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ABSTRACT

In order to investigate the effects of vocational training on labor force participation and unemployment, the researchers compared an experimental group of Tennessee Area Vocational-Technical School (AVTS) graduates with an individually matched control group. On the basis of data collected by questionnaire, the report concluded that vocationally trained workers have higher mean labor force participation rates, lower mean unemployment rates, and higher mean occupational mobility rates. However, the researchers warn that some of this difference might be attributable to unmeasurable motivational or achievement factors. Close matching with the control group can reduce, but not eliminate, this hazard. (BH)

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NON-WAGE BENEFITS OF VOCATIONAL TRAINING:
EMPLOYABILITY AND MOBILITY

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The benefits of education have been explored so completely by so many investigators that a justification for another paper on this topic seems required. We offer two justifications for the present paper: (1) that previous studies have emphasized the income effects of education to such an extent that the other economic benefits, such as increased employability and increased occupational mobility, have received inadequate emphasis, and (2) that previous studies have examined academic training more thoroughly than vocational training, treating education as a well-defined commodity when in fact it is a highly heterogeneous one. There are conceptual difficulties in measuring the benefits of a high school education when that education consists of an unknown amalgam of instruction in Latin, driver education and other topics.

One of the best sources of information about the relationships among formal educational attainments and rates of labor force participation and unemployment is the periodic surveys of the educational attainment of workers conducted by the Bureau of Labor Statistics.¹ A few findings from the 1968 survey can be cited to substantiate some propositions which have been well-established by numerous surveys in the past. The first is that there is an inverse correlation between educational levels and unemployment rates. In March, 1968 the unemployment rates were 3.4 percent for the population aged 18 and over, 1.0 percent for labor force participants with four or more years of college, 3.1 percent for those with four years of high school, and 4.2 percent for workers with eight years of elementary school.² The relationship

holds tolerably well for both sexes and all age groups under 65, but it seems more reliable among whites than nonwhites.

The second major finding of the BLS surveys is that there is a positive correlation between levels of formal education and labor force participation. Again we can cite a few figures from the 1968 survey to indicate the strength of this relationship: labor force participation rates were 60.4 percent for the entire population aged 18 and over, 73.3 percent for those with four years of high school, 50.9 percent for the population with eight years of elementary school, and 34.7 percent for Americans with less than five years of formal schooling.³ In this case too the relationship holds for both sexes (stronger for females) and all age groups (becoming stronger at high ages). Among nonwhites, the positive correlation holds reasonably well for females at all age levels and for males 55 and older.

When the scope is narrowed to vocational training, a more clearly defined item than formal education, comprehensive data for the entire labor force are limited to a single survey in April, 1963.⁴ This survey found unemployment rates of 5.2 percent for workers who had never received vocational training, and 4.6 percent for workers who had received vocational training at some time during their careers. The influence of formal education appears, however, to outweigh that of vocational training, and the unemployment rates were lower for vocationally trained workers only at low levels of formal education. The proposition that receipt of vocational training lowers the likelihood of unemployment, in summary, can be substantiated only at one point in time, and only for workers with less than 12 years of formal schooling. No participation rates can be computed for trained and untrained workers on the basis of the 1963 survey.

The influence of formal education upon occupational mobility has been documented for the labor force as a whole by a recent BLS study.⁵ Mobility is highest for high school graduates and dropouts, and lower for workers with college and those with only elementary education. For all employed workers, it appears that 9.9 percent changed occupations during 1965. The rate for workers with only an elementary education was 8.2 percent, for workers with a high school education 11.3 percent, and for those with four or more years of college 6.5 percent. The same mobility profile holds (at differing levels) for men and women, different age groupings and for whites and nonwhites.⁶ The conclusion seems to follow that formal education increases occupational mobility at subprofessional levels, but reduces mobility among more highly educated groups by facilitating entry into professional, technical and managerial occupations.

In June of 1968 the authors undertook a research project dealing with the effects of vocational training on labor force experience. The study, sponsored jointly by the Tennessee Division of Vocational-Technical Education and the University of Tennessee, was designed primarily to investigate various earned income effects of training received in the system of Tennessee Area Vocational-Technical Schools and consequently, to determine rates of return for the recipient and the school system. In order to compute these returns information about labor force experience during 1968 was also gathered. These data are the basis for the present analysis.

THE STUDY POPULATION

In order to investigate the effects of vocational training on labor force participation and unemployment, we first developed an experimental design that offered rigorous control upon exogenous variables. The experimental design provided for an experimental group consisting of members who

had received Tennessee Area Vocational-Technical School (AVTS) training and a control group consisting of specific cohorts methodically matched to the individual experimental member. Thus the experimental group and the control group were explicitly related with the arbitrary characteristics of the former determining those of the latter. Under these conditions the singular effects of AVTS training may be observed quite precisely, for the introduction of a circumstance in the experimental group resulted in the introduction of a similar circumstance in the control group.

A one-in-four random sample was drawn from the records of former students at the 19 Tennessee Area Vocational-Technical Schools then in operation. The system began operation on a small scale in 1963, so the sample, although heavily weighted toward short experience, had a range in potential labor force experience from one to five years. A gross sample of 1,701 former students was drawn. The next step was to select only those subjects that could be used to measure the benefits of training. Rejecting subjects for the five following reasons led to a net sample of 679: (1) subject was currently serving in the Armed Forces; (2) subject received less than 300 hours of instruction; (3) subject left AVTS after January 1, 1968, thereby having less than one year of potential labor force experience prior to the questionnaire mailing date of January, 1969; (4) records indicated a substantial physical or emotional disability; and (5) records indicated subject left AVTS to attend college.

For the purpose of selecting pairs of individually matched subjects the net sample was further reduced to a reasonably well-defined and homogeneous experimental group. Three exclusions were settled upon: (1) subjects who failed to graduate from a Tennessee high school were excluded, since it was almost impossible to match dropouts. The non-Tennessee high schoolers were

excluded due to the excessive cost of travel involved in attempting to match them. (Indeed one subject was graduated from an English school and another from a school in Newfoundland.) (2) Subjects were excluded who were born before January 1, 1943, partially for inaccessible records and partially due to the contaminating influence of variable experiences during the greater intervening time period. (3) Subjects were rejected who had one year or more of college prior to AVTS entrance. This process reduced the experimental group from 679 to 334 members.

Representatives of the study staff visited each high school attended by the 334 experimental subjects and selected a panel of potential matches consisting of the six students of the same race and sex belonging to the graduating class of the subject with grade point averages closest to the g.p.a. of the experimental subject. At the same time a considerable amount of additional information was collected on each experimental subject and potential match from the high school records. We received 100 percent cooperation from the Tennessee school authorities, and only a school fire that destroyed records, an absence of records for microfilming, and the apparent falsification of educational attainments claimed by students in AVTS applications caused us to lose sample members at this stage of the investigation.

From this list of potential matches was selected the control group. Where possible three control members were selected for each experimental member, because a pre-test of questionnaires indicated that the former responded less frequently. In addition to race, sex and graduation in the same high school class, four additional criteria were used to select matches that would allow the investigators to treat them as reasonable substitutes for one another. The following criteria were used to select the three "best" control members for each experimental member: (1) students were matched only when their

recorded IQ scores differed by less than 10 points;⁷ (2) students were matched only when their grade point averages diverged by 10 percent or less; (3) children of professional or managerial fathers were not matched with children of fathers of lower skilled occupations where known;⁸ and (4) students pursuing academic programs were not matched with students in general or vocational programs.⁹ Eighty-five experimental members were lost in this matching process, because no suitable matches could be found for them, leaving a total of 249 members in the experimental group and a total of 623 matches in the control group.

The influence of locally strong or weak labor demand was partially controlled by accepting only: (1) those pairs where both members resided in the county containing their high school or a contiguous county; and (2) those pairs where both members migrated at least two counties away from the county containing their high school. Most of the pairs (93 percent) faced the same local labor market since neither member moved. For the other 7 percent the members faced different markets, but if we assume economically motivated mobility each of them improved the demand for his labor, so that the influence of local differences has been lessened, although not eliminated.

COLLECTION OF DATA

Questionnaires were mailed to members of both groups in February, 1969 along with a payment of 50¢ for a service rendered. (The pre-test had indicated that the 50¢ payment was very effective in eliciting response.) This procedure along with methodical follow-up mailings resulted in an over-all response rate of approximately 70 percent. The questionnaire provided a great deal of information about each subject. For the purposes of the present study, this included certain demographic characteristics and the record of labor

force experience in 1968.¹⁰ Most of the information received on the questionnaires was unambiguous, and it was possible to interpret and code with reasonable precision the data subsequently discussed.

When the responses were tallied there were 129 matched pairs, but many of them were contaminated by additional educational or training experiences, differing marital states among women, and geographic mobility.¹¹ Consequently, as a final result we were left with 58 pairs matched as perfectly as possible, limited only by the measuring instruments and the authors' ingenuity, except that the experimental group had received the X dosage---AVTS training. Each member of the experimental group had received prior to 1968, with no other education or training before (except through high school) or after AVTS training, from three to twenty-four months AVTS training (the mean was approximately one year) in office occupations, metal trades, mechanics, health occupations, drafting or electricity. The control group had no formal training or education beyond high school at the end of 1968.

It is necessary at this point prior to any discussion of the findings to look at the resulting net sample of 58 pairs in terms of their representativeness of the population, particularly in view of the drastic reduction in the original sample of 334 experimental members. A comparison of key characteristics of the two groups is in order, but first it is necessary to state some assumptions about the original sample. The reader will recall that we first drew a one-in-four sample from files containing all former AVTS students, but we reduced this sample to represent a specific target population by accepting in our sample 334 only those former students who met our previously stated requirements for inclusion. Thus we are saying that our original sample of 334 is a representative sample of a specific population of former AVTS students who were graduates of Tennessee high schools, born in or after 1943, received

300 or more hours of AVTS instruction prior to 1968, reported no other training or educational experience through 1968, and had a year of potential civilian labor force experience in 1968. We claim and will submit evidence that there is insufficient reason to reject the hypothesis that our net sample of 58 is representative of our target population.

Table 1 compares the original sample of 334 with the net sample of 58 in age, IQ, rank in high school class, rural-urban residence, sex and hours of AVTS instruction received. The t-test was used to test the significance of differences in means and the test of difference in proportions was used to test the percentages, both at the .05 level. The net sample appears to over-represent females and female related characteristics, and as a result appears concentrated in health and office occupations, high in mean rank in high school class (females tended to be of higher rank), and concentrated in rural residence (female were disproportionately rural). This bias is explained by the unavoidable inclusion in the original sample of approximately forty male members, who either had military experience in 1968 and were ineligible due to the requirement of a full year of potential civilian participation in 1968 or had training contamination from armed forces schools and were ineligible due to our contamination rule. In either event it was impossible to screen the sample for armed forces participation prior to response to the questionnaire which contained questions about service experience. We believe that the 28 females in our net sample are representative of the females in the target population and that the 30 males are representative of their counterparts.

(Table 1 Here)

THE RESULTS

Participation and Unemployment

Although the earned income effects of vocational training are just now in the process of being analyzed, we have recently completed the analysis of substantial data with regard to the employability and mobility characteristics of trained versus untrained workers. We anticipated that vocational training would typically increase employability by increasing participation and decreasing unemployment.

The first pair of columns in Table 2 compares trained and untrained workers in the total number of weeks not worked (overall employability) in 1968, while in Table 3 these same data are presented as percentage rates with statistically significant differences indicated. The test of difference in proportions was used to estimate significant differences at the .05 level. Each of the 58 pairs of workers whose experiences were analyzed consisted of a vocationally trained worker matched with his untrained cohort, neither having been contaminated by any prior or subsequent formal training or education.

(Tables 2 and 3 Her)

An examination of the first set of columns in Tables 2 and 3 reveals that the total study population appeared to reflect the predicted employability trend; trained workers experienced fewer non-work weeks. However, when the components of sex, residence and marital status are broken out of the total a seemingly inconsistent relationship is revealed.¹² Male workers appear to have behaved atypically, since the trained workers had a higher non-work rate than the untrained. Also there appeared to be little difference between trained and untrained workers with urban backgrounds.

But before proceeding to any inferences it is necessary to refine further the classification of non-work weeks, since it included unspecified heterogeneous causes. That is, weeks not worked were caused either by the person not offering (or not being able to offer for that matter) his labor to the market or not having his labor accepted by the market. Since specific reasons for non-work were obtained, it was possible to dichotomize these reasons into two categories with an apparent respectable degree of accuracy: participation and unemployment. The questions asked each subject were as follows:

Were you out of work at any time during 1968? (Yes, No)
 If yes, how many weeks were you out of work? (Number of weeks)
 Why? (Reason)

In making the dichotomy between non-participation and unemployment, we tried to follow the Census-BLS definitions as closely as possible. At the end of the questionnaire there was an open-ended section for comments on any item; this was also frequently useful in making the dichotomy.

The last two sets of columns of both Tables 2 and 3 show participation and unemployment for trained and untrained workers. The initial observation that vocationally-trained male workers had a higher non-work rate than their untrained cohorts extends both to participation rate and unemployment rate. Although vocationally trained workers from urban backgrounds had a higher average participation rate, their unemployment rate was higher than their untrained cohorts.

In terms of the most favorable employability benefits stemming from vocational training it appeared that females improved their relative position the most. Even though untrained single females had a higher average participation rate than their trained cohorts, the former's unemployment rate was over fifteen times greater.

Although the sample consisted of only 116 subjects our observations did extend throughout the whole year of 1968 and reflect in most cases statistically significant differences between the trained and untrained workers. Further credence is lent to our data by the fact that the results tend to support previous findings. In an earlier study it was found that differences in employability between vocationally-trained and untrained workers tended to decrease as the years of prior formal education increased.¹³ That is, those workers already highly employable received less additional benefits from vocational training than did workers with little education who really became employable only after receiving vocational training.

This finding can be confirmed by two sets of comparisons in the present study: male-female and urban-rural differentials. It seems reasonable to assume that in general the supply of rural labor is large relative to the demand for it, and there is empirical confirmation for this fact in the persistence of a rural-urban wage differential over long periods of time. Female labor is also on the short end of a persistent sex differential which can reasonably be explained in the same supply and demand terms. Our findings indicate that women and rural dwellers derive greater benefits from vocational training than do men and urban dwellers. This is consistent with the earlier finding that high-school dropouts derive greater benefits than graduates, and leads toward the more general proposition that vocational training is likely to confer greater benefits upon an individual as his labor market position becomes more and more disadvantageous.

Occupational Mobility

In addition to the employability data each subject was asked to report occupational changes in 1968. The following questions were asked:

Have you done other kinds of work in 1968, different from your present occupation? (Yes, No) If yes, what other kinds of work have you done? (such as: welding, truck driving, selling, farming, bookkeeping, assembling, machine operator, etc.)

An earlier study previously discussed, based upon national data, suggested a parabolic relationship between education and occupational mobility, with high school attendance being the educational level associated with maximum mobility (the implied curve sloping downward in both directions).¹⁴ We were interested in determining the effect of vocational education, specifically, upon occupational mobility patterns within our study population. We reasoned that the following relationship would obtain: vocational education would be positively associated with occupational mobility.

Table 4 shows the reported occupational mobility rates for trained and untrained workers as a whole and subcategorized by sex, residence and female marital status. Again, rate differences were tested for statistical significance by estimating the confidence interval of the difference in proportions. Table 4 reveals a strong pattern that supports a positive relationship between vocational training and occupational mobility among high school graduates. Not only is the mean mobility rate of the trained workers twice that of the untrained, but a well-defined boundary persists between mean mobility rates of the trained and untrained when comparisons are made within all demographic subcategories except among married female workers. There appeared to be no difference between the mobility rates of trained and untrained married females.

(Table 4 Here)

It is difficult, from the information available, to identify precisely the interpretative variable that "explains" the relationship between vocational training and occupational mobility. There is considerable evidence that

receipt of vocational training leads to higher incomes.¹⁵ If our vocationally-trained subjects indeed have higher incomes than their untrained cohorts it seems reasonable to assume that their higher mobility is partly explained by job changes in the process of ascending the income ladder. Another possible explanation is the fact that the trained workers possess a better knowledge of the labor market and a higher aspiration level, both arising from vocational counseling received at school as well as the occupational training per se.

Further although indirect substantiation of the premise that the increased occupational mobility among the trained workers was a positive benefit of vocational training is given when both mobility and employability are considered together. The trained workers, although higher in mobility rate, were higher in participation and lower in unemployment rates. Coupled with the income data commented upon earlier, a fairly solid case is built for a higher incidence of rational, premeditated job changes among the trained that minimized non-participation and unemployment.

In the case of married females where no distinction in mobility rate was found between the trained and untrained, relatively frequent entries and exits to and from the labor force could have distorted their occupational mobility rates, since changing employers is frequently associated with changing occupations. Indeed Table 3 shows that married females of both categories had the greatest number of weeks out of the labor force.

SUMMARY AND IMPLICATIONS

We have shown that the vocationally trained workers in our study population had higher mean labor force participation rates, lower mean unemployment rates and higher mean occupational mobility rates. These differences reflect positive benefits for the trained workers. However, it is theoretically

tenuous to attribute 100 percent of the differences to vocational training, i.e., skill formation, alone. Two sets of factors may serve to invalidate a monolithic vocational training theory: antecedent variables and intervening variables.

Although we attempted to control as many variables antecedent to vocational training as we could identify and measure (such as high school rank in class, IQ, sex, race, father's occupation) there may have existed predisposing motivational or achievement factors that we could not measure that tended to separate the AVTS attenders from the non-attenders. Thus we could be capitalizing some motivation by calling it skill formation.

Under intervening variables consideration must be given to job counseling and guidance as a consequence of AVTS training. This aspect of AVTS attendance was in addition to skill formation but probably, in combination with it, caused the experimental subjects to be more rational actors in the labor market, thus increasing income, participation and occupational mobility, and reducing unemployment. This is a part of vocational training that is not well understood and needs further research.

Although our study population was small, it was rigorously controlled. Our findings are consistent with theory and other empirical studies. We have no reason to believe that our study population's experiences were atypical from that segment of the total labor force they were meant to represent with respect to the relationships among the variables under study.

The evidence presented in this paper lends strong support to the thesis that vocational training (in addition to increasing earning rates as reported in other studies) is an effective instrument through which the commitment to work may be amplified and the rational selection process in the job market may be enhanced. Although the study population reported upon here consisted

entirely of high school graduates, there is indirect documentation that vocational education would affect the employment experience of non-high school graduates even more dramatically.

Table 1
 A Comparison of Characteristics of
 the Net Sample with the Original Sample

Characteristics	Original Sample of 334	Net Sample of 58
Mean Age at Time of AVTS Enrollment	18.5	18.3
Mean Hours of AVTS Instruction	1222	1287
Mean IQ	100.7	101.5
Mean Rank in High School Graduation Class	43.5*	51.9
Sex		
Percent Male	65.0*	51.7
Percent Female	35.0*	48.3
Urban-Rural		
Percent Urban	28.9*	19.0
Percent Rural	71.7*	81.0
Type of AVTS Program		
Percent Drafting	15.5	10.3
Percent Health Occupations	11.2	10.3
Percent Machine Shop	9.4	12.1
Percent Mechanics and Repairmen	30.0*	17.2
Percent Office Occupations	24.9*	37.9
Percent Welding	7.9	10.3

Person 1007

*Difference significant at the .05 level.

Table 2
Weeks of Non-Work, Non-Participation
and Unemployment Among Trained and Untrained Workers

	Number of Pairs	Total Non-Work Weeks		Non-Participation Weeks		Unemployment Weeks	
		Trained	Untrained	Trained	Untrained	Trained	Untrained
Total	58	309(29) ^a	494(26)	193(16)	344(13)	116(13)	150(14)
Male	30	94(13)	61(7)	23(4)	14(1)	71(9)	47(6)
Female	28	215(16)	433(19)	170(12)	330(12)	45(4)	103(8)
Urban	10	34(3)	39(1)	10(2)	39(1)	24(1)	-0-
Rural	48	275(26)	455(25)	183(14)	305(12)	92(12)	150(14)
Married Female	19	207(14)	385(15)	165(11)	330(12)	42(3)	55(4)
Single Female	9	8(2)	48(4)	5(1)	-0-	3(1)	48(4)

^aNumber of workers in parentheses.

Table 3
Non-Work, Participation and
Unemployment Among Trained and Untrained Workers

	Number of Pairs	Non-Work Rate ^a		Participation Rate ^b		Unemployment Rate ^c	
		Trained	Untrained	Trained	Untrained	Trained	Untrained
Total	58	10.2*	16.4	93.6	88.6	4.1*	5.6
Male	30	6.0*	3.9	98.5	95.1	4.6*	3.0
Female	28	14.8*	29.7	88.3*	77.3	3.5*	9.2
Urban	10	6.5	7.5	98.1*	92.5	4.7*	-0-
Rural	48	11.0*	18.2	92.7*	87.7	4.0*	6.8
Married Female	19	21.0*	39.0	83.3*	66.6	5.1*	8.4
Single Female	9	1.7*	10.3	98.9*	100.0	0.6*	10.3

^aNon-Work Rate is defined as total weeks not worked for any reason divided by 52 times the number in the group.

^bParticipation Rate is defined as total weeks of participation divided by 52 weeks times the number in the group.

^cUnemployment Rate is defined as total weeks of unemployment divided by total weeks of participation by the group.

*Significant at the .05 level, with N = number of pairs x 52 weeks.

Table 4
Occupational Mobility Rates Among
Trained and Untrained Workers^a

	Number of Pairs	Trained Workers Rate ^b	Untrained Workers Rate
Total	58	41.4*	20.7
Male	30	50.0*	16.7
Female	28	32.1	25.0
Urban	10	80.0*	10.0
Rural	48	33.3	22.9
Married Female	19	36.8	36.8
Single Female	9	22.2	-0-

^aOnly three subjects had two occupational changes each, the rest had one or zero.

^bOccupational Mobility Rate is defined as the number of occupational changes occurring in a group divided by the number of workers in that group.

*Significant at the .05 level, with N = number of pairs.

Footnotes

¹See, for example, Elizabeth Waldman, Educational Attainment of Workers, March 1968, Special Labor Force Report No. 103, a Monthly Labor Review Reprint, from the February, 1969 issue.

²Waldman, table K, p. A-15.

³Waldman, table E, p. A-9. The relationship is explored more exhaustively by W. G. Bowen & T. A. Finegan in "Educational Attainment and Labor Force Participation," American Economic Review, May, 1966, pp. 567-582.

⁴Mary Bedell and Roger L. Bowlby, Formal Occupational Training of Adult Workers, Manpower/Automation Research Monograph No. 2, United States Department of Labor, December, 1964.

⁵Samuel Saben, Occupational Mobility of Employed Workers, Special Labor Force Report No. 84, a Monthly Labor Review Reprint, from the June, 1967 issue.

⁶Saben, table G, p. A-10.

⁷IQ scores or general achievement test scores were available for 91 percent of the subjects from school records. In the other cases we substituted grades in senior English as a proxy for IQ.

⁸School records for father's occupation were often missing, and commonly gave employers rather than occupation.

⁹We defined academic programs as including a laboratory science, higher mathematics, and a foreign language.

¹⁰Additional information will be used in our further research. It includes earnings for each subject obtained from the Social Security Administration on the basis of an individually signed authorization.

¹¹Where more than one reply from a "pure" match was available, we selected the match by a random process.

¹²The 58 pairs included 53 whites and 5 blacks; data were tabulated separately for whites and blacks, but the number of blacks seemed too small for meaningful analysis and the data for whites did not differ from the total in any significant respect.

¹³Bedell and Bowlby, op. cit.

¹⁴Saben, op. cit.

Footnotes (continued)

¹⁵See, for example, Adger B. Carroll and Loren A. Ihnen, "Costs and Returns for Investments in Technical Schooling By a Group of North Carolina High School Graduates," Economics Research Report No. 5, Department of "Vocational Education, A Study of Benefits and Costs," submitted to the United States office of Education, HEW, August, 1966 and Michael Taussig, "An Economic Analysis of Vocational Education in the New York City High School," A Paper Prepared for the Conference on Vocational Education, The Brookings Institution, Washington, D. C., April 17-18, 1967.

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