

14. "Higher Education Decision" Making and the Labor Market"

by Walter Fogel and Daniel J. B. Mitchell

↓
in M.S. Gordon, ed.,
Higher Education and The
Labor Market

McGraw-Hill, 1974
pp. 453-502

Are enrollments and degree production in American higher education responsive to the labor market? This is the rather broadly framed question to which this paper is addressed. The more precise focus of this study is on changes in the distribution of enrollments and degrees granted in professional schools and college and university departments in response to changes in the relative attractiveness of occupations that require higher educational preparation.

It is not difficult to demonstrate the increasing importance of this question. The numbers enrolled in schools of higher education and the numbers graduating from these schools have increased dramatically in the last 30 years. Projections show that by 1975, almost half of all 18- to 19-year-old males will be attending a college of some kind (Conger, 1962, p. 9). The costs of higher education have been rising even more rapidly and with the increased costs has come taxpayer resistance. The public is apparently no longer willing to foot the bill for rapid expansion of the system of higher education. This public attitude has developed, however, not only from the cost squeeze on the taxpayer, but also from an intensified questioning of the benefits of higher education. In part, the concern over benefits has arisen because of student violence and elitist activities, but it is also related to skepticism about the universities' responsiveness to the needs of society. One currently prevailing view is that the universities are being run primarily for the benefit of the faculties, that only student "radicals" are able to make an impact on this orientation, and that their response to society as it is presently constituted is likely to be destructive rather than constructive.

One need of society that higher education traditionally has been presumed to serve is that of manpower—of appropriate kinds and quality (Kerr, 1964, p. 230). If anything, this emphasis has increased as society has come to accept the usefulness of economic

planning for efficient resource allocation. Thus, it is quite appropriate to inquire into the extent to which the ever-expanding and ever-more-costly systems of higher education are responsive to the manpower needs of the country.

We recognize that this is a question that is heavily loaded with implicit values. Manpower is certainly not the only need to be served by higher education, and there are some who argue that manpower needs are only incidental to the appropriate function of higher education (Hutchins, 1936). One of the other important functions—that is, benefits to be obtained—of higher education is of providing cultural values for the society.¹ Another benefit, one that goes directly to the educated person, is the consumption of goods and services that could not be consumed in the absence of higher education. Also, the direct consumption of higher education is an important benefit, one that may not have been given sufficient attention in the literature. Some college and university students have a utility function that stresses the environment and activities that are directly associated with attending college. Young people may now be placing higher valuations on these direct-consumption benefits than was formerly true. In the view of many, the university is the “action” place in our society—where opportunities to explore, to experiment, to dissent, etc., exist to an extent unmatched elsewhere. If these values are becoming increasingly important to young people, and if the relative attractiveness of nonuniversity life has declined, the opportunity costs of attending institutions of higher education have declined while the benefits have increased, and college attendance will increase in an unanticipated fashion during the present decade.

These and other benefits of higher education may be more or less valuable than manpower benefits. There is no clear way of making that determination. Nevertheless, this does not prevent us from inquiring into the efficacy with which the manpower function is being served. The results of the inquiry could very well be relevant to the value question of whether the higher education system *should* attempt to serve manpower objectives.

How does one decide if the educational system is serving the nation's manpower needs? One approach to this question is to analyze the educational response—defined here as the number of degree recipients in a given academic year—to market disequilibria.

¹ See Hansen and Weisbrod (1969, pp. 36–38). For a more complete discussion of external benefits, see Weisbrod (1964, Ch. 3).

Since ours is an occupational focus, the relevant disequilibria are changes in relative earnings (for efficient markets) and trends in job vacancies (for slow-reacting markets). This approach assumes that the educational system (supply) cannot or does not anticipate shifts in the demand for various kinds of higher education, but instead reacts once the demand shifts have occurred. An approach based on the opposite assumption—that higher education attempts to respond to the predictions—would search for market disequilibria as evidence of failures to meet manpower needs. If few disequilibria were discovered, the conclusion would be that higher education *may* be satisfactorily serving national manpower goals. A more definitive statement could not be made, since absence of disequilibria could also be a result of production functions characterized by high substitution elasticities between college-educated labor and other labor. The latter is often referred to as supply creating its own demand (Blaug, 1967, p. 281; OECD, 1963, p. 84; Johnson, 1970, pp. 190–204).

The assumption required by the second approach is clearly wrong; manpower forecasts, even short-range ones, are not sufficiently accurate to enable schools to maintain equilibrium in college-oriented occupations even if they wished to do so (Blaug, 1967, p. 281). Consequently, our analytical and empirical efforts were devoted to examining the degree response to market disequilibria. In addition, we obtained a good deal of information from one system of higher education on decision making as it affects the meeting of manpower needs—as determined by the labor market—and manpower goals, however arrived at.

Educational decision making on student enrollment is responsive to a number of factors. Three commonly cited guides to decisions are labor market demand for graduates, student demand for places (as seen through applications and patterns of enrollment), and the costs of operation. The difficulty arises in trying to assign proper weights to these variables, and for the first one, in attempting to find an appropriate measure.

Some economists have argued that this type of problem would vanish if universities were operated as profit-making firms (Buchanan & Devletoglou, 1970). Under such a system, educational institutions would respond to student demand and costs in a manner designed to maximize profits. They would compete for customers

ECONOMIC ANALYSIS

(students) by catering to their tastes. Competition would force them to charge tuition related to costs. Thus, students would be left with the final decision. Based on costs, tastes, vocational opportunities, and the pleasure (or displeasure) of learning, students would apply to schools and determine the pattern of enrollments. Educational planning would be reduced to a sort of market research.

Such a system, unless subsidized by the state, would not be cognizant of social external economies that educational institutions are presumed to provide: the preservation of knowledge, the generation of research, and so on. In any case, the idealized economic model is unlikely to develop in the future.² Tuition proposals are usually viewed as budgetary measures, designed to take the pressure off reluctant taxpayers. Tuition is usually not differentiated significantly by program, although costs to the school obviously vary depending on which subjects are being studied. Hence, it is usually a very crude instrument for the allocation of resources.

Given nonprofit maximizing charges to the purchasers of education, is there anything that economic analysis can provide for present-day decision makers on student enrollments? They must operate in a market for education, which, as Harris pointed out, is a most peculiar one. Sellers (schools) ration their availability to buyers (students) by means of academic standards. Sellers often compete for the "best" buyers (Harris, 1953, p. 345). Tuition, particularly in publicly owned institutions, is not used as a rationing device. That is, there is generally an excess supply of applicants. Thus, educational institutions have wide latitude in channeling students into their various programs. They can simply apply quotas to certain popular programs and encourage rejected applicants to enter programs that are less in demand.

In the analysis that follows, we will assume that tuition is not charged and that educational decision makers determine enrollments in the various programs offered. Each program will be called a "department" and the educational institutional will be denoted as the "school." The source of funds will be the state. Our purpose in this section is not to describe real-world decision making. Instead, we will try to describe what decision makers *ought* to do within the framework of cost-benefit analysis, given a number of heroic assumptions about the availability of information.

A common criticism of the application of economic analysis to ed-

ucational decision making involves the problem of trying to determine the "benefits" of education.³ There has been considerable work aimed at measuring the financial benefits of education in terms of the present value or rate of return to the student.⁴ Even within this limited concept of benefits, numerous difficulties in measurement arise. For example, it is common to use cross-sectional lifetime profiles of income (with certain adjustments) to estimate the shape of future profiles for current graduates. Thus, the results that are obtained are based on the assumption that the future may be extrapolated from the present, an assumption open to question.⁵ A further problem arises from the alleged correlation of education and ability. Studies have been made that try to separate the two influences, but no one would claim to have achieved great accuracy in this regard (Ashenfelter & Mooney, 1968, pp. 78-86; Weisbrod & Karpoff, 1968, pp. 491-497).

It is often assumed that the external benefits of education—those not directly appropriated by the educated person—are largely non-economic. But there are a number of rather obvious economic benefits to the public, too. For example, public subsidies to medical education are generally justified in terms of relieving "shortages" of doctors and related personnel.⁶ The presumption is that an increased supply of doctors will drive down the costs of medical care to the consumer or increase its availability. In addition, there may be benefits that go beyond the immediate consumers of the graduate's services. For example, supporters of expanded engineering enrollment in California argue that the resultant pool of engineers will entice industry to the state (Engineering Advisory Council, 1965). Presumably, benefits will follow in terms of higher wages, levels of employment, real estate values, etc.

In addition to public and private economic returns, less tangible benefits must be considered. We chose to sidestep the issue of how

³ See Wiseman (1965, pp. 1-12); Shaffer (1961, pp. 1026-1035); Chamberlain (1967, pp. 1-13). Much of the difficulty revolves around the problem of measurement. As an example, John Keller suggests fourteen proxies for benefits, including such information as the graduate's starting salary, voting frequency, civic awards, and arrest record. How these factors are to be weighted is not explained. See Keller (1969).

⁴ A sampling of such studies would include Hansen (1963, pp. 128-140); Carol and Parry (1968, pp. 183-196); Ashenfelter and Mooney (1969, pp. 247-256).

⁵ Some studies adjust the cross-sectional profiles to take account of anticipated future productivity increases.

⁶ Definitions of such shortages are often quite imprecise in popular usage. See Bowman (1963, pp. 446-461); Rivlin (1962, pp. 276-377).

² A skeptical view of traditional arguments for state intervention in education may be found in Burns and Chiswick (1969, pp. 84-95).

these different types of benefits are to be valued in order to make some points about the complexity of decision making, apart from the valuation question. In what follows, therefore, it will be assumed that the valuation question has been overcome, and that a precise dollar amount can be attached to all of the various benefits. These benefits are assumed to represent both the personal rewards to the student (tangible and intangible) and the social benefits to society. We make this extreme assumption in order to explore whether, in this idealized world, any suggestive decision-making rules emerge.

Let us suppose that educational decision makers have as their goal the maximization of "net social benefits." The net social benefits will be defined simply as the difference between the gross returns resulting from the operation of a school or department and the costs of operation. Administrators will be assumed to include the student as a member of "society," so that purely private rewards will be included in net benefits along with external effects. In keeping with the usual practice of cost-benefit analysis, we will suppose that administrators ignore the distributional consequences of their decisions. That is, they will not concern themselves with who pays the costs, or who receives the gains.

The gross total benefits of each department (TB) in this model are determined by the number of students (N), the number of faculty members (F), and the stock of plant and equipment (K). That is:

$$TB = TB(N, F, K) \quad (14-1)$$

All elements in Eq. (14-1) have positive first derivatives. The addition of incremental amounts of N , F , or K adds something to the total benefits produced. If N is increased, total benefits rise because more people are receiving education. If F or K rise, the quality of education is increased for any given number of students. Students will be better trained and presumably better rewarded in the labor market.

Equation (14-1) may or may not be linear homogeneous depending on one's view of the educational process. It might be the case that very large departments run into problems of control and bureaucracy. Under such circumstances, the average level of quality might fall even if N , F , and K were expanded proportionally. In a relatively "thin" market for graduates, large increases in N might depress the wage or cause unemployment. This could also lead to diminishing returns to scale. At the other extreme, very small de-

partments might find it difficult to offer diverse courses or might suffer from insufficient intellectual stimulation. Thus, there may be a range of increasing returns to scale as well.

Taken individually, it is reasonable to assume that the three inputs each have negative second partial derivatives in the relevant range. Given a fixed level of F and K , an expansion of N results in a rise in the student-faculty ratio and a "crowding" of equipment. Thus, the benefits resulting from N increase at a diminishing rate. Similarly, increases in F will result in positive, but declining, benefits. A department consisting of 60 students and 3 teachers will surely benefit from the addition of a fourth teacher. Presumably, if the same department started with 10 teachers and added an eleventh, the marginal effect would be smaller. Much the same argument can be made for increases in K . There are surely benefits to more classrooms, improved lighting, increased library collections, and so on. But there are limits to the magnitude of these benefits if the number of students and faculty is held constant.

It is useful to consider optimum short-run behavior in this type of model. In the short-run, K is fixed. The degree to which F is variable will depend on the proportion of tenured faculty and the degree to which tenured faculty can be transferred among departments.⁷ For purposes of simplification, suppose that faculty inputs are variable.

Alternative patterns of decision making could be assumed at this point. Central administrators might be supposed to regulate departmental affairs in detail, including the levels of N and F in each department. Or, they could simply control the budget allocations of each department and allow the departments to do what they liked with their budgets. We shall assume the latter type of control, although this is not a critical assumption.

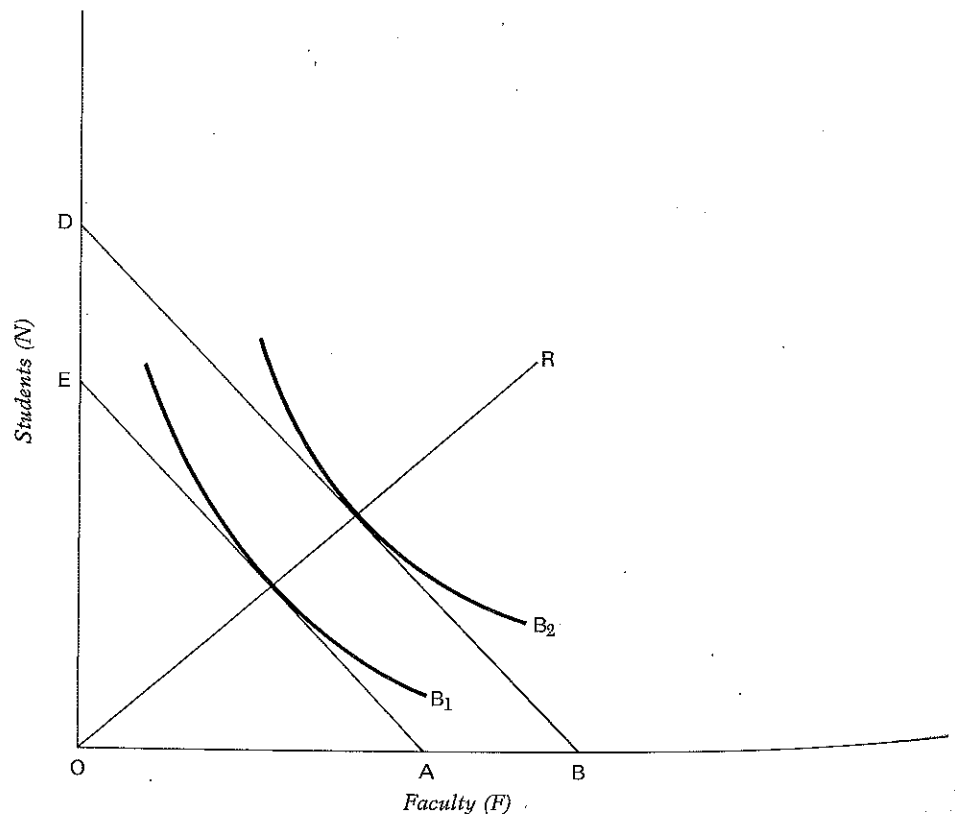
If the department is also operated with maximum net social benefits as a goal, the department chairman faces the problem of determining the optimum combination of N and F that achieves this purpose. Assume that each incremental student adds a constant nonfaculty cost (registration forms, test tubes, computer time) and that faculty members can be obtained from the labor market at a constant wage. Under these assumptions, the department's budget can be translated into a linear "menu" of combinations of students and faculty such as AE in Figure 14-1.

⁷ Some work has been done concerning the constraints imposed by the tenure system on obtaining a desired balance of faculty in an educational institution. See Oliver (1969).

The total benefit function described by Eq. (14-1) can be used to derive a family of isobenefit lines such as B_1 and B_2 , with higher lines representing higher total benefits. It is evident from Figure 14-1 that the highest benefits that can be obtained with the budget corresponding to AE are those associated with B_1 . Thus, the optimum student-faculty ratio is equal to the slope of ray OR . Educators commonly assume that within a department, there is a constant optimum student-faculty ratio at all levels of scale. Thus, we have drawn Figure 14-1 so that at a higher budget corresponding to BD , the optimum ratio remains the same. In technical language, the isobenefit map is homothetic.

With constant incremental nonfaculty costs, and a constant student-faculty ratio, the marginal cost of adding an additional student is also constant at any level of N . But the average-benefit

FIGURE 14-1



function will not be constant, since K is fixed in the short run. As more students are forced to work with a fixed stock of plant and equipment, quality deterioration inevitably sets in. Thus, average benefits per student (AB) as well as marginal benefits (MB) can be assumed to decline in the relevant range.

Consider two alternative assumptions about the behavior of the state (the source of financial support).

- 1 The state wishes to exploit all opportunities to maximize the net social benefits of the school. It presumes—as we do initially—that the school's administrators share its goal. Therefore, it provides the school with whatever financial resources the administrators think are needed.
- 2 The state imposes a budget constraint on the school and allows the administrators complete discretion within that budget. This assumption is probably closer to reality in these days of taxpayer revolts. Again, complete discretion is assumed to be left to the administrators as a sign of complete trust that their goal corresponds to the desires of the state.

Under assumption 1, each department is, in effect, a separate entity. Departments are not tied together by a fixed budget. Increased resources for one department do not imply decreased resources for another. All departments would accept students until the marginal benefit of doing so was just equal to the marginal cost.

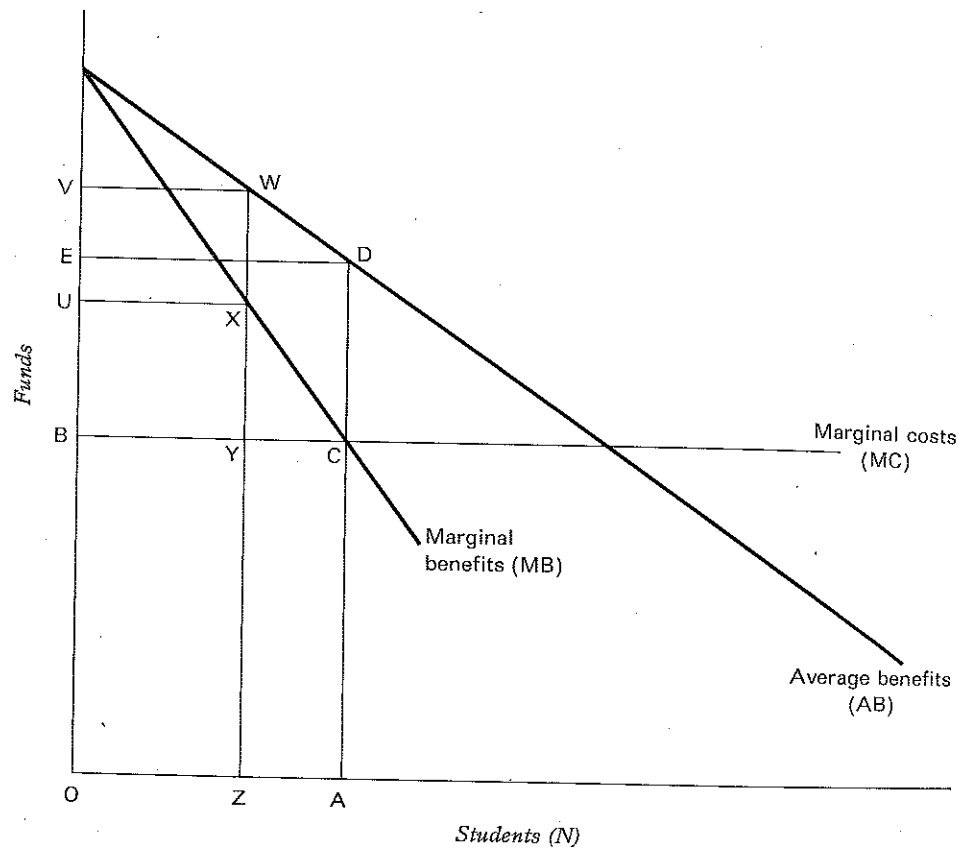
Assumption 2 links all departments together through the budgetary channel. Adding a dollar to one department means subtracting a dollar from at least one of the others. The optimal decision rule under these circumstances is to equate the marginal benefit-marginal cost ratios in all departments.⁸

Figure 14-2 illustrates optimum positions under the two assumptions with linear functions. Under assumption 1, the department operates at point C where $N = OA$. Gross benefits are then $OADE$ and variable costs are $OACB$. Thus, given K —and the sunk costs thereby implied—society “profits” by $BCDE$. No other position will provide net social benefits as high as $BCDE$.

If the school operates under assumption 2, we have to determine the general equilibrium solution in order to discover the optimum marginal benefit-marginal cost ratio that would be applied to all

⁸This result may be derived by maximizing Eq. (14-1) subject to a budget constraint.

FIGURE 14-2



departments.⁹ Suppose it turned out to be XY/YZ . Then the department operates with OZ students and provides a net social benefit of $BYWV < BCDE$.

Although the analysis has so far proceeded at a highly abstract level, it is worth noting that in reality, the state might wish to impose some additional constraints on the central administrator. It might not feel entirely comfortable leaving the determination of budget allocation entirely at his discretion. The only way to explain

⁹ In principle, the state could impose a budget less than or greater than the budget implied by point C . In the former case, the optimum marginal benefit-marginal cost ratio would be greater than unity. In the latter case, the ratio would be less than unity. As noted in the text, a less-than-optimal budget suggests a taxpayer revolt. A larger-than-optimal budget might occur if the state felt a commitment to process all eligible applicants.

this governmental anxiety is to relax the assumption that the school is composed entirely of net-social-benefit maximizers.

Suppose it were assumed that faculty pressure on the central administrator causes him to reduce the overall enrollment below the optimal level implied by either assumption 1 or assumption 2. The faculty might prefer small classes, few students, and more time for research. In that case, the state might feel compelled to require the school to admit some target number of students.¹⁰ Similarly, other constraints can be imposed wherever it appears likely that the school will deviate from state goals.

So far, the rules for optimal behavior have had little operational significance. Generally, decision makers do not have much information on the nature of the benefit functions. An interesting question, however, is whether any simple aids to the administrator can be adduced from the model. This is particularly important in terms of response to the labor market. If market demand for a particular occupation changes, how should decision makers respond?

Suppose students can be assumed to have accurate information about labor market conditions. If they have some interest in financial benefits, the pattern of applications can be expected to be influenced by labor market trends. There is, of course, a problem in trying to determine the exact relation between applications and the labor market. To avoid complications, we will assume that the relation is quite simple. As an example, imagine that a given percentage of increase in applications implies an equal percentage of increase in market benefits. In the analysis that follows, it really doesn't matter what the source of the benefits is (wages, tastes, etc.) or whether the administrator uses applications as the sole benefits index. But it will be convenient to think of applications as a guide.

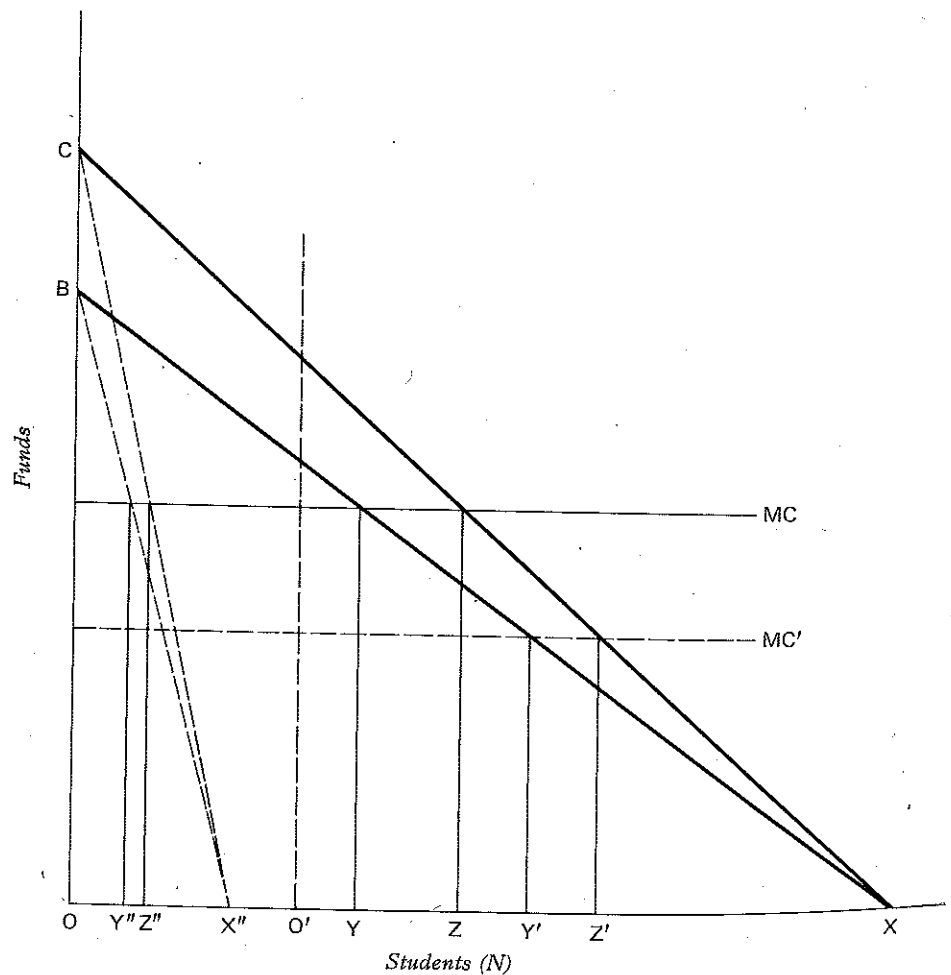
Since average benefits vary according to the number of students,

¹⁰ Constraints other than budgetary tend to produce peculiar results in terms of the optimizing rules implied. For example, if the school is given an enrollment constraint, but allowed to spend as much as it wants, the rule for maximum net social benefits is to set $MB - MC$ equal to a constant in all departments. If the school operates under a budgetary and an enrollment constraint, each pair of departments (i and j) should have $MB_i - MC_i = MC_j - MC_j$ equal to some constant. These peculiar rules might appear to imply that it is never optimal to impose anything more than a budget constraint because each rule implies a certain budget which, if it were the only constraint, would produce greater social benefits (by imposing $MB/MC = k$ on each department where k is some constant). However, as the text points out, if the state cannot "trust" the school to produce the desired results with only a budget constraint, it may have no choice but to limit the discretion of the administration.

the most reasonable way to define "percentage of increase in benefits" is by a rotation of the AB function around the horizontal intercept. That is, a 10 percent increase in a given average-benefit function implies another average-benefit function that is 10 percent above the original one at any value of N . Such an interpretation implies an equivalent rotation of the marginal-benefit function. For example, Figure 14-3 shows a marginal-benefit function that has been rotated from XB to XC to reflect increased applications.

Suppose the department of Figure 14-3 is operating in a school that has unlimited resources for maximizing net social benefits (assumption 1). The increase in the benefits requires an increase in

FIGURE 14-3



enrollments from OY to OZ . But it can be seen that the absolute change in enrollments depends, in part, on the level of MC , the marginal-cost function. If MC were lower, say at MC' , a smaller absolute increase in enrollments would occur ($Y'Z'$). This implies that a smaller percentage increase in enrollments would occur as well ($Y'Z'/OY' < YZ/OY$).

The explanation for the result is easy to understand, once it is realized that lower marginal costs imply lower marginal benefits, if the school starts from an optimal position. A 10 percent increase in marginal benefits that are at a low level because, for example, existing physical facilities are overcrowded, has less impact on decision making than a 10 percent increase from a high benefits level. Thus, the impact on enrollment is inversely related to the starting level of marginal costs.

From the model, one can derive the result that the absolute size of an enrollment response to an increase in benefits should be independent of the number of students who are already enrolled—if the origin on Figure 14-3 had been at O' rather than at O , the absolute increase in enrollments would still have been YZ .¹¹ It then follows, of course, that the percentage increase in enrollment from a given increase in benefits will vary inversely with preexisting enrollment. When marginal benefits are falling very rapidly, a given increase in benefits will bring forth a smaller absolute increase in enrollment than when benefits are falling slowly: if, in Figure 14-3, the MB functions intersected the horizontal axis at X'' instead of X , the absolute increase in enrollments would have been $Y''Z'' < YZ$. The nonintuitive result that the percentage increase in enrollment from a given benefit increase is not dependent on the rate at which marginal benefits are declining also obtains.¹²

Even in the simplest case, the relationship between changes in benefits and changes in enrollments is subject to a number of variables. Thus, no handy quantitative rules of thumb emerge from the analysis. Even if applications were considered to be an index of

¹¹ If the origin on Figure 14-3 had been at O' rather than at O , the absolute increase in enrollments would still have been YZ . Thus, the absolute change can be seen to be unaffected by the height of the intercept of MB (and hence AB) with the vertical axis. The location of the vertical intercept does not alter the magnitudes of MB or MC . Hence, the incremental response is independent of that intercept.

¹² Let $AB = za - zbN$ where it is a positive shift parameter initially equal to unity. Shifts in average benefits are described by changes in the value of z . (If

action with expensive devices. An expansion of these courses without corresponding equipment increases would lead to a quality-impairing drop in the amount of first-hand experience available to each student. If equipment is limited, then expansions in course offerings must be extremely modest.

Even if changes in student applications are assumed to be good indicators of changes in private benefits, simplistic decision making that adjusts departmental enrollments by percentage changes in departmental applications will avoid serious misallocation of school resources only under rather special circumstances. Marginal costs and the horizontal intercepts and slopes of marginal-benefit functions must be roughly equal in all departments. These conditions are probably not very common.

A pragmatic approach to the more complex decision making that is likely to be required would begin with a division of departments according to estimated marginal costs. With current techniques of cost accounting, perhaps three or four cost categories, ranging from low to high, would be practical. Changes in application patterns within these categories would be considered first. As a next step, the implications of modifying enrollments in accordance with applications would be reviewed. Expansions in some departments would be ruled out because of equipment or faculty shortages (steep MB curves). Other departments would then have their enrollments increased more than proportionally as a result. Total enrollments in each major cost category could be adjusted in the final step to accord with the budget and/or enrollment constraints imposed on the school.

There is an alternative approach by which enrollment decisions could be made. The previous analysis was based on the presumption that benefits must be considered along with costs. But if differences in benefits are largely ignored, the goal of administration becomes the processing of a maximum number of bodies per year with a given budget. This approach produces an emphasis on low-cost, minimum-quality programs with large undergraduate classes and a de-emphasis on graduate education.

The "costs-only" approach is at best a caricature of the extreme end of a spectrum that can be approached through diminished emphasis on benefits. But pressure for this extreme can come from within the educational system as well as from state sources of financial support.

Consider the following (oversimplified) view of the budgetary

benefits, it would clearly be incorrect to expand and contract departmental enrollments blindly in accordance with increases and decreases in applications. A department with very low marginal benefits and costs should not be greatly expanded, even if applications rise substantially. It could easily be the case that some other department, with a smaller increase in applications, should nevertheless be given a larger enrollment expansion.

The situation becomes even more complex when assumption 2 is considered. In that case, all departments are interrelated and decisions about one cannot be taken in isolation from information about others.

Despite these complexities, there are some conclusions that can be drawn from the analysis. First, in high-marginal-cost departments where marginal benefits are also presumably high, a rise in applications implies a need for relatively large absolute and percentage enrollment increases. Naturally, it is necessary to be sure that benefits are commensurate with costs initially before considering the impact of changes.

Second, in considering absolute enrollment increases, the slope of the marginal-benefit curve is an important consideration. It is unlikely that an administrator could make precise estimates of this slope. But he could look for certain indicators. Basically, steep slopes are associated with departments in which severe quality deterioration could result from expansion. Thus, a department whose course of instruction depends heavily on student experience with certain equipment should not be expanded very much in the short run, even if the benefits index rises considerably. For example, courses on computing methods require significant student inter-

average benefits rise by 3 percent, $z = 1.03$.) The marginal-benefit function can be written, $MB = za - 2zbN$. If the department operates according to the rule $MC = MB$, and if MC is constant, the following relationships can be derived:

- (1) $dN/dz = D = MC/2b > 0$
- (2) $dD/dMC > 0$
- (3) $dD/db < 0$
- (4) $(dN/dz) (z/N) = E = MC/(a - MC) > 0$
- (5) $dE/dMC > 0$
- (6) $dE/da < 0$

Note in particular that D is not a function of a ($dD/da = 0$) and that E is not a function of b ($dE/db = 0$). The discussion in the text follows from these results.

process at a public university. The university receives its budget based on the number of enrollments projected. The exact pattern of enrollments across departments is not taken into account. Instead, some sort of rough average cost per student—perhaps with a higher allowance for graduate students—is used to estimate operating costs.

Within the university, some departments will have less-than-average costs and therefore will be “profitable.” These “profits” are reallocated to research, high-cost departments, and other areas. A budget squeeze on the university could be accommodated by a reduced diversion of “profits” to research and other activities that the faculty enjoys. But it seems more likely that the pressures within the university will be to reduce high-cost programs—regardless of benefits—rather than research.

Is the costs-only model a paranoid academic nightmare, or does it reflect real-world trends? Ironically, attempts to increase the efficiency of internal resource allocation—such as cost-benefit analysis of the type discussed above—could lead down the costs-only path. Consider the new program budgeting techniques.¹³ Under program budgeting, costs are allocated by program (law, engineering, etc.) rather than by such arbitrary categories as salaries, telephones, and other types of purchases. Ideally, the resulting costs are then compared with benefits to see if the allocation of resources is appropriate. But the technique itself provides no benefit estimates.¹⁴ Hence, program budgeting could conceivably encourage a costs-only approach, despite the intent of its supporters.

Since technical progress is being made on the cost side, it is clear that educational decision makers must now turn to benefits if they are to prevent the costs-only approach from taking over. Just as it would be helpful for decision makers to divide up programs by a few estimated cost levels, a division on the benefit side would also be useful.

¹³ See Hirsh (1965); Williams (1966).

¹⁴ The University of California prepared a program budget in 1969 at the request of the state. We attempted to draw data on average cost per degree by level of degree from the tables included in the budget. This was algebraically feasible but the results did not turn out sensibly. See The University of California (1969). Thus, program budgeting may not provide the information needed for the department-level, resource-allocation decisions discussed in this section. However, cost technology has improved in recent years and such data can be estimated from simulation models.

The benefits of some programs can be considered largely in terms of labor market rewards. These programs are those that clearly purport to train for specific careers (law, medicine, engineering, elementary and secondary school teaching, business, etc.). For these programs, labor market demand can presumably be measured by applications in the short run, unless there is considerable evidence that students are misinformed. In the long run, when capital is variable, demand can be measured to a rough approximation by manpower projections.

Programs that are not market oriented must be classified separately. In the short run, educational judgments on the quality-degradation effects of “crowding” (falling *MB* curve) will suffice (along with the above-mentioned cost-category division) to adjust enrollments. For the long run we will need greater exposition of the “noneconomic” benefits than has been provided in the past. Certainly, applications by students in the face of loose market conditions represent evidence of consumer benefits. Some care must be taken to assure that these applications are not the result of misinformation. If a program is defended in terms of benefits to society (other than the student), manpower analysis cannot be avoided. Will the graduates of the program find opportunity to apply their training, albeit at a low financial rate of return, so that the alleged social benefits can be obtained?

The following section examines the degree to which this type of analysis is actually applied to decision making. Are manpower studies made when new programs are considered? What is the quality of such studies? Is costs-only on the horizon for higher education? These are some of the questions.

Using the foregoing model as a general guide, we examined decision making within higher education in California, chiefly the University of California, in order to gain some understanding of the extent to which enrollment distributions in higher education are responsive to the labor market and to economic efficiency criteria. Our methods of investigation were interviews with university and other officials and examination of relevant data and documents. California, of course, covers a significant fraction of the higher education system of the entire country. Our findings are likely to be representative for states other than California, although we cannot be certain about this.

DECISION MAKING ON ENROLLMENT DISTRIBUTION

The most important decisions affecting the distribution of students among the various specialties of higher education are those to be- gin, expand, or eliminate instructional programs, usually accom- panied by decisions on the construction of physical facilities. This is so because, given the existing condition of general excess demand for higher education in California (where student fees, at least until very recently, have been relatively low), almost all programs are able to achieve and maintain their desired enrollments. Once a de- cision to offer an instructional program has been made, adminis- trators can be nearly certain that the anticipated enrollment will be rapidly achieved. There are, of course, exceptions to this relation- ship and it is obviously true that a given program cannot expand indefinitely and attract the desired number of students, but in general, instructional programs in the University of California and in the California state universities and colleges have been able to attract desired enrollments in the last two decades, a fact due more to excess demand for higher education than to careful studies of the specialty distribution of student demand.

Our investigations led to the conclusion that decision making on educational program development and facility construction within California's systems of higher education is very complex. All that can be done is to provide an overview of the process and the more important influences that appear to operate. Our discussion of the decision process will consider both the loci of the decisions and the forces that influence the decisions, with emphasis on the forces that are associated with labor markets.

Instructional program decisions in the university are complex largely because the decision-making process is very much a shared one in which many groups and individuals participate and possess more or less power to affect the ultimate choice of program size and content. At campus levels, faculty and administrative committees, deans, and chancellors all have a degree of ability to originate, carry forward, or stifle program proposals, although in some instances program decisions may be made by the university administration and imposed on the campuses with little participation by the repre- sentatives of the affected campuses. Beyond the campuses, univer- sitywide faculty groups, staff units in the president's office, and the president himself have decision influence.

Out of the academic setting, the relevant decision makers are regent bodies and in some instances quasi-political higher educa-

tion coordinating groups. Because new programs usually require resources, the state legislature, including its appropriate commit- tees, and the governor of the state, with the advice of his executive agencies, are also important loci of the decision-making process, especially in their ability to veto choices made at other levels. Occa- sionally, when a bond issue is the method chosen to finance physical facilities necessary to operate a program, the voters of the state exercise final decision authority.

This elaborate gamut is designed to ensure careful review of program proposals. Whether this is achieved is not certain. It can be said, however, that the numerous reviews required before in- structional programs can be implemented are time consuming, and this prohibits the possibility of a rapid programmatic response to labor market requirements. Also, staff personnel with some ability to assess manpower needs are presumably consulted at several steps in this decision process, but the orientation of the groups and individuals with decision power is largely academic or political.

With that fact before us, let us try to delineate the various forces and criteria that influence the decision makers.

First, all capital-expenditure and instructional-program decisions in California higher education are apparently made within a plan- ning context. Existing master and academic plans are intended to provide long-range guidance for the expansion of the university and the various colleges. They do this for instructional curricula by de- scribing in general terms future needs for various kinds of pro- grams. These documents, however, do not set forth definite plans for expansion and, thus, there can be no assurance, particularly in recent years, that the general guidelines are carried out. The long- range plans are best thought of as very loose constraints on in- structional-program decisions.

Second, a variety of more proximate influences and pressures have an impact on the decision process. Faculty program preferenc- es perhaps deserve first mention, although the extent to which these preferences bear fruit seems to vary in a cyclical fashion. Ef- fective administrative leadership is an important influence. An ag- gressive president of the university, campus chancellors, and even deans can have great influence on the programs that are initiated or expanded. Logrolling not infrequently occurs within this multilevel system of decision making, whereby support for a desired program is obtained by an administrator in return for his commitment to

support the favorite projects of other administrators.¹⁵ Occasionally, influence from professional or industrial groups is the key to a decision. Local and regional interests, vigorously pursued, may result in the development of such programs as the theater arts program on the Los Angeles campus. Surprisingly, the university architectural and construction staff has significant influence on program expansion—because of the inadequacy of university and campus academic plans, we were told. A force that has gained in strength rather recently is that of articulated community needs, especially on matters of social policy.

Manpower requirements, examined through a benefit-cost framework, are a third type of influence on program decisions, but their net impact is difficult to assess. It is true that most decisions on professional programs are supported by some kind of manpower study or statement. The manpower studies vary considerably in quality and methods. There are some generalizations we can make, however, about the methodology of these studies. First, no organized mechanism exists for ongoing research into manpower needs. Studies are conducted in isolation. That is, a report will consider the need for, say, nurses, without comparing this need to those of other occupations. With a constrained budget, of course, it is *relative* needs (and costs) that must be compared.¹⁶

Second, a variety of factors are considered in reports on needs. These include projections of future manpower "requirements," student applications, costs, and so on. But the weight given to these factors varies from report to report. And the quality of information obtained is often questionable.

For example, a report by the Engineering Advisory Council estimated manpower needs in engineering by simple projections using the ratio of engineers to GNP. This type of projection is, of course, so crude as to be virtually worthless. On the other hand (and not surprising for a report by engineers), good construction-cost estimates were also provided (Engineering Advisory Council, 1965). A later, and much more critical, report on engineering placed heavy emphasis on student demand. It concluded that applications were too low to support even the existing engineering programs at optimum scale, let alone new ones (Terman, 1968). Although at

¹⁵For an analysis of this type of procedure, see Buchanan and Tullock (1962, pp. 131-145).

¹⁶Plans were under way to establish a manpower planning unit within the University of California when a budget cut forced their cancellation.

first rejected, the latter view now seems to prevail, largely due to the well-published problems of engineering unemployment in the aerospace industry.

Some reports attempt manpower projections but leave out cost considerations.¹⁷ Others define "needs" outside of the usual labor market context, presumably with the faith that by some means the labor market will absorb the degree output (Anderson, 1966). And even when the labor market is considered, there are problems in defining just what measures should be used. A report on nurses suggests the need is great, based on the large number of unfilled vacancies. But it notes that salaries remain low in the face of these vacancies, and that low salaries discourage student applicants (*Nursing Education in California*, 1966). The question remains, therefore, of whether it makes sense to expand nursing-education facilities if hospitals fail to maintain competitive salaries.

Regardless of the quality of the manpower statements, their importance to ultimate decisions is not at all clear. University documents express a strong desire to serve the manpower needs of the state, but our investigations indicated that decision making is probably responsive only to gross kinds of evidence of manpower needs. Thus, as already noted, the university is currently putting aside any expansion of engineering facilities, and it is trying to expand its medical-education facilities in line with the widespread general acceptance of this goal.

A fourth possible indicator of labor market conditions, one to which the university decision process is more responsive, is that of student demand for places. The Academic Plan of the university mentions this factor in justifying the proposed expansion of some of the professional programs, and information passed among administrators on application trends has an influence on proposals to expand various programs. Changes in patterns of student applications are not always good indicators of current or future manpower requirements: student information is not perfect, although some evidence suggests that it is very good (Freeman, 1967, Chs. 7 and 8). Student demand for places is influenced by noneconomic, sometimes ephemeral factors, and the condition of general excess demand for places makes it difficult to discern significant changes in the distribution of demand for places. Nevertheless, in the absence of alternative explanations, it is appropriate to presume that

¹⁷As an example, see Myren (1970).

changes in student demand for places—as indicated by applications for admission—reflect labor market trends in job prospects and attractiveness.¹⁸ This is especially true with respect to professional programs because of their vocational orientation.

All in all, university decisions on program additions and expansion appear to be loosely responsive to labor market conditions as these conditions become widely recognized by students and decision makers. Unfortunately, widespread recognition of market conditions often does not occur in time to avoid shortages or surpluses of various kinds of graduates. The current “looseness” of the market for new Ph.D.’s illustrates this fact.

Finally, cost considerations affect program decisions. Costs, of course, are included in the benefit-cost manpower analysis but, in addition, costs by themselves are becoming an increasingly important factor in university programs. Funds for expansion of facilities and programs in the University of California are now exceedingly difficult to obtain. Because of this fact, and independently of it, program planning and budgeting procedures are being initiated within the university. These procedures, which essentially attempt to provide information on benefits and costs of various activities, will probably lead to an increase in support for instructional programs that have low average costs per student at the expense of programs with high student costs. There is already evidence to support this assertion. A recent memo from the Office of the President to campus chancellors contained the following statement:

Because of the University’s current and presently foreseeable budgetary situation, it is necessary to adopt a conservative approach toward the establishment of additional Ph.D. programs in certain fields which involve high costs for facilities and/or library resources and in which there are Ph.D. programs already existing within the University.

This statement moves in the direction of a costs-only approach to the allocation of resources among various Ph.D. programs; there is no recognition of possible differential benefits of the various programs. It is likely that differential benefits are omitted, not because they do not exist, but because of skepticism that they can be shown and defended.

¹⁸ Freeman (1967) found that income differences at the margin affect the career choices of college students. The next section, “Empirical Evidence,” will provide greater discussion of this finding.

Given the difficulty of demonstrating differential benefits of various programs and California’s oft-stated policy of offering higher education to all who qualify, the executive and legislative branches of the state government and the university administration may increasingly shift their support to facilities that have low per-student costs. This does not rule out high-cost programs, but an increased burden of demonstrating correspondingly high benefits will have to be carried by those proposing the programs.

The University of California has nine campuses, and decisions are made at these campus levels that affect interspecialty (interdepartmental) distributions of enrollments within the constraints imposed by existing physical facilities. An initial discussion of decision making on the undergraduate-graduate division of students will illustrate the nature of influences, perverse and otherwise, that also affect the distribution of students among the various departments and programs of each campus.

For some time there has been a trend within the university to increase the relative number of graduate students. This movement has received official endorsement in the Master Plan of the university, along with a corresponding increase in the number of undergraduates to be enrolled by the junior colleges and the California state universities and colleges system, but there are three *underlying* factors that have produced the trend. First, there has been an increasing demand for master’s and doctoral graduates in response to the expanding enrollments in higher education and the increasing number of technical positions in government and industry. The increasing demand for graduate degree holders was accompanied by increasing student demand for graduate places.

Second, faculties have a preference for graduate over undergraduate students. Graduate students are generally brighter and more likely to be interested in the narrow scholarly interests of faculty than are undergraduates. Also, graduate students frequently go on to make recognized scholarly and other contributions of their own, and this enhances the prestige of the faculty with whom they took their graduate work.

Third, within the budget system of the university, graduate students are given from three-and-a-half to approximately one-and-a-half times the weight of undergraduate students for purposes of budget allocation (the exact ratios depend upon the level of preparation at which students are enrolled within both the undergraduate

Campus- Level Decisions

and graduate divisions). This is done in rough accord with the comparative average costs of educating undergraduate and graduate students. Graduate education, even in departments that do not use physical equipment other than classrooms, is more costly than undergraduate education. Class size is necessarily smaller and much more work with individual graduate students outside of the classroom must be performed. While the average cost differences between graduate and undergraduate education in the University of California appear to correspond to the budget weights,¹⁹ this may not be true for the marginal costs of adding graduate and undergraduate students.

It is probable that, as suggested in the previous section, the high budget allocations for graduate students permit departments to make "profits" that they then use to expand their faculty research activities and course offerings. In turn, more graduate students are required to support and justify the increased research and instructional activities. Expansion of graduate enrollment under the budget system that has existed may have been a circular, self-perpetuating process that, until recently, has been only loosely constrained by the labor market. Upgrading of job requirements within industry and education helped the labor market to absorb an increasing supply of graduate degree holders in this period (Berg, 1970, Ch. 3).

Some faculties adapted to labor market conditions by controlling the increments of new Ph.D.'s to the market without reducing the number of students enrolled in doctoral programs. It is worthwhile to describe the latter phenomena more fully, as an illustration of how faculties can use budgetary-allocation procedures to achieve their preferences in spite of an adverse labor market. The process, as hypothesized for the Berkeley campus of the University of California, has been studied by David Breneman (1970). His analysis postulates that the major objective of a departmental faculty is to maximize its prestige, and that one important way to do this is through placement of Ph.D. recipients in high-prestige positions, most of which are in major universities. As these jobs become harder to obtain—during a period of general reduction in expenditures for higher education, for example—the department lengthens

¹⁹ For an empirical study, see Weathersby (1967, pp. 90-92). This correspondence is not surprising since few university departments have trouble exhausting the resources which they receive for graduate education, that is, the budget ratios may determine the relative average costs, rather than the reverse.

the period of preparation for the Ph.D. by adding requirements or by imposing additional rigor on existing requirements. This reduces the number of persons receiving the degree in any period to match the number of prestige positions that are likely to be available. If there is also excess demand for Ph.D. programs, large numbers of Ph.D. students will continue to be enrolled, enabling departmental resources to be maintained.

While this analysis may have limited validity, it does appear to be appropriate for some instances—for example, the lengthy preparation time required for the Ph.D. in modern languages at most major universities. Language departments typically place their Ph.D. output in the academic labor market where prestige considerations are important. In contrast, departments such as chemistry send many graduates to industry, outside the academic sphere. Such departments generally have relatively short Ph.D. programs.

Although the precise methods vary, it is evident that budget procedures, in conjunction with a permissive labor market, have helped faculties to achieve their preferences for graduate students, and that when the labor market became less permissive, the budget procedures operated perversely to maintain faculty preferences. Currently, a change in the university weighting system is being discussed. If it is accepted, smaller budget weights for graduate students will result in a larger relative number of undergraduates or a very different mode of graduate education.

Turning now to the interspecialty distributions of student enrollments, we find it more difficult to identify the different decision makers than was true for statewide decisions. All campuses have review procedures for program matters that involve faculty and administrative personnel. Often, however, the review procedures are rather *pro forma*, with the key program decisions made through discussion or negotiation between departmental faculty and administrators. The conventional wisdom on University of California campuses says that the faculties decide program matters, including the determination of the relative size of the various programs. In fact, this is more false than true. Administrators, through their control and coordination of campus resources, have great means to influence program decisions, and since faculty persons usually do not have the time or interest that is required to have an impact on these decisions, effective control usually passes to administrators—all rhetoric to the contrary. Furthermore, as campus budgets become more constrained, administrative control tightens in order to

use available resources more efficiently. As shown in the previous section, centralized administrative control with a constrained budget can produce efficient resource use (in the sense of responsiveness to societal needs), depending on the forces to which the decisions respond.

In the University of California, forces or criteria affecting program distributions of student enrollment are supposed to be expressed through a campuswide planning process that results in an academic plan. What this means in practice is that local planning officers receive statements from all campus departments of the number of students they would like to have enrolled for each of "X" years into the future. These preferences are then adjusted by discussions involving the central administration, departmental representatives, and faculty committees so that the aggregate numbers conform to the campus enrollment ceilings. Our interest in this paper is on the criteria by which the adjustments are made; specifically, whether the criteria bring about decisions that are responsive to the labor market and economic-efficiency considerations.

The most frequently mentioned criterion affecting enrollment distributions is that of educational *balance*. At the highest level of generality, this term appears to mean that some kinds of distributions—those that concentrate large proportions of students in a few departments, for example—would be educationally unwise. Because of its uncertain meaning, the term offers little guide to operating decisions. Thus, its frequent use leads to a suspicion that it masks a lack of precise planning criteria.

One interesting example of the distributional planning process carried out under the "balance" notion is that described by the *Berkeley Revised Academic Plan (1965-75)* (The University of California, 1969). The plan adopts the policy, for the first time in the history of higher education in California, of limiting enrollment by department in order to establish for each department "an optimal balance between enrollment responsibilities and educational capability." Enrollment targets are established for each department of the campus, and these targets, if achieved, will redistribute enrollment away from the social sciences to the physical sciences and professional schools. Projected trends of student demand for places were considered in arriving at the enrollment targets, but the planned distribution of enrollments resulted principally from educational criteria having to do with optimal department size. Some departments were judged to be too large for effective education and

others were too small and had to expand faculty size in order to achieve a "critical scholarly mass." The criteria for determining educational effectiveness were not spelled out in the *Berkeley Revised Academic Plan*, but faculty preferences for department size were certainly important. Other than the extent to which projected patterns of student demand for places reflected relative benefits, no resource-allocation criteria had any apparent impact on the final document.

Obviously, a variety of influences can affect distributional decisions under the notion of educational balance. Not the least important of these are the prestige and internal and external political influence of individuals and groups of faculty members.

In spite of this fact, the most important influence on the *Berkeley Revised Academic Plan* was the interdepartmental distribution of student applications—the demand for places. The present distribution of students across disciplines, academic and professional, in the University of California has resulted largely from the distribution of student demand for places. If all departments had admitted half of the applicants and had had the same attrition rates, there would now be a perfect conformity between enrollment and student demand. Even though there is variation in admission to application ratios and in attrition rates, the conformity is fairly close. If the *Berkeley Revised Academic Plan* operates as intended, there will be some deviation on that campus between the distributions of applications and enrollments. Several informed observers believe, however, that the plan will not operate as designed simply because conflicts will occur between planned enrollment distributions and those desired by students, as expressed by their demand for departmental places.

Campus administrators are probably responsive to the pattern of student demand for places in the absence of any other clear-cut criteria for decision making. The imputation can be made from the analysis in the previous section that responding closely to applications involves the assumption that the marginal social benefits and the rates at which these benefits decline are the same for the graduates of all instructional programs, with marginal student costs not significantly different among these programs. Administrators probably do not engage in this kind of reasoning, but may well take a position that leads to the same result: that a public institution of higher education should be guided in its distributional pattern of student enrollment by the pattern of student applications for

the period of preparation for the Ph.D. by adding requirements or by imposing additional rigor on existing requirements. This reduces the number of persons receiving the degree in any period to match the number of prestige positions that are likely to be available. If there is also excess demand for Ph.D. programs, large numbers of Ph.D. students will continue to be enrolled, enabling departmental resources to be maintained.

While this analysis may have limited validity, it does appear to be appropriate for some instances—for example, the lengthy preparation time required for the Ph.D. in modern languages at most major universities. Language departments typically place their Ph.D. output in the academic labor market where prestige considerations are important. In contrast, departments such as chemistry send many graduates to industry, outside the academic sphere. Such departments generally have relatively short Ph.D. programs.

Although the precise methods vary, it is evident that budget procedures, in conjunction with a permissive labor market, have helped faculties to achieve their preferences for graduate students, and that when the labor market became less permissive, the budget procedures operated perversely to maintain faculty preferences. Currently, a change in the university weighting system is being discussed. If it is accepted, smaller budget weights for graduate students will result in a larger relative number of undergraduates or a very different mode of graduate education.

Turning now to the interspecialty distributions of student enrollments, we find it more difficult to identify the different decision makers than was true for statewide decisions. All campuses have review procedures for program matters that involve faculty and administrative personnel. Often, however, the review procedures are rather *pro forma*, with the key program decisions made through discussion or negotiation between departmental faculty and administrators. The conventional wisdom on University of California campuses says that the faculties decide program matters, including the determination of the relative size of the various programs. In fact, this is more false than true. Administrators, through their control and coordination of campus resources, have great means to influence program decisions, and since faculty persons usually do not have the time or interest that is required to have an impact on these decisions, effective control usually passes to administrators—all rhetoric to the contrary. Furthermore, as campus budgets become more constrained, administrative control tightens in order to

and graduate divisions). This is done in rough accord with the comparative average costs of educating undergraduate and graduate students. Graduate education, even in departments that do not use physical equipment other than classrooms, is more costly than undergraduate education. Class size is necessarily smaller and much more work with individual graduate students outside of the classroom must be performed. While the average cost differences between graduate and undergraduate education in the University of California appear to correspond to the budget weights,¹⁹ this may not be true for the marginal costs of adding graduate and undergraduate students.

It is probable that, as suggested in the previous section, the high budget allocations for graduate students permit departments to make "profits" that they then use to expand their faculty research activities and course offerings. In turn, more graduate students are required to support and justify the increased research and instructional activities. Expansion of graduate enrollment under the budget system that has existed may have been a circular, self-perpetuating process that, until recently, has been only loosely constrained by the labor market. Upgrading of job requirements within industry and education helped the labor market to absorb an increasing supply of graduate degree holders in this period (Berg, 1970, Ch. 3).

Some faculties adapted to labor market conditions by controlling the increments of new Ph.D.'s to the market without reducing the number of students enrolled in doctoral programs. It is worthwhile to describe the latter phenomena more fully, as an illustration of how faculties can use budgetary-allocation procedures to achieve their preferences in spite of an adverse labor market. The process, as hypothesized for the Berkeley campus of the University of California, has been studied by David Breneman (1970). His analysis postulates that the major objective of a departmental faculty is to maximize its prestige, and that one important way to do this is through placement of Ph.D. recipients in high-prestige positions, most of which are in major universities. As these jobs become harder to obtain—during a period of general reduction in expenditures for higher education, for example—the department lengthens

¹⁹ For an empirical study, see Weathersby (1967, pp. 90-92). This correspondence is not surprising since few university departments have trouble exhausting the resources which they receive for graduate education, that is, the budget ratios may determine the relative average costs, rather than the reverse.

use available resources more efficiently. As shown in the previous section, centralized administrative control with a constrained budget can produce efficient resource use (in the sense of responsiveness to societal needs), depending on the forces to which the decisions respond.

In the University of California, forces or criteria affecting program distributions of student enrollment are supposed to be expressed through a campuswide planning process that results in an academic plan. What this means in practice is that local planning officers receive statements from all campus departments of the number of students they would like to have enrolled for each of "X" years into the future. These preferences are then adjusted by discussions involving the central administration, departmental representatives, and faculty committees so that the aggregate numbers conform to the campus enrollment ceilings. Our interest in this paper is on the criteria by which the adjustments are made; specifically, whether the criteria bring about decisions that are responsive to the labor market and economic-efficiency considerations.

The most frequently mentioned criterion affecting enrollment distributions is that of educational *balance*. At the highest level of generality, this term appears to mean that some kinds of distributions—those that concentrate large proportions of students in a few departments, for example—would be educationally unwise. Because of its uncertain meaning, the term offers little guide to operating decisions. Thus, its frequent use leads to a suspicion that it masks a lack of precise planning criteria.

One interesting example of the distributional planning process carried out under the "balance" notion is that described by the *Berkeley Revised Academic Plan (1965-75)* (The University of California, 1969). The plan adopts the policy, for the first time in the history of higher education in California, of limiting enrollment by department in order to establish for each department "an optimal balance between enrollment responsibilities and educational capability." Enrollment targets are established for each department of the campus, and these targets, if achieved, will redistribute enrollment away from the social sciences to the physical sciences and professional schools. Projected trends of student demand for places were considered in arriving at the enrollment targets, but the planned distribution of enrollments resulted principally from educational criteria having to do with optimal department size. Some departments were judged to be too large for effective education and

others were too small and had to expand faculty size in order to achieve a "critical scholarly mass." The criteria for determining educational effectiveness were not spelled out in the *Berkeley Revised Academic Plan*, but faculty preferences for department size were certainly important. Other than the extent to which projected patterns of student demand for places reflected relative benefits, no resource-allocation criteria had any apparent impact on the final document.

Obviously, a variety of influences can affect distributional decisions under the notion of educational balance. Not the least important of these are the prestige and internal and external political influence of individuals and groups of faculty members.

In spite of this fact, the most important influence on the *Berkeley Revised Academic Plan* was the interdepartmental distribution of student applications—the demand for places. The present distribution of students across disciplines, academic and professional, in the University of California has resulted largely from the distribution of student demand for places. If all departments had admitted half of the applicants and had had the same attrition rates, there would now be a perfect conformity between enrollment and student demand. Even though there is variation in admission to application ratios and in attrition rates, the conformity is fairly close. If the *Berkeley Revised Academic Plan* operates as intended, there will be some deviation on that campus between the distributions of applications and enrollments. Several informed observers believe, however, that the plan will not operate as designed simply because conflicts will occur between planned enrollment distributions and those desired by students, as expressed by their demand for departmental places.

Campus administrators are probably responsive to the pattern of student demand for places in the absence of any other clear-cut criteria for decision making. The imputation can be made from the analysis in the previous section that responding closely to applications involves the assumption that the marginal social benefits and the rates at which these benefits decline are the same for the graduates of all instructional programs, with marginal student costs not significantly different among these programs. Administrators probably do not engage in this kind of reasoning, but may well take a position that leads to the same result: that a public institution of higher education should be guided in its distributional pattern of student enrollment by the pattern of student applications for

places, and that small differences in relative costs do not justify deviating from this guideline.

This position is responsive to the labor market to the extent that student applications reflect labor market conditions. Changes in the distribution of student applications, as discussed previously, probably do reflect changes in labor market opportunities. Still, student applications are not independent of the perceived opportunities for higher education. *Ceteris paribus*, a department with a reputation for rejecting most applicants will receive fewer applications than one that accepts most applicants. The rigor of an educational program also affects applications. Further, the distributional pattern of applications can be and is altered by vigorous recruiting efforts. Changes in student applications do generally reflect changes in relative benefits of occupations in the labor market, but imperfectly so.

Responding mechanically to student applications, as pointed out in the previous section, is likely to produce some misallocation of school resources in terms of cost-benefit analysis. Cost-benefit criteria do not appear to enter explicitly into the university decision process on enrollment distributions. This may change, however, if the program planning and budgeting previously mentioned are implemented. Decision making on student distributions would then be guided, in principle, by interdepartmental comparisons of marginal benefit-cost ratios. Increasingly constrained budgets for the campuses will hasten this movement, as suggested in the previous section. Progress toward more socially productive utilization of university resources is, of course, desirable, but there is a considerable danger that the program-budgeting system, as it is likely to be applied in the University of California, will be dysfunctional. The reason for this is simply that information can be fairly easily obtained on costs, but is very difficult to obtain for benefits. With constrained budgets, a requirement to enroll a minimum number of students, and information available only on the average departmental costs of educating students, redistributions of students from high- to low-cost departments are likely to occur.²⁰ If the pattern of average costs differs from the unknown,

²⁰ The Weathersby cost-simulation model has been applied to the University of California's Berkeley and Los Angeles campuses. It reveals considerable variation in costs between departments. For example, one student year of upper-division work in engineering at Berkeley costs about twice as much as a social science student year. The gap is even wider at UCLA. For a review of this type of model building in education, see Weathersby and Weinstein (1970).

but extant, pattern of marginal benefit-cost ratios, as seems likely to be the case, these redistributions will be dysfunctional.

In the course of interviews, several administrators, at both the state and campus levels, made comments that suggested that an emphasis on average costs has already begun to occur or will soon be occurring. Rather than focusing directly on costs, which carry a pejorative connotation within segments of the university, the decision process at the campus level is likely to pay increased attention to student-faculty ratios—which are correlated fairly closely with average per-student costs across departments. The result is likely to be allocation and reallocation of campus resources to departments with high ratios. University officials are quick to point out that student-faculty ratios are too simplistic a measure to use as a guide for allocation decisions, but they also frequently state the view that low ratios should be justified by a departmental showing of high benefits. It will not be easy for high-cost departments to make such showings because of the difficulty of agreeing on and measuring benefits.

The most important constraint on the allocational effects of an increasing budget squeeze is likely to be the campus academic plans (not all campuses have prepared them, however). As described, academic plans at University of California campuses establish projected enrollments by department—through a process of adjustment whereby departmental enrollment preferences are adjusted to the constraint of an overall ceiling on campus enrollment and to some notion of campus balance. Once the plan is established, deviations from it are relatively slight; given excess demand for higher education, most departmental projections of enrollment can be and are achieved, or nearly so. Major deviations would upset campus balance, probably more in a political than educational sense, and are, therefore, eschewed by administrators. This has the effect of limiting short-run campus responsiveness—to shifts in relative per-student benefits among the various educational specialties—to rather small alterations of student enrollment patterns. Similarly, the academic plan will be the chief barrier to redistribution of students from high- to low-cost programs if such redistributions would bring about marked departures from the plan. Thus, the academic plan, on the one hand, prevents a fine responsiveness of campuses to labor market (benefit) criteria and, on the other hand, protects the campuses from a costs-only approach to student distributions.

**Community
Colleges**

It is clear that two-year colleges, usually called junior or community colleges, are more responsive to the labor market than are four-year colleges and universities. The primary reason for this is that the community colleges are much more unequivocal in including among their objectives the preparation of students for employment and the offering of programs that help people improve occupational positions and earnings. A second reason is that decision mechanisms in community colleges are able to respond much more quickly to the labor market than are their counterparts in the universities.

When the need for a program, or an expansion or elimination of a program, is discerned in a community college, the dean of the occupational division of the college usually makes the decision himself—subject to review by the governing board. Requirements for review and approval by various faculty committees, which in the universities usually ensure the involvement of political considerations in the decision process, are minimal. Thus, the time span between the discerned need for a program and its inception is relatively short in the community college. Additionally, community colleges usually do not have to deal with a bureaucratic departmental structure. Courses and programs can be added or eliminated without threatening a department's existence. In fact, community colleges do eliminate programs as the lack of need for them becomes apparent.

Because community colleges are committed to occupational training, appropriate labor market information—that is, current and future employment prospects—is a necessary input to the decision process. Accurate knowledge of *future* labor market conditions is very difficult to obtain. Our impressions from conversations with community college officials is that most community colleges try to obtain the information that is required for responsiveness to (at least) current labor market needs.

All junior colleges in California have some kind of advisory body, composed of representatives of industry and labor, which provides guidance on occupational curriculum matters (Thornton, 1966, p. 193). It is not possible for us to evaluate the quality of advice coming from these groups.²¹ Most of the guidance arises from the unsystematic perceptions held by members of the body and these vary considerably in quality. Some groups have representatives of

²¹ For nonconclusive information on this matter, see Carlson (1967).

local offices of the public employment service as members. This would seem to enhance the chances that accurate and current knowledge is forthcoming.

Community contacts—with industry, labor, and government personnel—also help community college administration to keep in touch with the local labor market. Professional and occupational associations are other sources of information, although they may also be sources of pressure applied to community college governing boards and administration to achieve their own special goals.

Perhaps the source of information to which curriculum administration in junior colleges is most sensitively attuned is that of student interest (demand for courses). Student demand is expressed actively through requests to counselors, instructors, and administrators for particular courses. It is expressed passively by low enrollment in existing courses. Administrators respond to these indications of student preferences. First of all, there is the presumption that students are reasonably informed about labor market conditions (especially the evening students, who are usually employed and are close to the "job situation"), so that student demand is a close function of supply-demand conditions in the labor market. Secondly, in terms of efficient resource use alone, administrators tend to be responsive to student preferences. Courses with low enrollments mean high average costs per student. Certainly there are more benefits—if one measures benefits through student credit hours—from courses with high enrollments than from those that have low enrollments. This does not, of course, imply that costs are ignored except as they are affected by class size. Some courses require considerable amounts of equipment and facilities, and these costs do affect decisions on course offerings.

Although student demand is an important guide to occupational programs in community colleges, it is an imperfect one, because student demand is influenced by factors other than the labor market. Occasionally, students will not enroll in a program in spite of the very good employment prospects associated with it. In other instances, student demand for apparently occupationally related programs is strong in spite of limited employment opportunities. In these cases of noncongruence between student demand and market conditions, the former almost always dictates whether the program will be offered.

Overall, community colleges appear to do fairly well in responding to the labor market. (One area in which their performance

could improve considerably is in training for craft positions. Apparently, they have not been willing or able to produce trained craftsmen in the face of opposition from organized labor. Indeed, they appear to cooperate fully with the union-dominated apprenticeship programs by offering some courses that are limited to persons who are already indentured apprentices.) In view of their response to the labor market, some consideration should be given to widening their occupational scope to include programs that require more than two years preparation and to coupling their occupational curricula to academic programs in other institutions where both kinds of preparation for employment are desirable (California State Board of Education, 1970).

EMPIRICAL EVIDENCE

The cost-benefit analysis of the section on "Economic Analysis" can be applied to a single school. On the national level, it is quite possible that the educational system could show a responsiveness to changes in labor market conditions even if individual schools were inefficiently constrained by budget limitations, improper decision rules, "political" considerations, and so on. For example, if demand for workers in some occupations increases, new schools or departments may be created even if existing ones fail to respond to the changed conditions.

Two forms of evidence are commonly used to test for macro-level economywide responsiveness. First, a time-series study of a particular occupation can be undertaken. Changes in the supply of graduates can be examined to see if they can be explained by indexes of demand (wages, rates of return, present values, vacancies, employment, etc.).

The time-series approach raises certain problems. A positive association between law degrees and lawyer salaries could mean that the educational system responded to increases in lawyer salaries by using resources that "ought" to have been used elsewhere. Perhaps there was an even greater—but neglected—need for some other occupation based on cost-benefit considerations. Or it might be that the variations in output were responsive to the labor market, but that the output was inefficiently produced. The Breneman hypothesis, cited earlier, predicts that certain Ph.D. programs would be very wasteful in terms of student dropouts, but would nevertheless appear responsive in a time-series test.

Cross-sectional tests are an alternative methodology. Did greater salary increases (for example) in particular occupations relative to

others elicit relatively greater degree output? This type of test does look at comparative resource use. But its theoretical foundations are not as solid as they may seem. The same sort of analysis that was used in our earlier discussion on "Economic Analysis" can be applied here. The downward-sloping, marginal-benefit function can be interpreted as a long-run curve that falls as graduates are added to the labor market, and that refers to the nation rather than a single school.²² Similarly, the marginal-cost curve can also be given a national, long-run interpretation. We have already showed that when cost-benefit analysis is applied to these curves, a simple rank correlation between changes in demand and changes in output is not necessarily optimal. This was because the relevant cost curves also play a part in determining the optimum reaction. A correlation may indicate that the educational system is responding only to demand without taking proper account of its own cost functions.

Cross-sectional studies also raise questions about the lags of response. If schools could instantaneously respond to market conditions with graduates, fluctuations in the number of graduates would be observed, but not in the demand index. This lack of correlation would be a sign of a highly responsive system, not a failure to react. Actually, however, it does take time to produce graduates, so that lags may be reasonably expected. But, the lags will vary, depending on the time required to earn a degree. Cross-sectional work tends to ignore these differences in lags.

Finally, neither the time-series nor the cross-sectional approaches indicate *how* responsiveness to the labor market is achieved. It might be assumed that students are aware of labor market conditions and adjust their applications to schools accordingly. Schools might then passively react to application trends. Alternatively, students might be assumed ignorant of labor market conditions. In that case, any observed responsiveness would have to result from the channeling of students by school administrators.

Not all research in this field is rigorous in a statistical sense. One approach is to look for casual evidence of past "surpluses" and "shortages" in particular fields and then see if degree output appeared to respond. For example, in his study of university response

Previous Studies

²² As graduates are added to the labor market, wages are depressed below levels they otherwise would have obtained, or unemployment rates are increased. The educational capital stock is variable in the long run, and so the decline in the marginal-benefit function comes exclusively from the labor market.

in England during the interwar period, Sanderson looked at qualitative reports on labor market conditions and the universities' reactions. He reported some responsiveness, but with considerable lags (Sanderson, 1969, pp. 39-65).

Some writers have taken a more quantitative approach. Their work sometimes touches on responsiveness as a byproduct of other research. Wilkinson computed the lifetime present values of earnings of Canadian teachers and engineers (Wilkinson, 1966, pp. 556-572). He found that teacher present values were growing faster than engineer present values. The same was true of enrollments in universities for teacher preparation versus engineer preparation. Thus, Wilkinson uncovered what appeared to be a response to the labor market by the educational system.

Bumas studied the proportion of freshmen entering engineering programs (Bumas, 1970, pp. 231-242). He "explained" this variable by a vacancy measure, a starting-salary variable, and variables relating to the draft. The salary variable did not appear with the "correct" sign. But the vacancy index had the appropriate sign and was significant. Bumas' results indicate that the labor market makes itself felt through employment opportunities (measured by vacancies) rather than through financial rewards.

A recent study by Richard Freeman also included an analysis of freshman engineering enrollments (Freeman, 1971). In contrast to Bumas, he found that starting salaries did play a role in determining enrollments.²³ Higher engineering earnings tended to attract freshmen into engineering. Higher earnings in alternative occupations tended to decrease engineering enrollments. Freeman was able to estimate a similar model for accountants.

At the doctoral level, Freeman found a responsiveness to earnings, too. On a cross-sectional basis, the rank correlation between changes in median earnings (ages 30 to 34) of nine major specialties, with changes in degrees granted from 1948 to 1964, was 0.75. Using data from a variety of sources, Freeman was able to estimate an equation explaining the logarithmic change in doctoral degrees by occupational income disequilibrium, income disequilibrium in competing occupations, and the availability of stipend support.²⁴

²³ A letter from Freeman to one of the authors attributed the contrasting results to differences in specification of the estimated equations and to inappropriate wage data in the Bumas study.

²⁴ Freeman (1971, Ch. 4). "Income disequilibrium" is defined as the residual from regression-predicted, discounted, lifetime earnings in 1960 for 22 Ph.D. fields of study.

Tan's doctoral thesis was also supportive of a responsiveness of educational output to labor market conditions (Tan, 1967). Tan looked at degree output for groups of science, medical, and heavily female occupations. A number of income and stipend explanatory variables were used. All groups appeared to be responsive to market conditions. However, care must be taken in interpreting the coefficients reported since only the "best" results are shown.

Empirical Observations

A rather simple test of responsiveness on a cross-sectional basis is to see if occupations experiencing relatively rapid increases in remuneration during some time period also experienced relatively rapid degree growth.²⁵ The *Census of Population* provided a source of median income data for 1949 and 1959 by sex and occupation for a wide assortment of professions not previously studied. Obviously, it would have been preferable to use full-time earnings data rather than income. However, these were not available for 1949. Nor were there any convenient estimates of present values for that year.

It was found that there were 16 occupations for which both data on income and data on degrees granted could be obtained.²⁶ These were: accountants and auditors, architects, chemists, dentists, editors and reporters, foresters and conservationists, lawyers, librarians, nurses, pharmacists, physicians, social workers, teachers, veterinarians, social scientists, and natural scientists (excluding chemists). The U.S. Office of Education's breakdown into bachelor's and first-professional, and graduate and second-professional was followed with certain adjustments for medical degrees.²⁷

To investigate the responsiveness to income, the instantaneous percentage rate of change of income (from 1949 to 1959) was used as the explanatory variable.²⁸ It was used to explain the instantaneous percentage rate of change in degrees granted, calculated from a base year to an end year. All years between 1949 and 1959 were tried as base years. End years included all years from 1950 to 1967 subsequent to the base year. Thus, numerous lag structures are

²⁵ It must be stressed again that this type of responsiveness is not necessarily optimal. A negative finding, therefore, is not conclusive evidence of improper educational decision making.

²⁶ Data on degrees granted are available from the authors.

²⁷ Dentists, physicians, and veterinarians were reclassified as graduate and second-professional to reflect their status among advanced degrees.

²⁸ The use of two end points ignores the possibility that the trend might have altered or reversed somewhere between 1949 and 1959. However, only the end points were available.

TABLE 14-1 Summary regression results, base year = 1950-51

Academic year	Income regressions*						Employment regressions†					
	Bachelor's and first-professional‡			Bachelor's and first-professional‡			Graduate and second-professional			All degrees, both sexes		
	Male		Female	Male		Female	Male		Female	Male		Female
	Sign¶	R ²	Sign¶	R ²	Sign¶	R ²	Sign¶	R ²	Sign¶	R ²	Sign¶	R ²
1951-52	-	.05	+	.11	+	.00	-	.14	-	.01	+	.07
1952-53	-	.01	+	.00	+	.07	-	.06	+	.02	+	.08
1953-54	+	.21	+	.21	+	.17	+	.06	+	.00	+	.08
1954-55	+	.24	+	.25	+	.16	+	.04	+	.00	+	.08
1955-56	+	.14	+	.08	+	.23	+	.20	+	.03	+	.06
1956-57	+	.13	+	.05	+	.24	+	.28	+	.05	+	.07
1957-58	+	.14	+	.10	+	.25	+	.17	+	.07	+	.07
1958-59	+	.16	+	.11	+	.32	+	.27	+	.08	+	.07
1959-60	+	.15	+	.07	+	.34	+	.37	+	.15	+	.24
1960-61	+	.18	+	.08	+	.35	+	.35	+	.30	+	.29
1961-62	+	.18	+	.06	+	.37	+	.40	+	.38	+	.31
1962-63	+	.25	+	.17	+	.38	+	.27	+	.34	+	.33
1963-64	+	.11	+	.08	+	.36	+	.38	+	.44	+	.40
1964-65	+	.09	+	.15	+	.30	+	.33	+	.06	+	.39
1965-66	+	.01	+	.00	+	.34	+	.61	+	.23	+	.39
1966-67	+	.01	+	.00	+	.42	+	.63	+	.16	+	.45
1967-68	+	.01	+	.00	+	.36	+	.59	+	.19	+	.38

* Independent variable = instantaneous percentage change in median income, 1949-59; male, female, or total.

† Independent variable = instantaneous percentage change in employment, 1950-60; male, female, or total.

‡ Excludes dentists, physicians, and veterinarians, who were reclassified graduate and second-professional. After 1964, excludes librarians due to federal law discouraging bachelor's degrees for librarians.

§ Includes dentists, physicians, and veterinarians. Excludes librarians, nurses, social workers due to small numbers involved.

¶ Sign of coefficient of independent variable.

considered. The simple linear coefficient of determination (R^2) was employed as the measure of association.²⁹ The coefficient of determination has the advantage of providing the intuitively pleasing percentage of variance "explained." Experiments using the less restrictive Spearman's rank correlation coefficient revealed no important differences with the results presented below.

Use of the income variable raises certain problems. It was noted earlier that earnings data or present-value estimates would have been preferable. But there are conceptual difficulties as well as measurement problems. Student "tastes" toward particular occupations might run counter to labor market trends. The educational system should not be called unresponsive if student tastes prevent degree output from fluctuating in accordance with market forces. In addition, there are institutional factors that can change the pattern of degrees granted. Governmental policies such as Selective Service regulations can have a differential impact on particular occupations. Changes in accreditation rules can also be important. For example, federal legislation provided strong incentive during the mid-1960s to eliminate the bachelor's degree in library science.³⁰

Table 14-1 presents the highlights of the regression analysis. The table shows the R^2 obtained and the sign of the coefficient of the independent variable when 1950 is used as the base year.³¹ The income regressions revealed a positive but weak association between the income variable and the rate of change of degrees granted. At the graduate and second-professional level, no associa-

²⁹ No attempt was made to adjust the data for possible differential lags across occupations.

³⁰ Male bachelor's and first-professional degrees in library science fell from 595 in 1964 to 53 in 1965. Graduate and second-professional rose from 252 to 1,016. For females, the corresponding figures were 2,285 to 589 and 2,919 to 3,573. These dramatic changes seem to be due to the Higher Education Facilities Act of 1963 and the Higher Education Act of 1965. They provided federal funds to schools accredited by professional associations. The American Library Association accredited only master's degrees. Similar forces seem to have affected social work. Librarians were eliminated from some regressions to avoid distortion.

³¹ Results for other base years may be found in Appendix D. As noted in the text, computation of the Spearman rank correlation coefficient reveals little difference from the results in Table 14-1. For example, the rank correlations equivalent to those for the income regressions in column 1 are -.03, .04, .55, .49, .27, .28, .32, .24, .36, .30, .30, .18, .31, .23, .04, .16, .24. For the employment regressions in column 3, the numbers are .07, .33, .19, .19, .40, .40, .42, .55, .58, .59, .65, .65, .66, .68, .69, .78, .71. These figures are probably best compared with the square roots of the figures (R) in the two columns.

tion was found using the income variable for males. (There were too few females for any meaningful tests.) The difficulties inherent in the income variable, however, suggest that the lack of association at the advanced level may be more a problem of measurement than unresponsiveness.

It would be interesting to substitute unemployment rates or a vacancy measure for the income variable and repeat the correla-

tions.³² Unfortunately, no such measures are available for a broad range of occupations. However, the census does provide data on employment by occupation. Thus, it was possible to substitute the instantaneous percentage rate of change of employment for the income variable and repeat the test. Table 14-1 shows that the association improves when the substitution is made.

The results using employment raise problems of interpretation, however. Students might ignore labor market conditions in making their degree choices. When they graduate, the market might then adapt to the available supply. This alternative mechanism would also produce positive association. The regression results do seem to indicate somewhat of a lag between employment change and degree change, suggesting a causal relationship from the former to the latter. But great caution is required in interpreting these results.³³

Vacancy data are not generally available on an occupational basis. For certain occupations, however, the U.S. Employment Service does keep track of vacancies placed in its interstate clearance pool. In particular, data are kept for certain subcategories of engineers. These vacancies represent only a portion of the market, and so their accuracy must remain suspect. However, the Bumas study cited earlier did use total engineering vacancies from this source with some success.

It was possible to obtain annual average vacancy data for academic years 1950-51 to 1967-68 for five categories of engineers: electrical and electronic, civil, industrial, mechanical and aeronautical, and chemical.³⁴ As a simple test, average occupational vacancies as a proportion of average total engineering vacancies was used to explain occupational degrees granted as a proportion of total engineering degrees by degree level. Each occupation was analyzed separately on a time-series basis with various lags applied to the

³² If wages are sticky, changes in labor market conditions will show up as vacancies or unemployment rather than as income changes.

³³ The various regression results shown in Table 14-1 and in Appendix D are not independent of each other. Each regression shares a common base year or end year with a number of other regressions. Thus, it is difficult to be sure that a lagged relationship has been uncovered.

³⁴ The Employment Service stopped reporting chemical-engineering vacancies separately after academic year 1964-65. The Manpower Administration supplied unpublished data for 1961 through 1968. Earlier figures were taken from *The Labor Market and Employment Security*, a monthly journal of the Bureau of Employment Security.

independent variable.³⁵ Degrees were broken down into bachelor's and first-professional, and master's and second-professional (excluding Ph.D.'s).

Table 14-2 shows the R^2 obtained from the various runs. In general, positive association results when the degree variable is lagged three or four years behind the vacancy variable. This result makes intuitive sense, especially at the bachelor's level. However, there are also anomalies in the results. At the master's level, mechanical and aeronautical vacancies appear with an "incorrect" sign. And the association uncovered for the chemical and civil categories is quite weak.³⁶

Even if the results of this and other studies can be interpreted as revealing a measure of responsiveness by the educational system to labor market pressures, the mechanism of that response remains hidden. Do students know about market conditions and adjust their applications accordingly? If they do, schools may only passively react to applications. Or are students ignorant of market factors? In that case, schools may instead channel students in accordance with market forces through stipends, denial of admission to certain programs, or other means. Or is it some mixture of channeling and student awareness?

Some evidence on this question could be found if the amount of information students have could be determined. Economists are prone to look for signs of awareness of salary patterns in investigating student sophistication.³⁷ Freeman, for example, surveyed students in the Boston area and found them to be amazingly well informed about market conditions. When asked to rank starting salaries in 12 or 14 fields, their ranks were closely in line with rankings based on available salary data (Freeman, 1971, table 8-6). The Freeman' results were heavily discounted by administrators with whom we talked. The pervasiveness of this feeling was strong enough to encourage the gathering of some independent evidence.

The authors of this paper both teach at the Graduate School

³⁵ Some experiments were made with polynomial distributed lags. However, there were not enough observations for significant results.

³⁶ Actual coefficients from the regressions using a four-year lag are shown in Appendix D.

³⁷ Educators often have a different view of what constitutes important information. Complaints are sometimes heard that students are unaware of their own capabilities and limitations relative to program requirements. See Olsen (1960, pp. 396-399).

TABLE 14-2 R^2 result from regression of proportion of engineering degrees granted in a field against proportion of vacancies in interstate clearance (+ indicates positive association)

Engineering field	Lag of independent variable (number of years)						
	Current	One	Two	Three	Four	Five	Six
<i>Electrical and electronic</i>							
Bachelor's	-.00	+.01	+.07	+.19	+.33	+.26	+.07
Master's	+.02	+.13	+.17	+.16	+.13	+.03	-.01
All levels	+.00	+.03	+.09	+.19	+.29	+.18	+.03
<i>Civil</i>							
Bachelor's	-.00	+.00	+.02	+.09	+.08	+.00	-.36
Master's	-.17	-.34	-.03	+.20	+.22	+.01	-.23
All levels	-.01	-.00	+.01	+.13	+.11	+.00	-.37
<i>Industrial</i>							
Bachelor's	+.32	+.46	+.48	+.62	+.75	+.47	+.28
Master's	+.21	+.30	+.50	+.50	+.49	+.43	+.33
All levels	+.40	+.52	+.63	+.71	+.74	+.50	+.27
<i>Mechanical and aeronautical</i>							
Bachelor's	-.01	+.03	+.14	+.55	+.71	+.69	+.32
Master's	-.04	-.34	-.54	-.41	-.17	-.00	+.11
All levels	-.01	+.02	+.09	+.43	+.62	+.70	+.42
<i>Chemical</i>							
Bachelor's	+.14	+.26	+.17	+.10	-.00	-.00	-.00
Master's	+.02	+.08	+.10	+.10	+.16	+.23	+.13
All levels	+.07	+.18	+.14	+.10	+.04	+.05	+.02

NOTE: Bachelor's = bachelor's and first-professional; master's = master's and second-professional (excluding Ph.D.'s); all levels includes Ph.D.'s.

of Management, University of California at Los Angeles (UCLA). A questionnaire was given to 116 master's students in the school.³⁸ The students were asked to classify by earnings potential 12 of the various fields (including the general M.B.A.) in which master's degrees at the school could be obtained. All these students had to make—or had made—a decision about their areas of specialization during their programs. They were also asked questions about other master's programs within the university. Students without information were asked to check "don't know." Those with information were asked to rank the programs within the business school relative

³⁸This represents about 32 percent of the master's enrollment. The questionnaire was distributed and returned in classes. Hence, there was no nonreturn problem.

to the average school graduate with a master's. They were asked to consider master's programs throughout the university relative to an average graduate with a master's degree. Three levels of salary ranking were available: higher than average, average, and lower than average.

Unfortunately, there are no data on salaries by which to measure the accuracy of student responses. It was possible only to look at the consistency of student response and the rate of "don't know" answers. Thus, the results must be treated with caution.

Table 14-3 summarizes the responses. For programs within the school, the "don't know" rate varies between one-tenth and one-third. For university programs—where far less detailed knowledge is required—the rate did not exceed 13 percent. Thus, only a minority believed they had no information, although that minority was significant in some fields.

In no case were all students who did believe they had information unanimous in their answers. On the other hand, the chi-squared statistics indicate that the responses were significantly different from a purely random pattern. There was a general consensus among students who did claim information on salary characteristics.³⁹ The favorable rating given to engineering (fall 1970) appears to indicate a lag in the spread of information.

Of course, the fact that students have information does not mean that they choose to act upon it. Other factors may determine their decisions.⁴⁰ But it is worth noting that less than 7 percent of the students polled felt they had no information about business school graduates. And three-fourths of those with information believed the business school degree led to above-average salaries.⁴¹

³⁹ No investigation was made of the factors that influenced the amount of information the students had. A study of noncollege youth revealed that racial, regional, age, and experience factors are involved at that level. See U.S. Department of Labor (1970, Ch. 5).

⁴⁰ For example, a study indicates that students who choose the vocational tracks at junior colleges tend to be either high-ability students with noncollege parents or low-ability students with college parents. In other words, their choice may be viewed as a means of resolving a conflict between personal ability and parental values. See *The Two-Year College and Its Students* (1969, p. 97).

⁴¹ Within the areas of specialty offered by the business school, only four students believed the salary within their chosen field was below average. The M.B.A.'s generally believed their program to lead to average salaries for a business school graduate. This may simply reflect the fact that M.B.A.'s make up a large proportion of the school's enrollment. Therefore, their salary would heavily influence the average.

TABLE 14-3
Results of
questionnaire
administered to
116 master's
candidates at
the graduate
school of
business
administration
at UCLA
(percentages in
various
categories,
and X^2)

Area of specialization within business school or university	Higher than average	Average	Lower than average	Don't know	X^2
<i>Salary resulting from business school program relative to average business school master's graduate</i>					
Accounting and information systems	64.6	21.6	4.3	9.5	74.3
Behavioral science	11.2	31.9	39.6	17.2	18.2
Business economics	20.7	45.7	19.8	13.8	17.6
Finance	52.6	34.5	3.4	9.5	47.5
Industrial relations	11.2	46.6	25.9	16.4	26.2
International business and comparative management	25.9	37.9	11.2	25.0	17.7
Marketing	29.3	42.2	15.5	12.9	14.4
Operations management	42.2	36.2	6.0	15.5	31.0
Quantitative methods	44.0	31.9	7.8	16.4	28.3
Sociotechnical systems	12.1	31.0	25.9	31.0	9.7
Urban land economics	15.5	39.6	21.6	23.3	14.3
M.B.A.	19.0	58.6	10.3	12.1	52.5
<i>Salary resulting from university program relative to average master's graduate</i>					
Economics	33.6	42.2	15.5	8.6	14.2
Journalism	8.6	37.9	40.5	12.9	25.1
Library science	10.3	20.7	57.8	11.2	48.7
Public administration	14.6	49.1	28.4	7.8	22.7
Engineering	57.8	31.9	2.6	7.8	91.6
Education	6.0	35.3	49.1	9.5	37.3
Social welfare	6.0	25.0	56.9	12.1	52.3
Business	64.6	26.7	1.7	6.9	75.1

NOTE: X^2 indicates a confidence level above 1 percent in all cases.

CONCLUSIONS
AND
ADDITIONAL
REMARKS

Obviously, drawing conclusions from these empirical results is hazardous. Nevertheless, even tentative conclusions should be set forth, minimally, to provoke additional inquiry into this important subject.

It does appear, from our own research and that of others, that the numbers of degrees granted in professional specialties by institutions of higher education are responsive to labor market conditions. The responses lag behind labor market events by several years and, for the most part, are weak in the sense that changes in labor

market conditions explain only a small part of the variation in degree output.

Changes in employment, as a proxy for labor demand, produce a greater response than changes in relative income. We believe that this is because, in our economy, changes in relative occupational wages over a time period of, say, 10 years are slight. Instead, disequilibrium positions that produce unemployment and job vacancies tend to persist until corrected by shifts in supply and demand functions. This is especially the case for the occupations studied in this paper; many of them are found predominately in the public or nonprofit sector, where wage flexibility is constrained by institutional forces. But wage adjustment of occupational disequilibria is far from certain in private labor markets as well. Even in the private sector, institutional forces may have at least come to dominate the short-run behavior of occupational wage differentials.

On the question of how the response to the market comes about, it appears that student demand is the most active force, while higher education institutions are passively responsive. Student information about relevant labor markets appears to be fairly accurate, certainly better than is often supposed. It does, of course, lag behind real events, but by not nearly so much as do institutional decisions to expand programs and facilities in response to labor market behavior.

Institutions of higher education play a passive role in this process in the sense that during their evolution they permit departmental and, to a lesser extent, professional distributions of student enrollment to be guided by the distributions of student applications. When these institutions are fully matured, they passively accommodate to small changes in the pattern of student demand, but are usually not willing to accept large changes in enrollment distributions. Since student demand at state institutions is usually in excess of the number of places available, and is influenced by existing program offerings, few state colleges and universities have had to face the question of accommodating sizable changes in student enrollment preferences.

Higher education systems attempt to play a more active role on student specialty distributions by means of decisions to add or eliminate programs and capital facilities. The criteria by which such decisions are made are not at all clear, however. Responsiveness appears to exist only to rather obvious labor market trends; it is a delayed response rather than an anticipatory one.

We have not seen any evidence that up to the present any of California's institutions of higher education conduct the benefit-cost analyses that are required for efficient allocation—from a societal point of view—of enrollment and resources among the various higher education specialties.

We have shown that even if such analyses were made, they would rarely provide the basis for clearcut decisions on enrollment distributions. Nevertheless, benefit-cost analyses would almost certainly improve upon the present efficiency of resource allocation in public higher education.

A change in the public's implicit valuation of the benefits and costs of higher education is now taking place. After World War II and until the mid-1960s, great emphasis was placed on the benefits of higher education. It was usually assumed that these benefits warranted whatever costs were involved. There was only slight concern with the comparative benefits of various specialties, the assumption having been that, since benefits vastly exceeded costs for all programs, public higher education systems should largely allocate their resources according to the specialty distribution of student demand.⁴²

In the 1960s, public officials began to realize that both benefits and costs should be considered in higher education expenditures. Appropriate accounting techniques for doing this, such as program planning and budgeting, were then developed. These techniques were initiated, however, at a time when taxpayers were rebelling at greater expenditures on higher education and, at the same time, were raising questions about the alleged benefits. As a result, their development seems to be leading to a primacy of costs for allocation decisions in higher education. The difficulty of accurate assessment of benefits adds to this trend. Thus, it is probably not a great exaggeration to say that the earlier emphasis on "benefits only" is being replaced by one which looks at "costs only."

As a summary answer to our original question about the responsiveness to the labor market of higher education's degree production, we can say the following. In the short run, higher education institutions respond to labor market trends as reflected in the patterns of student demand for places. This response occurs only within the

⁴² Student preferences, however, were not always controlling. For example, students were channeled into technical programs by post-Sputnik financial support and were kept out of medical education by slowly rising limits on enrollment in medical schools.

constraints that are set by campus notions of academic "balance" and budgetary limitation. In the long run, when it is possible to construct new facilities and add or eliminate programs, higher education attempts to respond to apparent trends in manpower needs. It is not always successful in doing so, as evidenced by the nation's experience with medical education. These conclusions are based largely on our analysis of the decision process in higher education. Our statistical analyses of the labor market-degree production nexus are compatible with them, although not unequivocally supportive.

Clearly, higher education systems could be much more responsive to the labor market and to manpower needs than they are. But should they be? We do not presume any special competence to answer that question, and therefore, will limit our response to pointing out several possible dangers that may accompany a heightened sensitivity to the labor market.

First, there is the danger of reducing the interoccupational mobility that goes on in our society. American higher education, as contrasted to the British system, for example, has historically provided a rather general education and socialization values, rather than specific vocational skills.⁴³ This emphasis has enabled its graduates to pursue a variety of careers and to change careers in response to changing opportunities and their own changing interests.⁴⁴ Employers, unable to recruit enough specifically prepared people, have been willing to employ generalists and provide them with the specific training required for effective job performance. A high degree of responsiveness of higher education to manpower needs would produce more vocationally trained graduates, but they would also be graduates with less ability to make occupational changes. This would limit the occupational opportunities to which they could respond and might also reduce the supply flexibility of the labor force.

Second, greater responsiveness to the labor market would increase the market-regulation functions of higher education when less, not more, market regulation is desirable. To illustrate, as a response to the current excess supply of new Ph.D.'s, educational institutions can, and probably will, restrict entry into doctoral programs, or at

⁴³ On the socialization emphasis in American higher education, see Handlin and Handlin (1970).

⁴⁴ See the essay by Riesman in Dunham (1970). For evidence on the connection between college majors and careers, see Sharp (1970, p. 40).

least output from them, in order to prevent the average job remuneration (including job "quality") received by new Ph.D.'s from declining. This action might be inappropriately restrictive of individual choice. The response of higher education to the loose Ph.D. market should be the provision of information on the current and expected state of the market. Then, if applications for doctoral programs decline, enrollment and output of the programs should be permitted to decline. But continued strong demand for places in doctoral programs would probably mean that prospective students are putting a higher valuation on the nonfinancial returns from a Ph.D. If administrators determine that students are looking at nonfinancial rewards and are not simply uninformed, these types of benefits must be considered in determining enrollments.

Higher education must be responsive to, or at least should not interfere with, positive manpower needs that are clearly delineated by the society. Such behavior usually does not coerce individuals or restrict their occupational choices. However, restriction of entry into educational programs in order to influence market behavior does restrict choice and should be avoided.

Third, greater responsiveness to the labor market might well have adverse impacts on the educational process itself by bringing about increased emphasis on degree attainment at the expense of the substantive values of education. Even now there is some concern about overemphasis on academic certification and prolonged periods of study in higher education. If these fears are justified, then it must be true that employers, by using degrees as proxies for other desirable traits in prospective employees, have to some extent changed the emphasis in colleges and universities from learning to degree granting. Such an impact can occur without the active cooperation of the institutions themselves. The enrollment of large numbers of students who primarily seek a degree so that they can enhance their job prospects is sufficient to place great strain on traditional education programs, especially those that are not geared to prepare students for short-run professional goals.

There are indications that this indirect effect on higher education of student response to job requirements will increase. Educational requirements in industry and government appear to be inching upward without corresponding changes in the skills actually needed (Berg, 1970, Chs. 3, 4, and 9). As a consequence, the necessity for undergraduate and, ultimately, graduate degrees to compete successfully in job markets will increase. Even passive acquiescence to these trends by educational institutions can produce what Berg

terms "The Great Training Robbery"—excessive emphasis on formal degree requirements in hiring—as well as some transformation of the educational institutions themselves.

In order to reverse this self-reinforcing process, recommendations have been made to reduce the time spent in college, to de-emphasize degrees as employment standards, and to permit alternating periods of education and work experience (Carnegie Commission, 1971). However, a tendency toward unnecessary educational requirements—if one exists—is something very difficult to correct at the level of educational decision making discussed in this paper. The American educational system is extremely decentralized. But it is also standardized and tradition bound. One school cannot, by itself, institute major changes in the time required for undergraduate study or the meaning of a particular degree title. Some kind of national cooperative effort is required. On the demand side, employers should be encouraged to review their hiring standards. The current slackness of the labor market could lead to still more job-rationing educational requirements that would hinder job and social mobility in the future.

References

- Anderson, Lawrence B.: *California Education in Environmental Design and Urban Studies*, Coordinating Council for Higher Education, Sacramento, Calif., July 1966.
- Ashenfelter, Orley, and Joseph D. Mooney: "Graduate Education, Ability, and Earnings," *Review of Economics and Statistics*, vol. 50, pp. 78-86, February 1968.
- Ashenfelter, Orley, and Joseph D. Mooney: "Some Evidence on the Private Returns to Graduate Education," *Southern Economic Journal*, vol. 35, pp. 247-256, January 1969.
- Berg, Ivar: *Education and Jobs*, Praeger Publishers, Inc., New York, 1970.
- Berkeley Revised Academic Plan, University of California, Berkeley, 1969.
- Blaug, Mark: "Approaches to Educational Planning," *Economic Journal*, vol. 77, June 1967.
- Bowman, M. J.: "Educational Shortage and Excess," *Canadian Journal of Economics and Political Science*, vol. 29, pp. 446-461, November 1963.
- Breneman, David W.: "An Economic Theory of Ph.D. Production: The Case at Berkeley," Paper P-8, Office of the Vice-President, Planning and Analysis, University of California, Berkeley, 1970.
- Buchanan, James M., and Nicos E. Devletoglou: *Academia in Anarchy: An Economic Diagnosis*, Basic Books, Inc., Publishers, New York, 1970.

- Buchanan, James M., and Gordon Tullock: *The Calculus of Consent*, The University of Michigan Press, Ann Arbor, 1962.
- Bumas, Lester O.: "Engineering Occupational Choice, 1950-1965," *Industrial Relations*, vol. 9, pp. 231-242, February 1970.
- Burns, Joseph M., and Barry R. Chiswick: "An Economic Analysis of State Support for Higher Education," *Western Economic Journal*, vol. 7, pp. 84-95, March 1969.
- California State Board of Education: *A Policy and System Study of California Vocational Education*, Arthur C. Little, Inc., Boston, 1970.
- Carlson, Henry: "Functions and Activities of Lay Advisory Committees for Selected Junior College Vocational Program," Ed.D. thesis, Department of Education, University of California, Los Angeles, 1967.
- Carnegie Commission on Higher Education: *Less Time, More Options: Education Beyond the High School*, McGraw-Hill Book Company, New York, 1971.
- Carol, Arthur, and Samuel Parry: "The Economic Rationale of Occupational Choice," *Industrial and Labor Relations Review*, vol. 21, pp. 183-196, January 1968.
- Chamberlain, Neil W.: "Some Second Thoughts on the Concept of Human Capital," *Industrial Relations Research Association Proceedings*, pp. 1-13, December 1967.
- Conger, Louis H.: "College and University Enrollment: Projections," in Selma J. Mushkin (ed.), *Economics of Higher Education*, U.S. Government Printing Office, Washington, D.C., 1962.
- Engineering Advisory Council: *An Engineering Master Plan Study for the University of California*, Office of the President, University of California, Berkeley, Sept. 1, 1965.
- Freeman, Richard: "The Labor Market for College Manpower," unpublished doctoral thesis, Department of Economics, Harvard University, Cambridge, Mass., 1967.
- Freeman, Richard: *The Market for College-Trained Manpower: A Study in the Economics of Career Choice*, Harvard University Press, Cambridge, Mass., 1971.
- Handlin, Oscar, and Mary F. Handlin: *The American College and American Culture: Socialization as a Function of Higher Education*, McGraw-Hill Book Company, New York, 1970.
- Hansen, W. Lee: "Total and Private Rates of Return to Investment in Schooling," *Journal of Political Economy*, vol. 71, pp. 128-140, April 1963.
- Hansen, W. Lee, and Burton A. Weisbrod: *Benefits, Costs and Finance of Public Higher Education*, Markham Publishing Co., Chicago, 1969.
- Harris, Seymour E.: "Economics of Higher Education," *American Economic Review*, vol. 43, p. 345ff., June 1953.
- Harris, Seymour E.: "Economics of Higher Education," *American Economic Review*, vol. 43, p. 345ff., June 1953.
- Hirsch, Werner S.: "Education in the Program Budget," in David Novick (ed.), *Program Budgeting*, U.S. Government Printing Office, Washington, D.C., 1965.
- Hutchins, Robert M.: *The Higher Learning in America*, Yale University Press, New Haven, Conn., 1936.
- Johnson, George E.: "The Demand for Labor by Educational Category," *Southern Economic Journal*, vol. 38, pp. 190-204, October 1970.
- Keller, John: "Higher Education Objectives: Measures of Performance and Effectiveness," in John Minter and Ben Lawrence (eds.), *Management Information Systems: Their Development and Use in the Administration of Higher Education*, The Sterling Institute, Washington, D.C., 1969.
- Kerr, Clark, et al.: *Industrialism and Industrial Man*, Oxford University Press, New York, 1964.
- The Labor Market and Employment Security*, a monthly journal of the Bureau of Employment Security, various issues.
- Mushkin, Selma J. (ed.): *Economics of Higher Education*, U.S. Government Printing Office, Washington, D.C., 1962.
- Myren, Richard A.: *Education in Criminal Justice*, Coordinating Council for Higher Education, Sacramento, Calif., September 1970.
- Nursing Education in California*, Coordinating Council for Higher Education, Sacramento, Calif., July 1966.
- OECD: *Higher Education and the Demand for Scientific Manpower in the United States*, Paris, 1963.
- Oliver, Robert M.: "An Equilibrium Model of Faculty Appointment, Promotions, and Quota Restriction," Research Report no. 69-10, Office of the Vice-President, Planning and Analysis, University of California, Berkeley, March 1969.
- Olsen, Lionel R.: "Junior College Students' Reasons for Occupational Choice," *Junior College Journal*, vol. 30, pp. 396-399, March 1960.
- Riesman, David: "Commentary," in E. Alden Dunham (ed.), *Colleges of the Forgotten Americans: A Profile of State Colleges and Regional Universities*, McGraw-Hill Book Company, New York, 1970.
- Rivlin, Alice M.: "Research in the Economics of Higher Education: Progress and Problems," in Selma J. Mushkin (ed.), *Economics of Higher Education*, U.S. Government Printing Office, Washington, D.C., 1962.

- Sanderson, Michael: "The Universities and Industry in England 1919-1939," *Yorkshire Bulletin of Economic and Social Research*, vol. 21, pp. 39-65, May 1969.
- Shaffer, Harry G.: "Investment in Human Capital: Comment," *American Economic Review*, vol. 51, pp. 1026-1035, December 1961.
- Sharp, Laure: *Education and Employment*, The Johns Hopkins Press, Baltimore, 1970.
- Tan, Edita A.: "Supply of Professional Degrees in the United States," unpublished doctoral dissertation, Department of Economics, University of California, Berkeley, 1967.
- Terman, Frederick E.: *A Study of Engineering Education in California*, Coordinating Council for Higher Education, Sacramento, Calif., 1968.
- Thornton, J. W.: *The Community Junior College*, John Wiley & Sons, Inc., New York, 1966.
- The Two-Year College and Its Students*, American College Testing Program, Inc., Iowa City, 1969.
- The University of California: "A Program Budget: FY 1970-71 - 1973-74," April 4, 1969. (Mimeographed.)
- U.S. Department of Labor, Manpower Administration: *Career Thresholds*, U.S. Government Printing Office, Washington, D.C., 1970.
- Weathersby, George: "The Development and Application of a University Cost-Simulation Model," Office of Analytical Studies, University of California, Berkeley, June 1967.
- Weathersby, George, and Milton C. Weinstein: "A Structural Comparison of Analytical Models for University Planning," Paper P-12, Office of the Vice-President, Planning and Analysis, University of California, Berkeley, 1970.
- Weisbrod, Burton A.: *External Benefits of Public Education*, Princeton University, Industrial Relations Section, Princeton, N.J., 1964.
- Weisbrod, Burton A., and Peter Karpoff: "Monetary Returns to College Education, Student Ability, and College Quality," *Review of Economics and Statistics*, vol. 50, pp. 491-497, November 1968.
- Wilkinson, Bruce: "Present Values of Lifetime Earnings for Different Occupations," *Journal of Political Economy*, vol. 74, pp. 556-572, December 1966.
- Williams, Harry: *Planning for Effective Resource Allocation in Universities*. American Council on Education, Washington D.C., 1966.
- Wiseman, Jack: "Cost-Benefit Analysis in Education," *Southern Economic Journal*, vol. 32, pp. 1-12, July 1965.

Higher Education and the Labor Market

edited by *Margaret S. Gordon*

*Associate Director
Carnegie Commission
on Higher Education
and Associate Director
Institute of Industrial Relations
University of California, Berkeley*

A Volume of Essays Sponsored by
The Carnegie Commission on Higher Education

MCGRAW-HILL BOOK COMPANY
New York St. Louis San Francisco Düsseldorf
London Sydney Toronto Mexico Panama
Johannesburg Kuala Lumpur Montreal
New Delhi Sao Paulo Singapore