# A COST-BENEFIT STUDY OF POST-HIGH SCHOOL TECHNICAL EDUCATION IN OKLAHOMA

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# PREFACE

This study is concerned with the efficient allocation of resources, both human and physical, to areas of higher education by comparing rates of return to investments within specific programs in higher education. Those programs of higher education which realize higher rates of return are seen as being underinvested relative to programs with lower rates of return. Optimal allocation of resources is indicated where all areas of higher education realize similar rates of return.

An active manpower policy would provide incentives to prospective students of those programs in higher education with high rates of return through subsidization and higher incurred costs to those students anticipating programs with lower rates of return. Such a policy would insure more optimal allocation of both physical and human resources in the world of work and maximize the contribution of human resources to economic growth by insuring the availability of particular types of human resources to the labor market.

I would like to take this opportunity to express my appreciation to my thesis committee members, Dr. John C. Shearer and Dr. Paul V. Braden, for their assistance and advice. Their suggestions and guidance were of great importance. I am indebted to the cooperation and assistance of the students and faculties of the various Oklahoma technical schools and to Dr. Edward J. Coyle and Mr. Dan S. Hobbs of Oklahoma State Regents for Higher Education for invaluable assistance and information. I also wish to thank Dr. Richard H. Leftwich and Dr. Larkin B. Warner

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# CHAPTER I

## INTRODUCTION

For many years economists and others interested in education have known that education has value as an economic resource as well as social importance. Valuations have been made concerning general education at all levels. Few studies, however, except for those of retraining programs, give valuations to technical education. No study of this nature has occurred in Oklahoma. With a demonstrated need for technicians trained beyond the high school level,[1] expansion of existing programs demands certain information related to costs and returns for planning and comparison purposes.

High rates of return to investments in technical education have been demonstrated to exist in other states and tend to indicate underinvestment in this area of higher education relative to education in general.[2] A purpose of this study is to demonstrate whether similarly high rates of return to investments in technical education also occur in Oklahoma.

The objectives of this study were to obtain institutional and other societal costs, costs of education to the technical student, and

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[1] Manpower in Tulsa, Oklahoma Employment Security Commission, (Oklahoma City: May, 1965), p. 16.

[2] Adger B. Carroll and Loren A. Ihnen, Costs and Returns of Technical Education: A Pilot Study, (Office of Manpower Policy, Evaluation and Research, U. S. Dept. of Labor, Washington, D. C.: Government Printing Office, 1966), p. 2.

returns to the individual and to society in the form of increased income and productivity. By comparing rates of return to investments, an analysis is made concerning underinvestment and the misallocation of resources, both human and physical, in higher education.

The study was limited to 1967 graduates of Oklahoma's three post-high school technical institutes and to technical graduates of five of Oklahoma's junior colleges. There were 220 graduates participating from the following schools: Oklahoma State University Technical Institute, Stillwater; Oklahoma State Technical College, Okmulgee; Oklahoma State University Oklahoma City Technical Institute, Oklahoma City; Cameron State Agricultural College, Lawton; Eastern Oklahoma State College, Wilburton; Northeastern Oklahoma A & M College, Miami; Northern Oklahoma College, Tonkawa; and Murray State Agricultural College, Tishomingo.

Questionnaires were administered to the technical students by which they reported costs of education incurred them while enrolled in technical programs. These costs included tuition and fees, books and materials and related costs. Also reported in these questionnaires were sources of income which offset foregone wages and salaries due to enrollment in technical education. These included G. I. Bill benefits, scholarships in addition to other transfers, and earnings from summer and school employment.

A second questionnaire was administered about six months after graduation to determine wages or salaries received at that time. Intensive follow-up methods brought the response to this questionnaire to 169, or 76.8 per cent, of the 220 students participating in the first questionnaire. Of this 169, 91 or 53.8 per cent, were employed; 60, or

35.5 per cent, were continuing their education; 16, or 9.5 per cent, were in the Armed Forces; and 3, or 1.8 per cent, were classified as "other." No respondent from either Eastern Oklahoma A & M College or Murray State Agricultural College could be classifed as "employed" in the final response.

It was assumed in this study that a prospective student will behave toward investments in education not unlike he might behave toward other forms of investment. Adger B. Carroll (1966), in his dissertation entitled "Value of Human Capital Created by Investments in Technical Education," outlined three hypotheses which seem relevant to this study.[3]

(1) Returns to technical education are probably realized more quickly than investments in four years of college. Because the education received at the two-year institutions is more specifically oriented toward occupations, the education should be more marketable, and the rate of "payoff" during the first few years after graduation should be greater than for college education in general.

(2) The estimated private and social rates of return on investments in technical education will probably be higher than rates of return on investments in four years of college. Since the education received by the technical student is more nearly a producer durable, a greater portion of the education received can be measured by the market.

(3) The rates of return on both private and social investments in technical education are expected to be greater than those estimated for

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[3]Adger B. Carroll, "Value of Human Capital Created by Investments in Technical Education," (unpub. Ph.D. dissertation, North Carolina State University, 1966), p. 3.

physical capital. An investor in education has a less liquid asset than the investor in physical capital. If investors are cognizant of higher risks in education, other things being equal, they will prefer investments in education over investments in physical capital only if the rate of return on investment in education is higher.

## CHAPTER II

## COST-BENEFIT THEORY AND REVIEW OF LITERATURE

Cost-benefit analysis is an attempt to look at long-range effects, including side effects, of certain forms of investments in the public sector. It brings into view thoughts and methods from the areas of public finance, price theory and welfare economics. Decisions are limited to problems of economic relevance since one finds difficulty in assigning monetary values to certain social costs and benefits.

Prest and Turvey (1965) have established certain principles of inquiry in cost-benefit analysis as follows:

1. Which costs and which benefits are to be included?
2. How are they to be valued?
3. At which interest rate are they to be discounted?
4. What are the relevant constraints?[1]

Constraints cannot be made by economic efficiency alone. Attempts to get beneficiaries to pay more than the marginal social costs of certain investments will affect allocation of resources. In the field of education, beneficiaries may be other than those being educated, making it difficult to determine to whom the costs of education should be incurred.

Prest and Turvey are critical of cost-benefit techniques which

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[1] A. R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey," The Economic Journal, LXXV (December, 1965), p. 686.

attempt to quantify the contribution of education to economic growth.

> . . . . attempts to include human capital as a factor of production in quantitative analyses of the sources of economic growth scarcely qualify as cost-benefit analysis despite their present day interest.[2]

They do, however, look favorably upon studies which might affect policy makers in selecting priority roles for expenditures.

Theodore W. Schultz (1962) feels that although the actual contribution of education to economic growth is difficult to determine, its effects are obvious.

> No doubt the growth of investment in man has improved markedly the quality of work entering the human endeavor and these improvements in quality have been a major source of economic growth.[3]

Burton A. Weisbrod (1966) holds a similar view and attributes the increased expenditure in education as a reflection of higher return on capital from education than from other investment alternatives.[4] He sees the following forms of returns:

1. Benefits in terms of increased production possibilities.
2. Benefits that reduce costs and thereby make more resources available for more productive uses, such as crime and law enforcement personnel which might not be needed in the presence of higher earning and more enlightened attitudes.

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[2]Ibid., p. 724.

[3]Theodore W. Schultz, "Reflections on Investments in Man," Journal of Political Economy (Supplement), LXX (October, 1962), p. 6.

[4]Burton A. Weisbrod, "Investing in Human Capital," Journal of Human Resources, I (Summer, 1966), p. 11.

3. Benefits that increase welfare by means of public spirit or social consciousness.[5]

## Costs of Education

Schultz (1963) provides the basic format for considering which costs to consider in cost-benefit analysis in education. He states that

> . . . the productive capacity of labor is predominantly a produced means of production. We thus make ourselves and to this extent "human resources" are a consequence of investment among which schooling is of major importance.[6]

Education can be for pure consumption or for pure investment. Resources for education come from two sources:

1. Students themselves and the earnings which they must forego while attending school.
2. Resources which are used directly in schooling.[7]

Most of the resources which enter higher education come from time and effort on the part of students and in the productivity foregone by society while the student attends school.

Resources provided by the student include the following:

1. Student time and study effort which brings into view these costs:
   a. Leisure time foregone.
   b. "Opportunity Costs" in terms of foregone earnings. Average

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[5] Ibid.

[6] Schultz, The Economic Value of Education (New York: Columbia University Press, 1963), p. 10.

[7] Schultz, "Capital Formation by Education," Journal of Political Economy, LXVIII (December, 1960), p. 571.

earnings of non-students in comparable age, sex and race categories give a measure of alternative value of productivity.

2. Direct costs of education to the student include the following:
   a. Tuition and fees incurred while attending school.
   b. Books and materials.
   c. Transportation and housing in excess of that which would occurred had the student not attended school.[8]

Resources provided by schools include these expenditures:

1. Salaries of instructors and assistants, librarians, administrators and physical plant personnel.
2. Factor costs of physical plant maintenance and operation, materials provided by the school and depreciation upon existing facilities. To be excluded are dormitory facilities and organized athletics which are non-educational activities. School-financed fellowships and scholarships are transfer payments and are to be excluded also.[9]

Society realizes another cost in the form of productivity foregone while the student is attending school. This varies with labor market conditions, however. Under normal labor market situations, productivity foregone may be valued as being equal to total wages foregone by the student while attending school.

Benefits from education which result from public investments are usually measurable, but individual decisions toward self-investment in

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[8]Ibid., p. 573.

[9]Ibid., p. 577.

education require analysis in terms of both financial and "psychic" rewards. The motivations for educational investment decisions may vary from person to person. It is unclear whether all persons make educational investment decisions with the same expectations given to investments intangible capital. Much of the literature on the subject treats the expectations as being similar. Money value placed upon human attributes, learned or unlearned, is a theoretical valuation, however, and is difficult to measure in actual situations. Jack Wiseman (1965) feels that economic value may be given to certain human attributes when those attributes are mutually enhanced by education. Returns to education must be defined in terms of "real" returns since there is no satisfactory method of quantifying "psychic" returns to education.[10] Wiseman further argues that a "physic" attitude which might have economic value is the enlightening experience of education that allows an individual to see more clearly the economic alternatives before him.[11]

Another problem occurs when determining whether education is for investment or for consumption purposes. In either case benefits occur, but the returns are of very different nature. As an investment, education is a means to benefits whereas education in the form of consumption becomes an end in itself. As Schultz (1964) states, the valuation problem does not rest upon want-satisfaction because wants are not final.[12] Since revealed preference cannot distinguish between that part of education which is consumption and that which is investment,

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[10]Jack Wiseman, "Cost-Benefit Analysis in Education," Social and Economic Journal, XXXII (July, 1965), p. 3.

[11]Ibid., p. 4.

[12]Schultz, comment in Ibid., p. 13.

one must assign valuation mostly from intuitive analysis of the problem.

## Benefits of Education

Weisbrod (1962) gives a summarization of benefits derived from education as a form of investment. He states that any factor which alters relative prices is not a benefit if total utility is not increased.[13] Benefits of education which accrue to the individual include the following:

1. Direct financial returns, adjusted for factors other than education which enter into the income stream. Those who enjoy higher lifetime earnings also tend to live longer and enjoy more economic alternatives.[14]
2. Financial option returns in the form of increased opportunities for further investments in education.[15] The higher options to education allow a direct return for present use or a discounted ticket for possible future use.[16]
3. Non-financial options to the individual come in the form of situations which have economic implications yet are difficult to quantify monetarily. Education increases mobility, job opportunities and income-leisure-security options. Some security options may, however, be at the expense of increased

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[13]Weisbrod, "Education and Investment in Human Capital," Journal of Political Economy (Supplement), LXX (October, 1962), p. 107.

[14]Ibid., p. 108.

[15]Ibid., p. 109.

[16]Ibid., p. 110.

> earnings. A type of security against technological displacement comes in the form of a "hedging option." Persons with higher education can more easily adjust to change than those less educated. On-the-job training may be mutually enhancing with education also. Other returns come in the form of increased literacy and the ability to recognize economic opportunity.[17]

Weisbrod also gives a summarization of benefits external to the student. Probably the most important of these is the intergenerational effects of education as described by W. J. Swift and himself (1965). Alfred Marshall (1920) was well aware of the costs of perpetuating ignorance.

> But the point on which we have specially to insist now is that this evil is cumulative . . .; the less fully their own faculties are developed, the less they will realize the importance of developing the best faculties of their children, and the less will be their power of doing so.[18]

Better-educated people teach their children to have a greater appreciation for learning and its financial value. The intergenerational returns will vary directly with the number of children raised.[19]

Other benefits are external to the individual and the individual's family. Some are directly felt by neighbors and within the community while others affect society in general. Higher-educated persons ideally can see more clearly reasons for self-taxation for community invest-

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[17]Ibid., pp. 113-114.

[18]Alfred Marshall, Principles of Economics, Eighth Edition (London: MacMillan and Company, Limited, 1920), pp. 562-563.

[19]W. J. Swift and B. A. Weisbrod, "On the Monetary Value of Education's Intergenerational Benefits," Journal of Political Economy, LXXIII (December, 1965), p. 644.

ments in highways and other public expenditures. Reduced crime rates seemingly would occur among higher-educated persons.[20]

While the income effect of education can be estimated, one must consider other variables in the analysis. W. Lee Hansen (1963) has isolated some the variables apart from education which might affect age-income profiles:

1. Receipts from other assets or life-chances which distort earning expectations. This includes willingness to assume certain financial risks.
2. Minority groups whose earnings are depressed below average levels by discrimination and restricted opportunity.
3. Intelligence, ability, experience, sex and aptitudes which influence earnings apart from formal education. These factors may have a stronger influence than education in certain situations.
4. Lower mortality rates due to increased knowledge of and access to medical facilities, better nutrition and safer job situations.[21]

Gary S. Becker (1964) has demonstrated that a strong correlation exists between ability and education. An apparently large investment return of about ten per cent goes to graduates of higher education. It is difficult to determine how much of this return goes to education and how much to ability. Since a large portion of college graduates also hold higher abilities than do average persons, crediting education

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[20]Weisbrod, "Education and Investment in Human Capital," p. 116.

[21]W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, LXXI (April, 1963), p. 132.

alone with this high rate of return would result in overstatements.[22]

## Calculations of Valuation

M. S. Feldstein (1964) has described several methods of calculating valuation in cost-benefit analysis.[23] These valuation methods are applicable to public policy decisions if several alternatives are available. They are also applicable to individual decision if the motivation toward schooling is for investment purposes.

The pay-back period method has been used in manpower retraining program evaluations.[24] This method is applicable where there are numerous investment alternatives. When the total of net earnings equals the original investment, the project with the shortest pay-back period becomes the alternative with the highest priority. The maximum pay-back period schedule is analogous to the marginal internal rate of return, but the former is preferred in the Soviet Union since it avoids the connation of "return on capital."[25]

The present value-per-current dollar method applies to institutional investments when capital rationing must be apportioned between projects. The ratio of the present value is computed for each project, and the first dollar is applied to the project with the highest present value. The assumption is that diminishing rates of return occur with

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[22]Gary S. Becker, Human Capital (New York: Columbia University Press, 1964), pp. 80-81.

[23]M. S. Feldstein, "Opportunity Cost Calculations in Cost Benefit Analysis," Public Finance, XIX (1964), p. 118.

[24]Gerald G. Somers and Ernst W. Stromsdorfer, "A Cost-Benefit Analysis of Manpower Retraining," Proceedings of the Seventeenth Annual Industrial Relations Research Association (Madison: 1964), pp. 172-185.

[25]Feldstein, p. 133.

increased expenditures.[26] Another method used in cost-benefit analysis is comparing rates of return to those realized in private investment.[27] This method is popular in much of the literature, but differences in liquidity between private and "human" capital alters the risk and expectation schedules associated with returns.

The rate of return method is the most popular approach to evaluating the effectiveness of education. This method is defined by Becker (1960) as follows:

> Returns are related to costs by an internal rate of return--the rate of discount which equates the present value of returns and costs. In other words, it is the rate of return on college investment. If this rate of return was higher than on tangible capital, there would be evidence of underinvestment in education.[28]

Becker is critical of high rates of return to education which do not consider all relevant factors. According to Becker, the rate of return appears to have been about twelve and one-half per cent in 1940 and ten per cent in 1950 for white urban males in higher education in general. However, he feels that some estimates have failed to consider returns collected by the government in the form of higher taxes. Becker adjusts for this, leaving a return of nine per cent which he feels is still overstated since this estimate reflects only white urban males.[29] At the same time, the return to corporate investment appears to have been about eight per cent. Therefore, direct return alone cannot

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[26] Ibid.

[27] Ibid., p. 132.

[28] Becker, "Under-Investment in Education?," American Economic Review, L (May, 1960), p. 347.

[29] Ibid., p. 348.

justify increases in expenditure in education in recent years.[30] Schultz (1967) feels that although the rate-of-return method has disadvantages, there is no alternative measure which can adequately consider the additions to economic growth by education.[31]

Higher education, in general, seems to yield returns no higher than those of other forms of investment, but areas within higher education do seem to yield higher-than-average rates of return. A study by Carroll and Ihnen (1966) of technical graduates in North Carolina indicates that the area of technical education is underinvested in other states. In that study an estimated social rate of return of 16.5 per cent and a private rate of return of 22 per cent were found to be occurring to technical education. Even without expectations of future increases in income, the estimated social rate of return was 11.7 per cent, and the private rate was 16.9 per cent.[32]

Schultz (1967) is well aware of the contribution of education to economic growth. He prefers to think of the reciprocal of the rate of return as the price of an additional income stream to the economy. This price is the cost of adding additional human resources for economic growth.[33] Thus, the use of the rate of return method for allocating resources to education is a least-cost approach to economic growth.

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[30] Ibid., p. 349.

[31] Schultz, "The Rate of Return in Allocating Investment Resources to Education," Journal of Human Resources, II (Summer, 1967), p. 308.

[32] Carroll and Ihnen, pp. 2-3.

[33] Schultz, "The Rate of Return in Allocating Investment Resources to Education," p. 308.

# CHAPTER III

## COSTS OF TECHNICAL EDUCATION

Costs of education are incurred by both the individual student and society in general. An individual may incur educational costs for either "investment" or "consumption" purposes. It is assumed that technical students consider their educational expenditures as being mainly for investment purposes. Society considers its educational expenditures as being almost purely for investment purposes.

### Methods of Obtaining Costs

During the months of April and May of 1967, 220 graduating technicians of Oklahoma's technical institutes and junior colleges answered questionnaires concerning costs incurred them while enrolled in technical programs. Obtained with this questionnaire (see Appendix A) were expenditures for books and materials, and the number of semesters attended for purposes of calculating average tuition and fees. Students also reported income from scholarships, summer and part-time employment, and G. I. Bill benefits, all of which offset the income which is foregone while attending school. Expenses such as room and board, transportation, health and insurance, etc., were excluded since costs of a similar nature would be incurred whether the student attended school or not. Living costs for those persons attending school may differ in magnitude from those of non-students, but the latter are not

available for measurement. Also, many students and non-students of college age live with their parents and are not aware of their total living costs.

## Costs to Student

An estimate of earnings foregone while attending technical school was obtained from 1960 census data for high school graduates in this region. The median salary for males, ages 20 and 21, as reported by the U. S. Bureau of the Census, is probably understated due to a general increase in earnings since 1960 and also due to specific attributes believed to be inherent of persons attending institutions of higher education. More specifically, technical students are believed to hold higher abilities and stronger motivations for self-advancement than does the population of persons in general in that age category. This excludes, of course, life chances which may alter incomes apart from any known factor. A more realistic estimate, $2,959 per annum or $5,918 over a two-year period, the census figure for males, ages 22 through 24, is used as a measure of foregone income.[1] Since the qualities of interest, aptitude and ability cannot be separated as variables in the study, no control group comparison is possible. An estimate of foregone income in this situation must necessarily be influenced by intuitive judgment.

Table I calculates average income foregone while attending technical school. In Table II, income foregone is included as "opportunity

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[1] U. S. Bureau of the Census, U. S. Census of the Population 1960, Subject Reports, Educational Attainment, (Washington, D. C.: Government Printing Office, 1963), p. 107.

TABLE I

NET PER STUDENT INCOME AND INCOME FOREGONE WHILE ATTENDING TWO YEAR TECHNICAL PROGRAMS
(In Dollars)

| Institution* | G.I. Bill Benefits | Income Earned During Summer | Income Earned While Attending School | Scholarship, Fellowship, or Grant | Total Income | Income Foregone | Net Income Foregone |
|---|---|---|---|---|---|---|---|
| OSU | 172 | 1,014 | 617 | 133 | 1,936 | 5,918 | 3,982 |
| OST | 272 | 281 | 534 | 541 | 1,627 | 5,918 | 4,290 |
| OCT | 108 | 1,066 | 1,762 | 77 | 3,012 | 5,918 | 2,906 |
| Cameron | 143 | 876 | 2,604 | 29 | 3,651 | 5,918 | 2,267 |
| Eastern | 000 | 727 | 707 | 319 | 1,753 | 5,918 | 4,164 |
| NEO A & M | 38 | 686 | 1,265 | 191 | 2,180 | 5,918 | 3,738 |
| NOC | 000 | 766 | 1,030 | 192 | 1,989 | 5,918 | 3,929 |
| MSC | 000 | 717 | 317 | 200 | 1,233 | 5,918 | 4,685 |
| Average Weighted by Enrollment** | 122 | 788 | 944 | 214 | 2,068 | 5,918 | 3,849 |

* See key Appendix C.
** May not add exactly due to rounding.

TABLE II

TOTAL COSTS OF EDUCATION TO EACH 1967 TECHNICAL SCHOOL GRADUATE BY SCHOOL
(In Dollars)

| School* | Books and Materials | Per Cent Non-Resident | Resident Per Student Fees[2] | Non-resident Per Student Fees[3] | Average Per Student Fees | Total Per Student Direct Costs | "Opportunity Costs" | Total Costs of Technical Education to Student |
|---|---|---|---|---|---|---|---|---|
| OSU | 225 | 17.3 | 512 | 944 | 587 | 812 | 3,982 | 4,794 |
| OST | 31*** | 18.5 | 870**** | 1,470**** | 981 | 1,012 | 4,290 | 5,303 |
| OCT | 452 | 7.6 | 512 | 944 | 545 | 998 | 2,906 | 3,903 |
| Cameron | 111 | 0.0 | 288 | 720 | 288 | 399 | 2,267 | 2,667 |
| Eastern | 166 | 14.2 | 288 | 720 | 350 | 515 | 4,164 | 4,680 |
| NEO A & M | 190 | 13.7 | 288 | 720 | 347 | 537 | 3,738 | 4,275 |
| NOC | 220 | 0.0 | 288 | 720 | 288 | 508 | 3,929 | 4,437 |
| MSC | 115 | 0.0 | 288 | 720 | 288 | 403 | 4,687 | 5,088 |
| Average Weighted by Enrollment** | 196 | 13.7 | | | 722 | 919 | 3,849 | 4,768 |

* See key Appendix C.
** Figures may not average due to rounding.
*** Costs apart from books and materials which are included in general fees.
**** Represents six quarters on trimester basis

[2] Ibid.

[3] Ibid.

costs" to give an estimate of total costs of education to each 1967 two-year technical graduate by school. As may be seen in Table II, the average cost of education to a 1967 technical graduate is estimated to be about $4,768. The larger portion of this cost, an average of $3,849, comes from income foregone. Books, materials and fees constitute the remaining $919 for each student attending technical school. Average fees were calculated by weighing out-of-state graduating technicians as a percentage of total graduating technicians. Per-student fee schedules were obtained from Oklahoma State Regents for Higher Education.[4]

## Costs to Society

Tables III, IV and V are calculations of estimates of societal costs of technical education. Costs of education come from two sources. The largest cost is the productivity which is lost from the labor force while the student is attending school. Table III shows the derivation of this cost. This can be estimated as being equal to the income which the student foregoes while attending school. Since there is no alternative measure of the value of actual productivity foregone, net student income foregone supplies the best possible estimate. A part of student productivity foregone is offset by part-time or summer jobs held while the student is attending school. Net student productivity foregone is estimated to be about $4,186.

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[4] Oklahoma State Regents for Higher Education, Student Fees Authorized in the Oklahoma State System of Higher Education, (Oklahoma City: 1966), Schedules are amended for tuition changes between 1965 and 1967.

TABLE III

STUDENT PRODUCTIVITY FOREGONE WHILE ENROLLED
IN TECHNICAL EDUCATION
(In Dollars)

| School* | Unadjusted Productivity Foregone | Total Productive Activity While Enrolled | Net Productivity Foregone |
|---|---|---|---|
| OSU | 5,918 | 1,631 | 4,287 |
| OST | 5,918 | 814 | 5,104 |
| OCT | 5,918 | 2,828 | 3,090 |
| Cameron | 5,918 | 3,479 | 2,439 |
| Eastern | 5,918 | 1,434 | 4,484 |
| NEO A & M | 5,918 | 1,951 | 3,967 |
| NOC | 5,918 | 1,796 | 4,121 |
| MSC | 5,918 | 1,033 | 4,885 |
| Average Weighted by Enrollment** | 5,918 | 1,732 | 4,186 |

* See key Appendix C.
** May not add exactly due to rounding

A second cost to society is the actual cost of operating educational institutions used by the students. Table IV shows the calculation of this cost. The 1965-66 figures are derived from current operating expenditure reports from the various institutions as reported by the Oklahoma State Regents for Higher Education.[5] The 1966-67 figures are derived from budget reports which should closely approximate final

[5] Oklahoma State Regents for Higher Education, Current Operating Income and Expenditures, Oklahoma State Colleges and Universities, Fiscal Year 1965-66, (Oklahoma City: 1967), p. 6.

expenditure figures which are not yet available.[6] In comparing costs of operation on a per-student basis, caution must be exercized in assuming exact intercomparison among the schools. Due to the degree of diversification among these institutions, costs of operation will vary due to factors other than classroom activities. For example, Oklahoma State University reflects higher per-student costs due to the inclusion of post-graduate programs as well as large research and extension activities.

The per-student cost figures in this study represent all students, technical or otherwise, since there is no means of determining actual per-student costs of operation in specific programs such as electronics or data processing. The costs of operating technical programs, however, appear not to differ greatly from the overall per-student costs of operation. For example, the per-student costs of operating Oklahoma State Technical College and Okalahoma State University Oklahoma City Technical Institute, which consist entirely of technical and vocational programs, are not dissimilar to the costs of operation among the other institutions (see Table IV). Without the design and adoption of methods to determine the costs of operation of specific programs, the actual contribution of individual programs is more difficult to assess. The estimated institutional cost of educating a technical student over the two academic year periods of 1965-66 and 1966-67 is estimated to be $1,637.

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[6]Oklahoma State Regents for Higher Education, The Oklahoma State System of Higher Education, Education and General Budgets--Part I, Summarization and Analysis, Total Allocations to May 3, 1967, (Oklahoma City: 1967), p. 3.

TABLE IV

TOTAL INSTITUTIONAL COSTS PER FULL-TIME EQUIVALENT STUDENT OVER A TWO YEAR PERIOD
(In Dollars)

| School* | Amount Per FTE Student 1965-1966 | Amount Per FTE Student 1966-1967 | Total Per FTE Student |
|---|---|---|---|
| OSU | 883 | 1,022 | 1,905 |
| OST | 760 | 910 | 1,670 |
| OCT | 444 | 406 | 851 |
| Cameron | 459 | 427 | 886 |
| Eastern | 559 | 562 | 1,121 |
| NEO A & M | 546 | 534 | 1,080 |
| NOC | 547 | 541 | 1,088 |
| MSC | 808 | 665 | 1,473 |
| Average Weighted by Enrollment** | | | 1,637 |

* See key Appendix C.
** May not add exactly due to rounding.

Source: Oklahoma State Regents for Higher Education

Combining Tables III and IV, the total societal cost of educating a technical student is estimated to be $5,823. Table V shows the calculation of this estimate. Differences in productivity foregone may be explained by considering wage and employment opportunities available to students at the various institutions. Schools in or near urban areas tend to reflect more part-time or summer earnings which in turn reduce productivity foregone.

Costs of technical education to the student appear to be about $1,055 less than the costs of technical education to society over a two-year period. The intrinsic value of a single dollar spent for

education by the individual may differ from that intrinsic value of a dollar spent from public funds. The actual burden of educational costs may actually be greater for the individual, even though actual cash outlays are less on his part.

TABLE V

TOTAL SOCIETAL COSTS PER STUDENT ENROLLED IN TWO YEAR TECHNICAL EDUCATION
(In Dollars)

| School* | Total Productivity Foregone | Total Institutional Costs** | Total Societal Costs Per Student |
|---|---|---|---|
| OSU | 4,287 | 1,905 | 6,192 |
| OST | 5,104 | 1,670 | 6,774 |
| OCT | 3,090 | 851 | 3,941 |
| Cameron | 2,439 | 886 | 3,325 |
| Eastern | 4,484 | 1,121 | 5,605 |
| NEO A & M | 3,967 | 1,080 | 5,047 |
| NOC | 4,121 | 1,088 | 5,209 |
| MSC | 4,885 | 1,473 | 6,358 |
| Average Weighted by Enrollment | 4,186 | 1,637 | 5,823 |

* See key Appendix C.
** See Table III.

## CHAPTER IV

## RETURNS TO TECHNICAL EDUCATION

In estimating returns to technical education, one must consider the fact that the future holds much that could alter lifetime income streams, and render less predictable calculations of those income streams. In an economy with an ever-increasing rate of technological change, it is estimated that youth of today may hold as many as five occupations in a lifetime and see education and retraining as an on-going process.[1] Many technical graduates will have exposure to types of on-the-job training and management opportunities which can greatly alter their lifetime earning potentials. Even barring external economic events, any projection of lifetime increased earnings due to technical education becomes highly speculative. Estimates of lifetime earning streams must be made here as though no variable of later consequence will affect earning potentials. These estimates must be conservative in nature. The more accurate measure of the returns to investments in technical education is the pay-back period method.

The second questionnaire was mailed in November 1967 to the 220 graduate technicians who responded to the first questionnaire. This questionnaire was designed to obtain actual salaries of graduate technicians (see Appendix B). To the second questionnaire, 169, or 76.8 per

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[1]Grant Venn, Man, Education and Work, (Washington, D. C.: American Council on Education, 1964), p. 26.

cent of the graduate technicians responded. Of this 169, 91, or 53.8 per cent, were employed; 60, or 35.5 per cent, were continuing their education; 16, or 9.5 per cent, were in the Armed Forces; and 3, or 1.8 per cent, were classified as "other."

Table VI is a matrix of average salaries of 1967 Oklahoma graduate technicians by school and by program. The average overall starting salary is estimated to be $6,131 per annum. An estimate of 35 per cent rate of return to the individual was calculated using conservative lifetime projections. A rate of return to society of 25 per cent was derived using the same conservative income projects. The average age of the graduates was 21.6 years, and the estimate of 41.6 years of remaining productive activity was used in the projection.[2] The pay-back period for the individual is estimated to be about three and one-fourth years. The pay-back period to society is estimated to be about four years.

The rates of return to technical education in Oklahoma compare favorably with the nine or ten per cent rate of return estimate by Becker (1960) as occurring in higher education in general.[3] Carroll and Ihnen (1966) found 22 per cent individual and 16.5 per cent societal rates of return going to technical education in North Carolina[4] which, when compared with the rates of return to technical education in Oklahoma, tend to indicate that high rates of return to technical

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[2] "The Length of Working Life for Males, 1900-60," Manpower Report No. 8, (Washington, D. C.: U. S. Office of Manpower, Automation and Training, July, 1963), pp. 10-11.

[3] Becker, "Under-Investment in Education?," pp. 347-349.

[4] Carroll and Ihnen, pp. 2-3.

education may be a general phenomenom throughout the United States.

TABLE VI

AVERAGE YEARLY STARTING SALARIES OF 1967 OKLAHOMA GRADUATE TECHNICIANS BY SCHOOL AND PROGRAM (In Dollars)

| | School* | | | | | | Average |
|---|---|---|---|---|---|---|---|
| Program | OSU | OST | OCT | Cameron | NEOAMC | NOC | by Program |
| Electronics | 6,847 N=14 | 5,861 N=10 | 6,560 N=11 | 6,252 N=1 | 4,656 N=4 | 5,730 N=2 | 6,261 N=42 |
| Drafting & Design | 5,910 N=3 | 6,097 N=11 | 6,773 N=1 | 6,213 N=2 | 5,250 N=2 | | 6,026 N=19 |
| Data Processing | 6,247 N=2 | | 7,200 N=3 | | 5,042 N=9 | 4,440 N=1 | 5,594 N=15 |
| Nuclear & Radiation | 5,872 N=6 | | | | | | 5,872 N=6 |
| Fire Protection | 7,812 N=1 | | | | | | 7,812 N=1 |
| Aeronautical | 6,618 N=2 | | | | | | 6,618 N=2 |
| Metal | 6,247 N=2 | | | | | | 6,247 N=2 |
| Environmental | | | 8,528 N=1 | | | | 8,528 N=1 |
| Instrumentation | | | 6,528 N=1 | | | | 6,528 N=1 |
| Chemical | | | | | 6,360 N=2 | | 6,360 N=2 |
| Average by School | 6,495 N=30 | 5,987 N=21 | 6,799 N=17 | 6,226 N=3 | 5,131 N=17 | 5,300 N=3 | 6,131 N=91 |

* See key Appendix C.

Since no respondent from either Eastern Oklahoma A & M College or Murray State Agricultural College could be classified as "employed," no measure of earnings is available from either of these schools. Where a program or school is represented by only a small number of respondents, the estimate can be said to represent that program or school with less certainty. It is believed that on-the-job training and experience has affected the estimate represented for Oklahoma State University Oklahoma City Technical Institute because that institution operates evening classes for students employed on a full-time basis. Since the response to the second questionnaire was almost 77 per cent, bias of non-response is not believed to be large.

It is known that some technical students choose to take early employment rather than complete course requirements for graduation. It is not known, however, whether these "drop-outs" realize salaries which differ from those of technical graduates. If those students who do take early employment reflect similar or higher starting salaries, the individual and societal rates of return would be higher than those of graduates due to less foregone income and use of institutional facilities on the part of the "drop-outs."

# CHAPTER V

## SUMMARY AND RECOMMENDATIONS

### Analysis of Underinvestment

The rate of return estimates to technical education of 35 per cent to the student and 25 per cent to society tend to indicate underinvestment in technical education as compared with higher education in general. Graduates from two-year technical programs in Oklahoma realize starting salaries which are comparable to those of graduates with four-year baccalaureate degrees in many instances.[1] These high rates of return may indicate a misallocation of human and physical resources to technical education in relation to higher education in general. In terms of public finances to higher education, investments in technical education should take priority over areas with lower rates of return.

### Incentives to Students as Allocative Means

As an allocative mechanism for human resources, public policy makers might use the direct costs of education to the student as an incentive in the selection of programs in higher education. Students anticipating the selection of programs with low rates of return might be confronted with higher incurred costs while students anticipating

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[1] Oklahoma State University Seventh Annual Report, (Stillwater, Oklahoma: University Placement Service, 1967), p. 10.

programs with higher rates of return would realize reduced direct program costs. In no case would costs be intended to be prohibitive since it is desirous to operate an open society with freedom of occupation choice. When a society is financing much of the costs of education, however, that education should be strongly associated with society's demand for specific types of human resources.

When developing public policy strategies based on the high rates of return to technical education, one must consider the problem of prestige which seems to have restricted the number of students entering technical education.[2] A possible investment strategy would be for society to assume a larger portion of the direct costs of technical education, especially for students of low-income status for whom technical education would be an advance in prestige. The returns to society would be at least as great as those from baccalaureate programs and the student's education would be marketable in two years rather than four.

Another investment alternative might allow a particular state to realize a greater portion of its investment in technical education by diminishing its loss of human resources through "brain drain." Loans might be granted to lower-income students to encourage a larger number of them to enter technical education. The state would "forgive" all or part of loans to students choosing to take employment within that state for a given length of time. After a few years, many of those students would have become attached to the area and would be less likely to migrate out of the state. Such a method would not seriously

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[2] Maurice W. Roney and Paul V. Braden, Occupational Education Beyond the High School in Oklahoma, (Norman, Oklahoma: Oklahoma Economic Development Foundation, January, 1968), p. 169.

impede the efficient allocation of human resources since students with attractive out-of-state employment opportunities would weigh those advantages against the costs of repaying their loans. Adjustments or deferments of loan repayment would be made where military service interrupts employment.

## Limitations and Recommended Research

This study was limited by several factors inherent in the research methods used. For example, the questionnaire method asks students to recall their expenditures for schooling over the two years previous to graduation. At best, they can only make estimates and the direction of bias is indeterminant. It is impossible to assume that the estimates distribute normally, allowing upward and downward biases to cancel each other.

The methods of determining institutional costs are crude. The present accounting procedure aggregates so many programs together that the per-student costs presented cannot fairly be assumed to be typical of any specific program. A need exists here for better statistical data. Other estimates of program costs, were attempted but proved to be even less reliable. In attempting to determine "income foregone," it is difficult to define a model which describes the typical technical student who decided to work rather than to attend school. The abilities, aptitudes and motivations which might affect salaries cannot knowingly be replicated at this time.

These findings are intended to estimate the rates of return to technical education in Oklahoma. They are not intended for comparing cost-effectiveness of the schools involved. Where the profit motive

cannot be directly be attributed to the allocation of resources, rates of return are not applicable. Also, some institutions had few or no graduates classified as "employed" and could be seriously misrepresented in terms of cost-effectiveness.

These limitations do not exhaust the list of shortcomings of this study. They are, however, believed to include the more serious inadequacies. The findings of this study are not believed to be invalidated by its limitations.

There is a definite need for continued research in the economics of education. There are more questions specifically in the area of technical education. One salient need is for long-run income statistics of technical graduates of Oklahoma. A more accurate estimate of lifetime income streams would allow one to distinguish between very similar rates of return. Also, it is believed that technical graduates reach an earlier plateau in earning potential than do persons with baccalaureate degrees. If this hypothesis is true, it might be due to reduced emphasis in technical programs on communicative skills and liberal arts which increase opportunities to advance into management positions.

Additional research might investigate rates of return before and after an increase in expenditures has occurred in a program. Little is known about the responses of students and schools to changes in relative rates of return. Other areas of higher education might be studied by using cost-benefit analysis to produce an array of rates of return for investment alternatives. There may be other areas in higher education with high rates of return yet to be discovered.

While economics cannot determine every aspect of public policy

toward education, it can encourage decisions where valuation is possible and necessary. The market does not operate in all areas of education and in some areas its forces are difficult to discern. But where market forces are visible, economic analysis can give direction and priority to alternatives where such decisions are needed. When considering the contribution of education to economic growth, the rate of return method demonstrates a least-cost, or maximum contribution per dollar, method of allocating resources to education.

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# APPENDICES

APPENDIX A. STUDENT COST QUESTIONNAIRE (Questions 14 through 20).

STUDY OF TECHNICAL EDUCATION
Oklahoma State University
School of Industrial Education
Stillwater, Oklahoma

Please consider each question carefully and answer as accurately as you can. All information will be held in strict confidence.

We hope to contact you in July or August. If you know at this time where you will be residing after graduation please indicate below. If you do not know please give the name and address of someone who will know how to contact you. (parent, relative, etc.)

NAME_____ PHONE_____

ADDRESS_____

CITY_____ STATE_____ ZIP_____

FOR WHOM WILL YOU BE EMPLOYED?_____

CITY_____ STATE_____

1. Your Name _____

2. Sex M___ F___. 3. Marital Status _____ 4. Age_____

5. From what technical program are you graduating?_____

6. Where did you graduate from high school? School_____

City_____ County_____ State_____

7. After graduating from high school, did you stay out of school for one year or more before enrolling here? Yes_____ No_____

8. How many miles did you live from this school before enrolling here? _____

9. Where did you live before enrolling here?

Number and Street_____

City_____ County_____ State_____

10. Did you either permanently or temporarily change your address in order to attend this school? Yes_____ No_____

Present Address_____ City_____

County_____ State_____

11. How many miles do you now live from your classes? _____

12. How do you normally get to classes? Auto_____; Bus_____; Bicycle_____; Motor bike or Motor cycle_____; walk_____; Other_____.

13. How many minutes does this trip take? _____

14. What was the total amount you spent for books and materials required for your studies? $_____

15. If you received G.I. Bill benefits while attending school, what was the total amount you received? $_____

16. If you worked last summer, what was the gross amount earned? $_____

17. If you worked while attending school, what is the gross amount you received in wages over a two-year period? $_____ (exclude last summer's earnings)

18. If you received unemployment payments last summer or at any time while enrolled in the program, what was the total amount you received? $_____

19. If you received financial assistance such as a scholarship or grant while enrolled in this program, what is the total amount you received while in the program? $_____ (exclude financial assistance from parents; loans, gifts, etc.)

20. How many semesters have you attended this program? _____

Thank you for your time and consideration.

APPENDIX B. STUDENT SALARY QUESTIONNAIRE (Questions 1 through 9).

STUDY OF TECHNICAL EDUCATION
Oklahoma State University
School of Industrial Education
Stillwater, Oklahoma

The information which you provide will be used for research purposes only. To insure that this information will remain confidential, do not place your name on this questionnaire. We wish all participants to remain anonymous.

1. School and program from which you graduated. _____

_____

2. Which of the following pertains to you? Am now employed_____

Attending school_____ In the Armed Forces_____ Other_____

IF EMPLOYED, PLEASE ANSWER PARTS 3 THROUGH 10.

3. Present job title. _____

4. Present earnings (wages, salary) before taxes. _____

Is this an hourly, weekly, monthly, or annual amount? _____

5. Please check the following fringe benefits which you receive:

a. Paid Vacation _____
b. Sick Leave _____
c. Employer paid insurance:
Life _____
Hospital _____
Disability _____
d. Retirement Benefits_____

6. What are your average weekly overtime earnings? _____

7. What is the total value of capital, such as tools or instruments, which you must provide in your work? _____

8. Does your job require the technical education which you received?
Yes _____ No _____

9. Do you hold a second job? Yes _____ No _____
If yes, does this job require your technical training? Yes___No___
Please estimate your earnings from this second job. _____
Is this an hourly, weekly, monthly or annual amount? _____

10. How many miles do you now live from your home town? _____

ALL PARTICIPANTS PLEASE ANSWER PARTS 11 THROUGH 18.

These questions relate to factors involved in mobility and willingness to migrate. Please answer as accurately as possible. Again, you are assured that the information which you provide will be held confidential and will be used exclusively by Oklahoma State University.

11. In what type of community did you reside before attending technical school?
On a farm or ranch _____ Town, 2,500 to 9,999 _____
In open country (small acreage) ___ City, 10,000 to 50,000 _____
Village under 2,500 population ____ City, over 50,000 _____

12. What type of work does (did) your father do? _____

13. What type of work does (did) your mother do? _____

14. Which letter best describes your family's total annual income? ___
A. Less than $3,000
B. $3,000 to $4,999
C. $5,000 to $7,499
D. $7,500 to $9,999
E. $10,000 to $14,999
F. $15,000 or more

15. Which of the following best describes your parents' marital status?
Married ____ Separated ____ Divorced ____ Remarried (one or both) ____ Deceased (one or both) ____

16. How many times did your family relocate in another city before you graduated from high school?
Never did ____ Moved 1-3 times ____ Moved more than 4 times ____

17. Please indicate below the education which your parents received.

| Father | Highest Grade Completed | Mother |
|---|---|---|
| _____ | Grammar school | _____ |
| _____ | Some high school | _____ |
| _____ | High school | _____ |
| _____ | Some college | _____ |
| _____ | College | _____ |
| _____ | Postgraduate | _____ |

18. Where would you best like to live if job and salary were not a factor? _____

THANK YOU FOR YOUR TIME AND CONSIDERATION.

## APPENDIX C. KEY TO INSTITUTIONS

OSU - Oklahoma State University Technical Institute,
Stillwater

OST - Oklahoma State Technical College,
Okmulgee

OCT - Oklahoma State University Oklahoma City Technical Institute,
Oklahoma City

Cameron - Cameron State Agricultural College,
Lawton

Eastern - Eastern Oklahoma State College,
Wilburton

NEO A & M - Northeastern Oklahoma Agricultural and Mechanical College,
Miami

NOC - Northern Oklahoma College,
Tonkawa

MSC - Murray State Agricultural College,
Tishomingo

VITA

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