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ABSTRACT

In this paper, the author looks at the contribution of education to economic growth and examines the desirability of public vs private financing of education from the standpoint of economic efficiency and equity. The author sees expenditures on education as an investment in human capital, the contribution to output of such an investment depending on the amount of the investment and the realized rate of return. He compares the rates of return for differing levels of education to the rates of return on nonhuman capital in the private domestic economy. In addition, the author discusses the financing of education in light of the social and private benefits that accrue from education. The paper concludes with a few specific comments about the benefits and financing of higher education. (DN)

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EDUCATION AND PRODUCTIVITY

Prepared for the
National Commission
on Productivity

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Preface

The National Commission on Productivity was established by President Richard Nixon in June 1970 to develop recommendations for programs and policies to improve the productivity of the U.S. economy. The Commission is composed of top-level representatives of business, labor, government, and the public. In order to aid the members in their consideration of various topics, staff papers will be prepared by government or private industry experts in different subject matter fields. These papers serve as background material for the members but do not necessarily represent their views.

This paper was prepared by Theodore W. Schultz, Professor of Economics, the University of Chicago. Professor Schultz presents an economic perspective for interpreting studies dealing with the return on investment in schooling and higher education and on the allocation of resources in education and research.

Contents

Part A. EDUCATION AND GROWTH

The services of labor—unskilled, skilled, including all technical and professional workers—account for about four-fifths of the output of the U.S. economy and the rest comes mainly from the productive services of physical capital, i.e., from structures, equipment and land. The acquired skills of labor account in turn for most of the services of labor. The contribution of "brute labor" to production is small and it is diminishing. Thus, a head count of laborers that fails to reckon the value of skills is a very imperfect measure because it does not take account of the difference in the skills of laborers. Moreover, these skills have become increasingly important in explaining the growing abundance of the goods and services.

My approach to the role of education in growth rests on the following propositions: (1) Increases in output come predominantly from the growth in real factor inputs and only to a minor extent from "total factor productivity". (2) The growth in the productive services per laborer is mainly a consequence of additional skills. (3) Increases in the general level of skills are attained slowly and, as a rule, gradually over time; they are in this sense long run developments and not to be had either quickly or suddenly. (4) The acquisition of skills that account for the additional quality of labor over time come in large part from schooling and education and associated activities. (5) The acquisition of these skills is in essence an investment in human capital and its contribution to output depends upon the amount of the investment and upon the realized rate of return.

1. The Evidence

The extension of economics in analyzing human capital is of two basic parts. The "capital" part rests on the proposition that certain types of expenditures create productive stocks embodied in man that provide services for future periods. (Schultz, 1961 A and B.) These services consist both of personal satisfactions that accrue directly to the person and of productive services that enhance his earnings. The other part of this extension of economics is the development associated with the allocation of "time" by Becker (1965) an outgrowth of the role that earnings foregone plays in the formation of human capital and in a wide array of nonmarket activities.

The core of the available evidence can be summarized by presenting the rate of return estimates. It is these rates of return that reveal what schooling and higher education are contributing per dollar of investment to growth. In general, they show that the rate of return to higher education from additional earnings is approximately in line with the rate of return in the economy taken in its entirety even though the personal satisfactions that accrue to students from their education over their life time are not taken into account. High school ranks higher by this test and elementary schooling is at the top as the following estimates show.

The rate of return to investment in elementary schooling appears to be upwards of 100 percent. The first estimates, Schultz (1961, A), which is admittedly a rough approximation, place it at about 35 percent. Hanoch's (1965, 1967) private rates of return derived from a one in thousand sample of the 1960 census are in the neighborhood of 100 percent. They confirm the estimates of Hansen (1963). (There may be some upward bias here because of changes in the no-schooling reference class.)

Becker's (1964) estimates for high school graduates restricted to white males, after personal income taxes, show that the private rate of return rose from 16 percent in 1939 to 28 percent in 1958 and that it has risen slightly since then. But unlike the upward trend in the rate of return to high school graduates, college graduates were earning over the same period in the neighborhood of 15 percent on their private investment in their college education. (Earnings foregone are included as part of the real cost of this investment.)

In estimating the rate of return on the private cost of graduate work borne by students, much depends on how one treats the stipends that are awarded to graduate students. Treating them as earnings, for which

a very plausible case can be made, the private rate of return to graduate work has been in the neighborhood of 15 percent. (Schultz, 1971, based on studies by Stafford, 1968, and by Weiss, 1968.)

With respect to the quality of schooling, Welch (1966) found that the rate of return to improvements in the quality in rural farm areas (elementary and high school) come to about 27 percent. Johnson and Stafford's (1970) recent study, using the University of Michigan sample of U.S. households, shows a strong 20 percent rate of return to quality of schooling associated with low expenditure per pupil, and this rate of return declines, as one would expect it to, as associated expenditures per pupil rise.

The private rates of return to schooling and higher education of non-whites in both the South and North have been less stable than for whites and lower according to Becker (1964), Hanoch (1965), and Welch (1966). Labor market discrimination is a part of the explanation. Recently, however, the job opportunities for non-white college graduates have improved markedly (Freeman, 1971).

As a benchmark in interpreting each of the above estimates, we have the implicit rates of return for the U.S. private domestic economy; they have ranged between 10 and 15 percent after profit taxes, but before personal taxes (Jorgenson and Griliches, 1967). See Table 1, Column 4.

Table 1. Estimates of Private Rates of Return, United States

Year	High school graduates: white males after personal taxes* (1)	College graduates: white males after personal taxes* (2)	Corporate manufacturing firms after profit taxes but before personal taxes** (3)	U.S. private domestic economy: implicit rate of return after profit taxes but before personal taxes*** (4)
	Percent	*Percent*	*Percent*	*Percent*
1939	16	14.5	. . . . .	. . . . .
1949	20	13.+	. . . . .	12.6
1956	25	12.4	7.0	14.4 (1955–56)
1958	28	14.8	(for period 1947–57)	12.3 (1957–58)
1959	Slightly higher than in 1958		. . . . .	9.7
1961	Slightly higher than in 1958		. . . . .	11.2 (1960–61)
1963–65	. . . . .		. . . . .	13.3

*From Becker (1964), p. 128.

**Also from Becker (1964), in which he draws on a study by G. J. Stigler (see p. 115 and n. 2).

***From Jorgenson and Griliches (1967), p. 268.

Source: T. W. Schultz, "Resources for Higher Education: An Economist's View", *Journal of Political Economy*, Vol. 76, No. 3 Chicago: University of Chicago Press, May/June, 1968.

The capabilities of laborers are also enhanced by *post-school investment*. On-the-job training and the acquisition of experience play a large role in increasing the stock of human capital. Using Mincer's (1962) first set of estimates, Schultz (1962) shows that the human capital in males in the U.S. labor force as of 1957 from their investment in on-the-job training came to about $347 billion compared to the educational stock of capital in the labor force at that time of $535 billion. Although there are no explicit rate of return estimates pertaining to this class of post-school investment, Mincer's recent work (1970) and a major National Bureau of Economic Research study, virtually completed, strongly support two major inferences: (1) Post-school investments continue to be very large and they systematically increase life-time earnings; (2) The complementarity between the amount that has been invested in schooling and higher education on the one hand and the amount of post-schooling investment that follows, is firmly established; college graduates acquire the most, high school graduates substantially less and those who enter the labor force with only elementary schooling acquire the least in adding to their capabilities by means of post-schooling investment.

There is an appalling lack of evidence on pre-school investment despite the apparent national concern about the unequal start among children when they enter upon their regular schooling. In launching the *headstart* programs to reduce this inequality, the contributions that these programs were expected to make became grossly exaggerated. These expectations could

not be realized. (Ribich, 1968.) The heterogeneity of the home inputs that characterizes the families with children who receive a bad start and that of the communities in which they reside has made and will continue to make it exceedingly difficult to design programs appropriate to the task. Measurement of the results have been plagued by no end of problems pertaining to data, method, and the precise purpose of this program.

Despite these trials and errors, there are strong reasons for believing that pre-school investment ranks high, even higher than that pertaining to elementary schooling both in terms of rates of return and on equity grounds. It is obvious there are no earnings foregone from the value of the time of the children at the pre-school level. The required investment must in large part be made by motivating the mothers of the children who are reared in homes beset with disadvantages and by enhancing the ability of these mothers to give their children a better start than they are now capable of doing. Thus, it becomes a dual investment, for it is a means of increasing the skills and knowledge both of mothers with low levels of schooling and through them that of their children.

I would expect, in view of the economic disequilibria that characterize the schooling enterprises in the United States at this juncture in our history, that pre-school investments will prove to be consistent extension of the rates of return profile associated with schooling in the following sense: The rates of return will turn out to be highest for the pre-school endeavors once efficient ways of making them are discovered.

2. The Interpretations

There are several qualifications to be borne in mind in drawing inferences from the rate of return estimates pertaining to schooling and higher education. They are all biased downward because they do not account for the personal satisfactions that students derive from their education during their life time. In each case, they are restricted to the additional earnings associated with the education. There are some clues to the benefits that are realized in addition to earnings. Recent studies show a consistent rise in the efficiency with which resources are used in consumption associated with the increases in the level of education. The nonmarket value of the time of women in their economic contributions to the home is also clearly evident. Another source of bias, also downward, arises from the increases during the last decade in part-time work by students while attending high school and college. The effect of this development is to reduce the earnings foregone and thereby reduce substantially the private cost of the education (Schultz, 1971, Chapter 7). The estimates cited above have not been corrected for this development.

The estimates for elementary schooling are undoubtedly biased upwards as a consequence of the "deterioration" in the capabilities of the no-schooling (or with less than five years of schooling) class which serves as the reference group in making these particular estimates.

It must also be kept in mind that these estimates are for males and some of them are restricted to white males. They are derived from earnings net of personal taxes in Becker's study. The *earnings profiles* that have been estimated by Hanoch (1965) are the best now available.

Then, too, these estimates are the *private* rates of return and not *social* rates. There are difficulties aplenty in estimating the social rates of return that would be counterparts of the private rates presented. Becker's (1964) perceptions of the "Social Productivity Gains" from college suggest that the social and private rates may be quite similar. Hansen's (1963) estimates also indicate that the private rates after taxes are in general similar to the social rates of return.

3. Conclusions

As an investment to attain additional future earnings, schooling and higher education are in general a good investment; the rates of return are as high and for the most part higher than the implicit 10 to 15 percent rate of return indicated in Table 1 for the private domestic economy on nonhuman capital. Consistent with the difference in these rates of return, the stock of reproducible capital in the U.S. economy has been increasing at a substantially slower pace than the stock of educational capital embodied in the labor force (Schultz, 1971, page 129). The gradual increases in real earnings of laborers over time is predominantly a consequence of the additional skills of laborers and only to a minor extent a consequence of so-called "total factor productivity".

Part B. RESOURCE ALLOCATION

There are investment opportunities in education and research with relatively high social and private rates of return. It is of course difficult to identify these opportunities, to reallocate resources accordingly, and to indicate changes in the organization of education and research that would lead to greater efficiency. There are, also, several major unsettled questions in this domain of "resource allocation" that require serious thought. This memorandum is addressed mainly to these questions.

It is possible to show some evidence and arguments for the following propositions:

1. Education and research tend to enhance the productive services of the real factors of production. It is in this sense that they contribute to growth. How much they contribute for the purpose at hand depends upon the investment that is made and the rate of return that is realized.

2. Education and research have a rather long gestation period which extends from the time the investment is made to the time when gains in real factor services are realized. It is another reason why any manipulation of the funds that support education and research is an inappropriate means of dealing with either inflation or deflation. Thus, the notion of turning these two sectors—education and research—off and on to attain particular short run overall price objectives is absurd. Consider the price effects of manipulating public funds allocated to support agricultural research which come to about $500 million annually. If they were eliminated or doubled, it would not alter agricultural production and prices for five to ten years. (Evenson, 1968.)

3. The thrust of the evidence is that public and private expenditures on education and research in the U.S. have in general been good investments in terms of the rates of return that have been realized.

The unsettled issues on which I shall concentrate are basically of two parts. The part about which we have some knowledge pertains to the economic efficiency with which resources are allocated to these two sectors. The other part is in the realm of social equity, i.e., the effects of these allocations upon the distribution of personal income. Despite the advances that have been made in extending economics in dealing with social questions including the distribution of personal income, it is still true that the hallmark of economics is economic efficiency. It stands for rigorous analytical workmanship when it is not encumbered by the social problem of equity.

But it is seldom that additional economic efficiency in the allocation of resources is *neutral* in its effects upon the distribution of personal income. Education and research are no exception in this respect. Nevertheless, the trade-off in policy choices between efficiency and equity are not clearly established. Under the assumption that the prevailing social preference calls for less inequality in the distribution of personal income, what is often overlooked is the fact that there are policy choices that would achieve additional economic efficiency and that would also contribute to the social goal of reducing the inequality in the distribution of personal income. The following are examples: (1) The gains from agricultural research that reduce the real factor cost of producing food are transferred, under competitive conditions, to consumers and become in the language of economists a *consumer surplus;* the lower real price of food that is implied improves the personal income position of low income families relatively more than that of high income families. Resources allocated to such research has been efficient in terms of the social rate of return that has been realized and it has also contributed somewhat in reducing the inequality in the distribution of personal income. (2) The allocation of additional resources to elementary schooling to equalize the quality of such schooling between the poor and the rich school districts earns a high rate of return and, therefore, represents a gain in economic efficiency; it also has the effect of reducing the inequality in personal earnings later in life of the children who now live in such diverse school districts.

1. Economic Efficiency Considerations

The *test* of economic efficiency in using the investment approach is that the allocation of resources be in accordance with the priorities set by the relative rates of return on alternative investment opportunities. The advantages of this test are that it has a firm foundation in economic theory, that it is applicable to both private and public allocative decisions, that it is widely used and understood in practical economic affairs, and that it leads to efficient allocations when all investments are made in accordance with the above test.

The following three questions may be helpful in taking one's bearing:

1. Should we be troubled whether the allocation of resources to education and research is efficient or not? The answer is yes, even though the prevailing strategy in an expanding economy beset with inflation is always to ask for more funds. The affirmative answer rests on the fact that these two sectors have become very large in the resources they absorb, and there are many possibilities for malallocations (wasteful uses of resources) within these sectors and between them and alternative opportunities.

2. Is there hard evidence that private educational choices are privately efficient; that is, do private rates of return to schooling and higher education tend (a) to be equal as among educational options, and (b) to be comparable to private rates of return to other private investments? The evidence implies substantial inefficiencies.

3. Are the social rates of return and private rates of return proportional in all of these activities? The available evidence bearing on this question is not sufficient to be sure of the answer.

It should be made clear that in all that has been said above no account is taken of the "inefficiencies" that may occur within the internal operations of schools, colleges, universities and agencies engaged in organized research. With respect to these areas of "economic behavior," we have virtually no analysis. None has been analyzed less than that of higher education. The shoemaker's children have no shoes.

Could it be that the economist is misled by his estimates that show high rates of return to elementary schooling, in the sense that even though they are high, it is in the nature of elementary schooling that they would remain high? Economic thinking provides a strong negative reply. As a matter of fact, there are many ways of spending more on this or that part of this schooling, namely, on each of the several inputs entering into elementary schooling. Moreover, the economist would point out that for each of these inputs there will be, in all probability, diminishing returns as more of it is brought into play and that the objective should be to increase the use of each input to the point that the rate of return on it would be neither higher nor lower than that of the standard of the U.S. economy, say between 10 and 15 percent.

Once we see the heterogeneity of elementary schooling, it will elucidate the investment opportunities. Underinvestment in elementary schooling is not characteristic of communities where the level of personal income is high, where the parents are well educated and where the supply of women who have completed college is large. On the other side of this ledger, there are many communities where too few resources are allocated to elementary schooling. Among those that qualify are the following: (1) rural-farm communities where people are mostly poor, transport costs are large, schools are often small and the salary of teachers unattractive; (2) communities in the rural South, many of them compounded by the racial issue and the poverty of Negroes; (3) also some of the other nonwhite populations, e.g., Mexican-Americans throughout the Southwest; (4) the white population of parts of Appalachia and the Piedmont, the people who are left behind; and (5) masses of poor people crowded together in parts of the central cities that lack community stability, where schools are overcrowded, classes inordinately large, and where teaching is done under very adverse circumstances that make it difficult to attract and hold competent, experienced teachers. Thus, considered broadly, these are the parts of the elementary school enterprise where underinvestment is most common.

Closely associated with the underinvestment in the elementary grades is the *neglect of quality in schooling*. It extends also into high school. The combination of school inputs and the amount of them that is required to move to an optimum quality of schooling is still highly speculative in the sense that it has not been subject to the measurement and analysis that is long overdue. I venture the proposition, however, that it is mainly the competence of the teachers and the grouping of students that would maximize their motivation to learn what matters most in attaining quality in schooling.

The rate of return to high school has continued to rise notwithstanding the rapid expansion of high school enrollment measured in terms of the proportion of the youth of high school age in high schools. There is undoubtedly much room here also to improve the quality component, but its economic importance is not

as clear and plausible as it is in what we see in the elementary grades.

The rate of return estimates for higher education are on a par with the "normal" rates of return in the economy. Thus, it would appear, that in general there is neither under- nor overinvestment in higher education when it is viewed in its entirety. But this is a misleading view because higher education is an exceedingly heterogeneous aggregate ranging from small community colleges to universities of the highest quality. The heterogeneity within higher education conceals a wide range of returns to society and to the participating students.

In thinking about higher education as an investment, the following considerations should be borne in mind: (1) The "product" of higher education, as already noted, is far from homogeneous. Parts of it are for consumption (future personal satisfactions) and parts are for production (revealed in future earnings). To lump them in determining the value of higher education is bad economics. (2) The value of each type depends on the services it renders. (3) Educational capital that is embodied in students requires a long horizon because the abilities that the student acquires are a part of him during the rest of his life. (4) The acquired abilities are subject to obsolescence. The upper limit is the remaining life span of the student; more important, however, is the obsolescence from the changes in the demand for these acquired abilities that are consequences of our type of economic growth (Schultz, 1971, pp. 162–3).

Higher education performs three basic functions: It discovers talent, it provides instruction, and it engages in research. One of the major unsettled questions that awaits clarification and analysis is the following: What is an efficient organization of each of these three activities in higher education in terms of scale (size of the college or university), specialization, location, and importantly the *complementarily between the discovery of talent, instruction, and research*?

Another major unsettled issue pertains to the inadequacies that characterize *incentives and information* that motivate and guide the allocative decisions throughout higher education. I have argued elsewhere (Schultz, 1971) that when it comes to making optimum allocative decisions with regard to higher education, the system of incentives is weak and at many points seems virtually nonexistent and the state of information is in bad repair. This situation accounts for many inefficiencies in the way investment resources are allocated in this area. But who should make these allocative decisions? Who is best qualified? One strongly-held view is that students and their families are best qualified. Those who hold this view appeal to student sovereignty and thus to the private self-interest of students (families). There is another view that contends that there are substantial external economies or social benefits that accrue not to the student, but to others in society and therefore these allocative decisions can best be made by public or other social bodies. What is the contribution of school administrators in managing our complex educational enterprise? In view of the inefficiencies that are consequences of poor incentives and poor information, the effects of these on the decisions of students, teachers, administrators, and public bodies requires a brief comment.

The key to student sovereignty is the private self-interests of students and of their families. Their self-interest would be sufficient to bring about an efficient allocation of investment resources to education under the following conditions:

1. That there be competition in producing educational service along with efficient prices of these services;
2. That the information required by students be optimal;
3. That there be an efficient capital market serving students; and
4. That there be no appreciable disassociation between private and social benefits (losses) from education.

A clear view of the function of the private self-interests of students in these allocative decisions is blurred by arguments about the underlying conditions. Surely it is possible to have competitive pricing of educational services. Student loans from public and private sources can be devised to provide additional capital. It should also be possible to take account of social benefits (losses). Nor is the Achilles' Heel of student sovereignty in the domain of information (Freeman, 1971) although the long standing controversy over this issue is still with us as it was when the classical economist divided on it (West, 1964).

The following quotation summarizes the underlying issues inherent in the student sovereignty approach (Schultz, 1971):

> In enlarging the scope and improving the performance of student sovereignty in allocating resources to . . . education, the gaps in information and the distortions in incentives really matter. On earnings foregone, students are well informed, but on their capabilities as students they are in doubt. With regard to the benefits that will accrue to them, the state of information is far from

optimum. But much worse still is the lack of information on the differences in the quality of the educational services of different colleges and universities. No where are students confronted by prices for these services that are equal to the real cost of producing them, and therefore the prices to which they respond are not efficient prices. As a consequence, no matter how efficient students are privately in their decisions, from the point of view of the economy as a whole, the allocation of resources to . . . education will not be efficient.

In using economic incentives to attain economic efficiency, the ideal price for the educational services that students obtain should be neither more nor less than the real cost of producing these services. This proposition, however, does not support the view that there should be no difference between public and private tuitions, or for that matter, among public or among private schools. Equality of tuition would merely replace one type of price distortion by another type because it would conceal the difference in cost of the quality difference of educational services. A major step in improving the state of information would be the development of efficient prices to which students could respond. But more than this is required. They must know what they are buying. Specifications that are only in quantitative terms (years of schooling) are not sufficient. Much depends upon knowing the differences in the quality of the educational services. Truth in advertising might well be applied to the catalogues that universities issue.

2. Equity Considerations

What are the effects of education upon the distribution of personal income? The way it is financed and the manner in which the benefits from it are distributed among the population, the net results are in all probability far from *neutral*. There is little room for doubt that education changes the personal distribution of income over time. It is understandable that this issue of equity should become a major social question. National concern about it is bound to increase, especially so in the executive and the legislative branches of government and in public discussions pertaining to the allocation of public funds to education.

The analytical cupboard is not altogether bare. Becker's (1967) approach is basic. We also have the recent excellent survey of the analytical developments in this area by Mincer (1970). There is also Chiswick's (1967) study. Hansen and Weisbrod (1969) conclude that in the case of public higher education in California the net results are *regressive* in their effects on the distribution of personal income. Pechman (1970) has expressed disagreement with the Hansen-Weisbrod conclusion. He, however, has addressed his comment to a different aspect of this problem. This cupboard also contains a number of other useful studies that I have listed in my "Reference" under "Other Personal Distribution of Income Studies."

3. Concluding Comment

This comment is restricted to higher education starting at the top.

1. Differences in the quality of graduate instruction is in large part a consequence of the differences in the quality of the research in which the graduate programs are involved. First rate Ph.D. research is strongly dependent upon first rate faculty research. In general, the market for the services of Ph.D.'s pays substantial life time premiums for quality. The rate of return on the resources required to achieve this type of quality is in all probability high.

2. There is evidence that the rate of return to on-campus research tends to be highest in the *major research oriented universities*. Evenson's (1968) study supports this conclusion. (Also see. Schultz. 1971. Chapter 12.)

3. There has been a tendency in allocating federal funds to favor graduate instruction and university research in those parts of higher education where the rate of return in general is low compared to returns that are realized in the major research oriented universities. It is a tendency that is inconsistent with the test of economic efficiency.

4. Turning to undergraduate instruction, the prevailing programs, with few exceptions, are not integrated with on-campus research. Whether undergraduate programs would be more efficient if students were involved in research is not known, although there are plausible reasons for believing that they would be more efficient.

5. There is some evidence that suggests that when account is taken of the differences in the abilities among undergraduates when they enter colleges, the value added to their abilities while in college is larger for those who attend colleges with relatively small undergraduate enrollments than it is for those who attend colleges where the enrollments are large.

6. One of three functions of higher education is that of providing opportunities that serve students in discovering their talents for this level of learning. Although higher education in the United States uses

a larger share of its resources for this purpose than do the colleges and universities in Western Europe, the U. S. practice appears not to be an inefficient use of resources. There are many clues that indicate that the returns from this activity to society and also to students privately are relatively high.

7. Most families in the United States have the necessary income and wealth to pay the *full cost* of the undergraduate instruction of their children. Moreover, full cost pricing of these educational services would greatly increase the allocative efficiency of higher education.

8. Since higher education is in essence an investment and since the benefits accrue predominantly to the student, there is a strong argument for improving the capital market so that it will serve students better than is presently the case. Public funds for student loans is one important way of achieving this objective.

9. There is, however, a minority of potential college students who are qualified in terms of ability, but who come from families with small incomes and with very little wealth. Student loans may not suffice for them in view of the fact that many of these families cannot forego the earnings of their children. Increasing the amount of the student loans to compensate for the earnings foregone would make such loans inordinately large. More important, however, is the behavior of many low income families that is characterized by capital rationing that they impose upon themselves. They simply would refuse to go into debt to this extent. Some subsidization of this class of students is warranted both in terms of equity and economic efficiency.

10. In general, privately supported colleges and universities have evolved programs of financial assistance for the minority of students, discussed in 9 above, that are superior and more effective than are the programs of the publicly supported colleges and universities.

11. The formulation of the *Grand Design* for transferring federal funds to the "states" should be that such funds should be allocated directly to the persons who would benefit from using them for the purposes intended and to the agencies that provide particular services that are deemed necessary on public accounts and for which there is no effective private demand. Accordingly, federal funds to assist undergraduate students should be transferred directly to such students and funds to support nonprofit research should be transferred directly to the universities and other research agencies that are efficient in undertaking such research. Conversely, such transfers of federal funds should not go first to the states, and from there to cities or counties, and then to the colleges and universities for research and to enrolled students.

Appendix A: REFERENCES ON EDUCATION AND GROWTH

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