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ABSTRACT

This benefit-cost analysis of occupational-vocational training offered at five selected junior colleges in Illinois compares the economic benefits of occupational-vocational training (primarily income) to the economic costs of such training. Both the view of the private individual and the view or society are taken. The results indicate that occupational-vocational training is: (1) a profitable investment for the typical student, given his or her usual alternatives, (2) a profitable investment for society, particularly when compared to conventional college transfer programs in community colleges, and (3) apparently less profitable an investment in Illinois than nationwide. The term "profitable" investment as used here means that the rate of return on whatever money and resources that have been invested is greater than the rate of return that is realized on typical investments elsewhere in education and in society, e.g., the rate of return on college education or the rate of return on a corporate bond. (Author)

A Benefit-Cost Analysis Of Vocational-Occupational Training At Selected Junior Colleges

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A BENEFIT-COST ANALYSIS OF VOCATIONAL-OCCUPATIONAL TRAINING AT SELECTED ILLINOIS JUNIOR COLLEGES

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SUMMARY

A BENEFIT-COST ANALYSIS OF VOCATIONAL-OCCUPATIONAL TRAINING AT SELECTED ILLINOIS JUNIOR COLLEGES

Contained in this report are the results of a benefit-cost analysis of occupational-vocational training offered at five selected junior colleges in the State of Illinois. The analysis compares the economic benefits of occupational-vocational training (primarily income) to the economic costs of such training. Both the view of the private individual and the view of society are taken.

The results indicate that occupational-vocational training is: (1) a profitable investment for the typical student, given his or her usual alternatives; (2)a profitable investment for society, particularly when compared to conventional college transfer programs in community colleges; and, (3) apparently less profitable an investment in the State of Illinois than nationwide. The term "profitable" investment as used here means that the rate of return on whatever money and resources that have been invested is greater than the rate of return that is realized on typical investments elsewhere in education and in society, for example, the rate of return on a college education or the rate of return on a corporate bond.

The methodology of the study is in the tradition of the "human capital" studies which characterize the rapidly developing area of the economics of education. The benefit-cost methodology used is the standard approach to the evaluation of manpower training programs. The primary sources of data for the study include data contained in previous work done by G. W. Forgey and C. R. Hicklin entitled, Some Economic Benefits and Characteristics of Junior College Benefits, the United State Bureau of the Census, Current Population Reports, and The Development of a Coordinated Educational Data Processing System, a report submitted to the Division of Vocational and Technical Education, State of Illinois.

I. Introduction

This report describes in detail the results of a benefit-cost analysis of vocational-educational training conducted at five selected junior colleges in the State of Illinois. The analysis compares the economic benefits of occupational-vocational training received at the junior colleges to the economic costs of providing such training.

The analysis, which is conducted in the tradition of "human capital" studies[1] in the economics of education, considers the costs of obtaining occupational-vocational education and training to be an investment in human beings which yields computable benefits. The benefits are assumed to be the increased incomes realized by those individuals who receive the education and training. A rate of return on the investment cost of the education and training can therefore be obtained which is comparable to the rate of

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[1] Although one can harken back to the work of economists such as Adam Smith and Alfred Marshall and find isolated passages which hint at a human capital approach which emphasizes investment in human resources, the seminal contribution in the area is to be found in Theodore Schultz, "Capital Formation by Education," Journal of Political Economy, Vol. 68 (1960), pp. 571-583. The decade of the 1960's has witnessed a truly phenomenal upsurge in the interest of economists in the economics of education. A 1968 bibliography of the economics of higher education taken alone consisted of 1333 items. See Klaus Hufner, "Economics of Higher Education and Educational Planning--A Bibliography," Socio-Economic Planning Sciences, Vol. 2 (1968), pp. 25-101.

of return associated with any conventional type of investment, for example, the rate of return on a corporate bond. The efficiency of the investment in human capital is evaluated by means of comparisons with other rates of return, both on human and non-human capital. The analysis is extended to private individuals and the public and separate rates of return are reported for each of these groups.

II. The Relevance of Other Studies

General manpower studies of the type reported in this study have proliferated in the decade of the 1960's because of the research sponsorship of the Manpower Administration of the United States Department of Labor. Benefit-cost analyses of occupational and technical training have frequently been among the sponsored pieces of research. Several of these pieces of research have particular relevance to the work that has been performed here and will be reviewed in some detail.

The first study to be examined is the Hardin-Borus Study,[2] which reported the results of retraining programs upon gross national product, on welfare expenditures, and upon tax payments. The retraining was primarily of a short-course variety and was not done at junior or community colleges.

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[2] Einar Hardin and Michael E. Borus, Economic Benefits and Cost of Retraining Courses in Michigan. MDTA Contract Number 9-63.

Nevertheless, the methodology of the Hardin-Borus study is quite similar to that proposed here. The two economists found that retraining courses were sound investments, both for society and for the individual. The benefit-cost ratio was estimated to be 1.21 for society, assuming the benefits to be realized for 10 years only, and using a discount rate of 10 per cent. Benefits were measured by the gain in annual earnings; costs were measured by the sum of earnings lost during training, trainees' expenses, and the costs of instruction and administration. However, a rate of return on the investment was not computed and therefore the comparative efficiency of the project is not immediately obvious.

While the Hardin-Borus study did not concern itself with occupational-vocational training at junior and community colleges, it nevertheless proceeded along the lines which have become fairly standard in terms of manpower program evaluation. The data for the study were obtained by survey techniques (as in this study); increased incomes earned were used as the primary measure of benefits received; this increased income was discounted and deflated in order to take account of its time pattern; and, the costs computed included not only direct instructional and administrative costs, but also the costs of foregone income by the individuals who were forced to give up income while being trained in the program.

The primary deficiencies of the Hardin-Borus study are to be found in their inability to hold other relevant factors constant. Hardin and Borus did construct a control group of individuals of similar background. However, this control group was homogeneous primarily with respect to job background and not with respect to intelligence, motivation, and other relevant factors. A further criticism revolves around the use of the 10 per cent discount rate. The validity of this rate is open to question and will be discussed later. Finally, Hardin and Borus did not compute a rate of return on the investment in training. An estimated rate of return, while possessing no magic qualities, is an unambiguous indicator of the worth of the investment and is easily understood. Benefit-cost ratios are not so straightforward.

Another interesting study is that done by Gubins.[3] Gubins investigated the impact of age and previous education upon the benefits and costs associated with vocational training. As one might have expected, age and previous educational attainment proved to be important influences upon the economic benefits and costs related to vocational training. As a direct result, the study has taken account of the previous age and educational attainment of the junior college students in order to isolate the effects of the occupational-vocational training.

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[3] Samuel Gubins, The Impact of Age and Education on the Effectiveness of Training: A Benefit-Cost Analysis. MDTA Contract 91-22-68-23.

By far the most valuable piece of previous work (for the purposes of this study) is a benefit-cost study of two years of postsecondary technical training performed by Carroll and Ihnen.[4] Carroll and Ihnen sought to determine if a private investment by an individual in two years of postsecondary technical education at Gaston Technical Institute, Gastonia, North Carolina, was profitable. The answer was yes. An internal rate of return on the typical individual's investment was found to be 16.5 per cent, and this rate of return rose to 20.1 per cent when the fringe benefits of the graduates' jobs were considered.

The Carroll-Ihnen study standardized the incomes of the Gaston Tech graduates for the influences of intelligence, background, previous work experience, etc. With the influence of these factors accounted for, the income differential between the Gaston Tech graduates and a control group whose education had terminated at high school was more truly representative of the effects of the Gaston Tech training. Carroll and Ihnen did not compute a rate of return for society's investment in such training.

III. The Model, the Data, and the Basic Assumptions

The internal rates of return (IRR's) which accrue to investments made in vocational-occupational education and

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[4] Adger B. Carroll and Loren A. Ihnen, "Costs and Returns for Two Years of Postsecondary Technical Schooling: A Pilot Study," Journal of Political Economy, Vol. 75 (December, 1967), pp. 862-873.

training have been computed according to the following well-known formula:

$$0 = \sum_{t=1}^{N} \frac{\$_t}{(1 + r)^t}$$

where: $\$_t$ = net costs and/or income due to student's training realized in year "t"
r = internal rate of return (IRR) on the investment in education and training

The primary data source for the study is cross-sectional observations of students enrolled in vocational-occupational training programs at five selected junior college institutions in the State of Illinois. These observations, aggregated, may be found in Some Economic Benefits and Characteristics of Junior College Benefits,[5] a report submitted to the State of Illinois Advisory Council on Vocational Education by C. R. Hicklin and G. W. Forgey. Since only three observations of students' incomes exist in data provided in the Forgey-Hicklin study, it was necessary to project future streams of the individuals. While this would be a very doubtful undertaking for a single individual, it is not so when the 562 individuals involved in this study may be averaged together. Presumably, the incomes of the individuals who receive training at an Illinois junior college will grow over

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[5] C. R. Hicklin and G. W. Forgey, Some Selected Economic Benefits and Characteristics of Junior College Programs (Normal, Illinois: Mid-State Educational Consultants, 1971).

time in the same fashion as those with similar training throughout the United States. Nationwide data may be found in United States Bureau of the Census' Current Population Reports series.[6]

Three different types of costs exist. First, there are the direct costs paid by students for their education and training. Second, there are the direct costs such as faculty salaries, equipment, etc., which are paid by society. Finally, there is the foregone income of the students who are receiving the education and training Attendance at a junior college in order to receive vocational-occupational training reduces, to some extent, the income that the individual would ordinarily earn. This is a cost to the individual and a cost to society since the student's foregone income represents lost productivity to society. The primary source for direct cost data for the public was Optimum Size of Illinois Public Junior College Campuses Related to Selected Costs, an unpublished doctoral thesis by Daniel Oborn,[7] and The Development of a Coordinated Educational Data Processing System, a research report

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[6] For example, United States Bureau of the Census, Current Population Reports, Series P-60, No. 66, "Income in 1968 of Families and Persons in the United States," (Washington, D.C: United States Government Printing Office, 1969).

[7] Daniel S. Oborn, Optimum Size of Illinois Public Junior College Campuses Relative to Selected Costs (Unpublished Doctoral Thesis, Illinois State University, 1970).

submitted to the Division of Vocational and Technical Education.[8]

Prior to presenting the actual empirical results, several important issues which surround every rate of return study must be confronted and given consideration. These issues are: (1) the fact that vocational-occupational training graduates would have earned certain incomes anyway even if they had not obtained a degree; (2) the contention that a large proportion of the observed income differential between vocational-occupational training graduates and high school graduates is not due to increased education but instead to differential motivation and ability; (3) the fact that certain individuals enter and leave the labor force periodically and therefore do not earn the income which is reported for their peers in some years; (4) the possibility that some education and training is viewed by students as being a consumption expenditure rather than an investment expenditure; (5) the possibility that large intergenerational effects and externalities are caused by education and training which are not captured by income data; (6) the vulnerability of increased incomes to increased tax payments; (7) the non-monetary aspects of certain jobs; and, (8) the use of cross-section data. We will now consider each of these in turn.

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[8] C. S. Rzonca and R. M. Tomlinson, The Development of a Coordinated Educational Data Processing System (Springfield, Illinois: State of Illinois, Board of Vocational Education and Technical Education, Research and Development Unit, 1971).

It is improper to attribute to a vocational-occupational training graduate the income that a typical high school graduate earns anyway. Therefore, from each income stream must be deducted the median earnings of a high school graduate who has no vocational-occupational training.[9] Evidence also exists which points to the fact that post-high school students as a group have greater ability and motivation than the ordinary individual and therefore would have excelled even had they not undertaken post-high school education and training.[10] Recent studies which have controlled for a host of relevant factors indicate that about 25 per cent of the income differential between post-high school students and high school graduates is due to ability and motivational differences and is not due to post-high school education and training.[11] That adjustment has been applied here after a multiple linear regression of the incomes of both trainees and non-trainees on socio-demographic variables such as age, work experience, etc., confirmed the 25 per cent figure.

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[9] U. S. Bureau of the Census, Current Population Reports, Series P-60, No. 66, "Income in 1968 of Families and Persons in the United States," (Washington, D.C: United States Government Printing Office, 1969).

[10] Burton A. Weisbrod and Peter Karpoff, "Monetary Returns to College Education," Review of Economics and Statistics, Vol. 50 (November, 1968), pp. 491-497.

[11] See Weisbrod and Karpoff, op. cit., and W. Lee Hansen and Burton A. Weisbrod, Benefits, Costs and Finance of Public Higher Education (Chicago: Markham Publishing Company, 1969).

Certain students, particularly females, often leave the labor force for long periods of time. Whatever the reasons for this, the effect of it is to lower the stream of income which accrues to the individual. Such adjustments, when made,[12] will effectively lower the IRR's in many fields.

It is possible that some individuals may regard a portion of their expenditures upon post-high school education and training as consumption expenditures which yield pleasure and cultural benefits at the very time the expenditures are made. Such expenditures are not considered to be investment costs, and therefore part of the computed costs of receiving vocational-occupational education and training must be eliminated on the grounds that this type of expenditure is no different than the purchase of any consumer good (for example, a pizza). The effect of this is to reduce the investment basis of the education and training and to raise the computed rates of return on such an investment.[13] On the other hand, Blaug[14] (among others), has pointed out

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[12] Labor force participation rates obtained from the United States Department of Labor were used to make this adjustment.

[13] Assume that students regard one-quarter of their expenditures on a bachelor's degree as consumption expenditures. This reduces the investment basis of their education by 25 per cent; and, for example, increases the 9 per cent rate of return computed by Becker to over 14 per cent. See Gary Becker, Human Capital (Princeton: Princeton University Press, 1964).

[14] Mark Blaug, "The Rate of Return on Investment in Education in Great Britain," The Manchester School, Vol. 33 (September, 1965), pp. 205-251.

that many college students experience great disutility in the higher education process. High collegiate drop-out rates and low class attendance are impressionistic evidence in support of the disutility argument. Consumption aspects of occupational-vocational education and training are probably low, however. Such students are job-oriented and typically undertake such education or training as an investment. Hence, it will be assumed that all the costs of vocational-occupational training are investment expenditures, with none being consumption.

Virtually no evidence exists which supports the existence or empirical validity of intergenerational effects and external effects of vocational-occupational education and training such as the oft-cited enhanced ability of college graduates to raise children. Lower crime rates are an additional external benefit often cited by some commentators. The most comprehensive statement in support of the existence and importance of these external effects is to be found in an article by Weisbrod.[15] It should be noted, however, that Weisbrod has since decided that such external effects are probably not important phenomena empirically.[16] Indeed, there seems to be little evidence other than individual

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15 Burton A. Weisbrod, "External Effects of Investment in Education," Journal of Political Economy, Vol. 70 (October, 1962), pp. 106-123.

16 W. Lee Hansen and Burton A. Weisbrod, Benefits, Costs and Finance of Public Higher Education (Chicago: Markham Publishing Company, 1969), p. 40.

impressions of any external effects except greater tax-paying ability.[17] Therefore, rather than involve ourselves in a subjective estimate of the presence and amount of these external effects, we shall assume that all of these effects except increased tax-paying ability are of negligible importance empirically.

Since a portion of this study is centered upon private rates of return, allowance must be made for the fact that a portion of the increased income earned by a vocational-occupational training graduate will be taken away by taxes. Hence, it is necessary to apply to the income differential between vocational-occupational training graduates and high school graduates an adjustment which reflects the expected marginal tax rate on income.[18] The effect of this adjustment is, of course, to reduce the internal rates of return. This adjustment has not been made when social rates of return have been computed.

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17 Greater tax-paying ability is, of course, a benefit to governmental units, but is at the same time a detriment to private individuals. Unless one views government as a profit-maximizing unit, then greater tax-paying ability is not a legitimate external benefit since such taxes necessarily are taken from the same population that they will presumably be returned to in spending programs.

18 Marginal federal income tax rates for the year 1969 (when student decisions were made in the work performed in this paper) were used. This information was obtained from United States Treasury Department, Internal Revenue Service, 1971 Federal Income Tax Forms, Schedule II (Washington, D.C: United States Government Printing Office, 1971), page 18.

It is clear that non-monetary differences exist between jobs: some jobs are pleasant, others are unpleasant. Unusually difficult, demanding or unclean jobs will (ceteris paribus) command higher incomes. Therefore, it is possible that IRR's may reflect such non-monetary differences among jobs. The fact that this study is limited to jobs held by vocational-occupational training graduates eliminates some potential diversity. Nevertheless, the existence of perfect mobility of all factors of production and existence of perfect knowledge would probably not result in the equality of IRR's which accrue to investment in alternative areas.

Finally, it has been alleged[19] that the use of cross-section data such as that upon which this study is based is fraught with danger because it forces the researcher to examine many different cohorts of individuals rather than centering attention on one cohort of individuals through the passage of time. Each successive cohort of individuals may differ from previous cohorts in important ways, for example, in the quality of education given them. As a result, more recent cohorts may have age-earning profiles quite dissimilar to those of older cohorts. Hence, a cross-sectional analysis will not properly reflect the true

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[19] Marshall Colberg and Douglas Windham, "Age-Income Profiles and Invidious Comparisons," Mississippi Valley Review of Business and Economics, Vol. 6 (Winter, 1970), pp. 28-40; see also, John Vaizey, The Economics of Education (New York: The Free Press of Glencoe, 1962).

return to an investment in education by a given individual or cohort. While this argument may have some validity, at least four reasons militate against its acceptance. First, earnings differentials have been remarkably constant in recent decades and this fact would seem to deny the importance of changing cohorts. Second, IRR's are fairly insensitive to changes in age-income profiles which occur several years after the discounting process has already begun. Thus, even if cohorts do change as time passes, the discounting process will seriously shrink the impact of any such changes upon the empirical results. Third, unlike time series data, cross-sectional data is not as susceptible to the effects of exogenous factors such as the business cycle and full-scale war. Finally, it need be noted only parenthetically that extensive data which detail age, education, and income are simply not available in time series form.

In light of the eight factors discussed above, we rewrite our formula for IRR as:

$$0 = \sum_{t=1}^{N} \frac{[\$_t^v(A_t) - \$_t^{hs}(A_t)]\ [1 - MT_x]\ [.75] - C_t}{(1 + r)^t}$$

where: $\$_t^v$ = income of vocational-occupational trainee in year "t"

$\$_t^{hs}$ = income of high school graduate in year "t"

A_t = adjustment factor for labor force participation in year "t"

MT_x = marginal income tax rate [zero for social rates of return]
C_t = cost of obtaining vocational-occupational training, including foregone income
r = internal rate of return

IV. The Empirical Results and Their Implications

Table 1 presents internal rates of return (IRR's) for both individual and public investment in vocational-occupational education and training at the five selected junior colleges in the State of Illinois. These rates of return are strictly analogous to rates of return that are realized on a conventional investment such as a savings account or real estate. It should be noted that the 12.3 per cent private rate of return on the investment made by an individual in vocational-occupational training and the 8.9 per cent rate of return realized by society on its investment in such training are generally above the rates of return realized on alternative investments (see Table 2). That is, vocational-occupational education and training is a profitable investment, both for the private individual and for the public at large. The rate of return which accrues to the public at large is smaller than the private rate of return received by individuals because of the subsidy provided by taxpayers for vocational-occupational education and training.

TABLE 1.

INTERNAL RATES OF RETURN TO PRIVATE AND PUBLIC INVESTMENT IN VOCATIONAL-OCCUPATIONAL TRAINING AT FIVE SELECTED JUNIOR COLLEGES IN THE STATE OF ILLINOIS

Group	Internal Rate of Return
Private Individuals	12.3%
Society (State of Illinois)	8.9%

TABLE 2.

COMPARATIVE INTERNAL RATES OF RETURN

ON ALTERNATIVE INVESTMENTS

Type of Investment	Internal Rate of Return
Vocational-Occupational Training (Private Individual, Illinois)	12.3%
Vocational-Occupational Training (State of Illinois)	8.9%
Vocational-Occupational Training (Private Individual, Nationwide)	14-16%
Vocational-Occupational Training (Private, Gaston Tech, Gastonia, N. C., 1967)	16.5%
College-Transfer Program (Private Individual, Junior College)	6.8%
Bachelor's Degree (Private Individual, Elementary Education)	3.2%
Bachelor's Degree (Private Individual, Accounting)	8.7%
Bachelor's Degree (Private Individual, Sociology)	5.1%
Bachelor's Degree (Private Individual, Chemistry)	7.1%
Manufacturing Capital	8.0%
Treasury Bills, 1971	3.7%
Treasury Notes [5 year], 1971	6.2%

Source: James V. Koch, "Student Choice of Undergraduate Major Field and Private Internal Rates of Return," Submitted Manuscript, 1971.

Table 2 makes more explicit the comparison between rates of return on various types of investments. Both the private and the public rates of return on investment in vocational-occupational education and training are greater than the private of return realized by students who are in college-transfer curricula at junior colleges and the rates of return realized by students who invest their resources and time in most most conventional bachelor's degree curricula at a four-year college or university.

On the debit side of the ledger, however, the rates of return computed for vocational-occupational education and training in the State of Illinois are lower than those typically found elsewhere in the United States. This may mean that the Illinois programs are relatively inefficient and costly. On the other hand, it may mean that the programs surveyed here are relatively new and are not yet operating as well established programs.

The implications of these results are four-fold:

(1) Vocational-occupational education and training is a good investment for both the individual and for society;

(2) More resources and funds should be devoted to vocational-occupational education and training because such education and training is generally more economically efficient than other types of post-high school educational experiences;

(3) With respect to junior colleges, the evidence indicates that the vocational-occupational education and training programs are economically more efficient than the college-transfer programs;

(4) The vocational-occupational education and training programs at junior colleges in the State of Illinois should be monitored closely because the rates of return found for these programs are lower than those found nationwide; the reasons for this are not immediately clear but should be given further attention.

V. Recommendations

The results generated by this study lead directly to the following recommendations for action:

(1) The economic efficiency of the vocational-occupational education and training programs should be publicized and made known in order that greater amounts of resources may be devoted to such programs at junior colleges in the State of Illinois;

(2) Pursuant to the previous recommendation, the vocational-occupational education and training programs surveyed here are the most economically efficient investment that the State of Illinois is making at the undergraduate collegiate level; this must be made known in order that the resources devoted to vocational-occupational education and training can be increased;

(3) If junior colleges face a constant dollar situation in terms of the total resources available to them, the share of those resources devoted to vocational-occupational education and training should be increased, even if this occurs at the expense of the college transfer programs;

(4) The State of Illinois Advisory Council on Vocational Education should conduct further study in order to determine whether the vocational-occupational education and training programs in the State of Illinois are relatively less efficient than similar programs in other states because of their newness or because of cost or quality reasons.