not relevant. It is simply assumed that there will be 60 top institutions at the end of the decade, that they will be, for the most part, those now in this category, and that shifts of a few institutions into and out of the top 60 will not significantly affect the trends characteristic of the top 60 group or of the remaining universities.
10. L. E. Moses, *Science* **177**, 494 (1972).
11. As this article neared completion, I reread the 1969 report prepared by L. M. Hartman for the National Science Board [*Graduate Education: Parameters of Public Policy* (Government Printing Office, Washington, D.C., 1969)] and found that he had anticipated my conclusions. He said, "The contribution of top quality institutions will decline from 52.1 percent in academic year 1964–65 to about 34.1 percent in 1980–81" (p. 118).