DOCUMENT RESUME

ED 065 714 VT 016 191

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TITLE	Economic, Demographic, and Sociological Factors Influencing the Geographic Mobility of Young Workers.
INSTITUTION	Mississippi Univ., University. Center for Manpower Studies.
SPONS AGENCY	Manpower Administration (DOL), Washington, D.C.
REPORT NO	UMISS-MPR-72-01
PUB DATE	Apr 72
NOTE	40p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Demography; Geographic Distribution; *Labor Force; *Migration Patterns; Mobility; Relocation; *Socioeconomic Influences; Technological Advancement; *Young Adults

ABSTRACT

Geographic mobility of the labor force is an adjustment mechanism essential to the maintenance of a growing economy which is undergoing technological change and a rising educational level. This study analyzes the factors which influence mobility decisions to determine whether these choices are made on the basis of rational economic motives. To hold constant the effects of age and education in mobility, both of which are already known, the study uses a sample of noncollegiate Tennessee high school graduates between the ages of 18 and 26. The data indicate that noneconomic variables such as family ties act to reduce mobility, but once the economic variables become strong enough to overcome sociological influences, mobility results. This supports the hypothesis that a large degree of economic rationality underlies individual mobility decisions. (BH)

ECONOMIC, DEMOGRAPHIC, AND SOCIOLOGICAL FACTORS INFLUENCING THE GEOGRAPHIC MOBILITY OF YOUNG WORKERS

Center for Manpower Studies

Memphis State University & University of Mississippi

U.S. Department of Labor Grant 31-45-70-03

The material in this report was prepared under Institutional Grant No. 31–45–70–03 from the Manpower Administration, U.S. Department of Labor, under the authority of title I of the Manpower Development and Training Act of 1962, as amended. Researchers undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment. Therefore, points of view or opinions stated in this document do not necessarily represent the official position or policy of the Department of Labor. Moreover, the researcher is solely responsible for the factual accuracy of all material developed in the report.

UMISS-MPR-72-01

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April, 1972

INTRODUCTION*

Geographic movement of the United States population is well documented and has long been the subject of study by social scientists. Although the importance of some types of labor mobility has been recognized by economists for sometime, the study of geographic labor mobility as an area which is significant in itself is of relatively recent origin. Economists are not primarily interested in the migration of the entire population, although this is important for some purposes, but in the geographic movement of the labor force.[1] Such movement is viewed as a part of the general movement of productive factors which, theoretically, functions to adjust temporary imbalances within the economic structure. The rapid nature of technological change, which has continually brought about economic development of different geographic areas of the United States, together with the increasing level of education and skills of labor force members could make geographic labor mobility essential in maintaining a growing, vigorous, and healthy economy.

When geographic movement is viewed as an adjustment mechanism, important questions arise pertaining to the speed of adjustment, the volume of labor movement, and the direction of such movement. Perhaps even more basic is the question of the desirability of labor movement as the adjusting mechanism. Analysis of labor mobility as an adjusting mechanism assumes that mobility decisions are made by individuals on the basis of rational economic motives. It is, therefore, important to discover the

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The author wishes to thank the Bureau of Business and Economic Research and The Center for Manpower Studies (U.S. Department of Labor Grant 31-45-70-03) for their support in the preparation of this monograph. Data for the study was obtained with financial assistance from the U.S. Department of Labor, Manpower Administration (Grant 91-47-71-100) and the University of Tennessee. This monograph has benefited from the comments of Brian S. Rungeling and William R. Schriver who read the entire manuscript and from the editorial assistance of Ernest N. Waller. The author assumes responsibility for the views expressed in the study and for any errors.

[1] The definition of Labor Force used here as well as the definition of employed and unemployed used throughout this study are those which are defined in U.S. Department of Labor, Handbook of Labor Statistics, 1969 (Washington: U.S. Government Printing Office, 1969), pp. 1-3.

factors which lead to geographic mobility, the extent to which these factors are economic in nature, and the extent to which noneconomic factors may impede the economically "correct" adjustment, that is, the ability of geographic labor movement to push different geographic labor markets toward equilibrium.

Age and education, of the factors which can and do influence mobility decisions, are the most generally recognized as being important determinants of geographic mobility. In a 1954 survey of labor mobility research, Parnes stated, "So universally has mobility been found to decline with advancing age that this relationship may be regarded as conclusively established."[2] Almost twenty years later in a survey of additional research Parnes said, "Recent research has produced no surprises with respect to the relationship between age and mobility."[3]

Education, like age, has been found in most investigations to have an important bearing on geographic mobility. Studies such as those of Lansing and Mueller, Fein, and Bogue all confirm the relationship between the level of education and geographic mobility, that is, that high levels of education are associated with higher rates of geographic mobility.[4]

Age and education are so widely recognized as being important in determining geographic mobility that there seems little value in further investigation of these variables relative to what is still to be learned regarding the influence of other factors on geographic mobility.[5] This study is therefore designed to hold the above

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[2]Herbert S. Parnes, Research on Labor Mobility (New York: Social Science Research Council, 1954), p. 102.

[3]Herbert S. Parnes, "Labor Force Participation and Labor Mobility," A Review of Industrial Relations Research Volume I (Madison, Wisconsin: Industrial Relations Research Association, 1970), p. 56.

[4]John B. Lansing and Eva Mueller, The Geographic Mobility of Labor (Ann Arbor, Michigan: Institute for Social Research, University of Michigan, 1967); Rashi Fein, "Educational Patterns of Southern Migration," Southern Economic Journal, XXXII, No. 1, Part 2 (July, 1965), pp. 106-124; Donald J. Bogue, "Internal Migration," The Study of Population, P. M. Hauser & O. D. Duncan, Eds., (Chicago: University of Chicago Press, 1959).

[5]Years of formal education are held constant but unfortunately the quality of education, which could be important in influencing geographic mobility, cannot be controlled.

mentioned variables constant by investigating a sample of noncollegiate Tennessee high school graduates between the ages of 18 and 26.

This particular segment of the labor force was chosen for the following reasons:

(1) Younger workers are, in general, the most mobile of all age categories.

(2) Like the rest of the South, Tennessee has long been losing population, with a high proportion of the net outmigration being concentrated in the younger and better educated.[6]

(3) Recent research has concluded that the age-sex compositional change in Tennessee's labor force since 1950 has resulted in deterioration in the quality of that labor force, due in part to the net outmigration of younger workers with higher than average education.[7]

(4) Institutional and sociological barriers to geographic mobility should have less influence on young workers than on any other age group. If any group of workers can be expected to behave in an economically rational manner with respect to mobility decisions, the group chosen for this study should be expected to do so.

As indicated by the reasons stated above a study of this particular population will not only contribute to the knowledge of the causes of geographic mobility, particularly of young workers, but the findings should be of interest to those who are concerned with the future quality of the labor force in Tennessee.

METHODOLOGY

Geographic labor mobility, although simple in concept, presents a definitional problem in that geographic movement may be defined in many ways, any of which will, in some sense, be arbitrary. Ideally, geographic mobility should be defined in a manner such that an individual is located in a different geographic labor market after he has moved. The fact that labor markets are often difficult to distinguish and also vary in breadth from occupation to occupation makes a single definition difficult. Rather than attempting to identify specific labor market areas

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[6] Mary G. Currence, ed., Tennessee Statistical Abstract (Knoxville, Tennessee, Center for Business and Economic Research, University of Tennessee, 1969).

[7] Thomas A. Bieler, The Contributions of the Primary Inputs to the Growth of the Tennessee Economy with a Partial Analysis of the Residual, 1950-1967. unpublished Ph.D. dissertation (Knoxville, Tennessee University of Tennessee, 1971).

this study defines a move as a change of residence of at least fifty miles. It is highly improbable, although still possible, that an individual could move fifty miles and still offer his services to the same employer or group of employers as he did prior to moving. In the sample drawn this did not occur and it is therefore assumed that an individual who moved fifty miles or more has entered a different labor market than the one in which he previously sought employment.

Sampling Procedures

Analysis was conducted on a random sample drawn from the target population containing all noncollegiate Tennessee High School graduates who were born after January 1, 1943, and who graduated prior to July, 1967.[8] Data were obtained primarily by means of a questionnaire mailed to the 680 subjects selected. The response rate was 86.9 percent of the net sample. The availability of secondary data on all sample members, for example, sex, race and age, allowed testing for bias due to nonresponse. The results of this testing led to the conclusion that no significant differences existed between the respondents and the nonrespondents and that the respondents were representative of the population. It is reasonable to assume that wives move with their husbands and that children living with their parents move with their parents; therefore, most analysis in this study was conducted on heads of households only. There were 378 independent household heads in the sample drawn.

Statistical Methodology

Previous research on geographic mobility has clearly shown that there are significant intercorrelations among the variables which are generally believed to influence geographic movement. These intercorrelations require that any research which attempts to identify relationships between geographic mobility and a particular factor or set of factors must resort to multivariate statistical techniques. The multivariate technique employed in this study is ordinary least squares multiple

[8] For a detailed discussion of the sampling procedure see Appendix B.

regression.

The qualitative nature of most of the variables which are to be investigated leads to extensive use of dummy variables in the regression equations.[9] Using dummy variables allows such factors as education, occupation, marital status, and family ties to be investigated without forcing them into a linear form, since the use of dummy variables requires no specification of the functional relationship between the independent variable and the dependent variable. It does, however, assume that the effects of different independent variables on the dependent variable are additive, an assumption which at times may not be totally accurate.

The nature of dummy variables is such that for any set of n categories within a dummy variable identification of n-1 categories, by definition, identifies all n categories since each observation must fall into one and only one category, all other categories being zero for that observation. This makes it impossible to estimate the regression equation directly because there are more coefficients to be estimated than there are independent normal equations based on ordinary least squares criteria. More than one method exists to handle this problem, but the most widely used method and the one adopted here is to constrain one category of each dummy variable to zero. The coefficient estimates will then measure the net effect of membership in one category of a dummy variable relative to membership in the omitted category.

Using ordinary least squares regression analysis to examine differential mobility rates in this study presents a unique statistical problem, due to the use of

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[9] A brief discussion of the use of dummy variables in regression analysis can be found in Daniel B. Suits, "Use of Dummy Variables in Regression Equations," American Statistical Association Journal, (December, 1957), pp. 548-551; good non-technical discussion of the use of dummy variables is in Emanuel Melichar, "Least Squares Analysis of Economic Survey Data," Proceedings of the Business and Economics Section of the American Statistical Association, (September, 1965), pp. 373-385; for a technical discussion of dummy variables and their uses see Arthur S. Goldberger, Econometric Theory (New York: John Wiley and Sons, 1964) pp. 173-177, 218-231, 248-255; J. Johnston, Econometric Methods (New York: McGraw-Hill Book Company, Inc., 1963), pp. 221-228.

a dichotomous dependent variable, "1" if a move occurred and "0" if no move occurred. This type of dependent variable has been used for sometime in the analysis of problems similar to the one investigated here, and the method employed here benefits from the efforts of previous studies.[10]

The problem which emerges when using a dichotomous dependent variable is that the assumption of homoskedasticity, which is part of ordinary least squares analysis, is not met. It has been demonstrated elsewhere that although the coefficient estimates are statistically unbiased the variance of the disturbance term depends on the values of the explanatory variables.[11] A method has been suggested to handle this problem which requires the calculation of estimated values of the independent variables by ordinary least squares and using the obtained weights to calculate corrected regression equations. This procedure is in general not workable because of the possibility that estimated values may in actuality be less than zero or greater than one. In general, therefore, the estimates of the standard errors of the regression coefficients are biased and inconsistent. An indication of the bias present in the standard error can be found by estimating the variances of the regression coefficients directly by generalized least squares methods using y_t $(1-y_t)$ as weights.[12] Following the procedure described in Bowen

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[10] John B. Lansing and Eva Mueller, The Geographic Mobility of Labor, Yochanan Comay, "Determinants of Return Migration: Canadian Professionals in the U.S.," Southern Economic Journal, XXXVII, No. 3 (January, 1971) pp. 318-322; William G. Bowen and T. Aldrich Finegan, The Economics of Labor Force Participation (Princeton, New Jersey: Princeton University Press, 1969).

[11] Arthur S. Goldberger, Econometric Theory, pp. 248-250. Goldberger has shown that $Ee_t = (X_t'B)\ (1-X_t'B) = Ey_t\ (1-Ey_t)$; therefore the disturbance is heteroskedastic and varies systematically with X_t.

[12] This weight has been suggested by Arthur S. Goldberger, Econometric Theory, p. 250; a more detailed discussion of the problem and the use of the weighting procedure can be found in William G. Bowen and T. Aldrich Finegan, The Economics of Labor Force Participation, pp. 642-648.

and Finnegan an estimate of standard errors by both methods was carried out on a subsample. The results show that the revised standard errors deviated from the standard errors derived by ordinary least squares and were generally smaller, indicating that although the test statistics used in this study are somewhat biased they are in general conservative.[13] Even though some of the differences are relatively large, it was decided to use ordinary least squares regression procedures in spite of the fact that some variables may not be found to be significant when in fact they are; this should be kept in mind when reading the results presented in the following pages.

Format for Reporting Results

Because of the use of dummy variables the standard formats for reporting regression results are less than ideal. When one of the categories of each dummy variable is set equal to zero, the coefficients that are found by the regression analysis are deviations from that category. What is desired for analytical purposes is the deviations of each category from the general sample mean, in this case, the percentage of the sample that moved. An additional problem arises because there is no coefficient for one category of each dummy variable.

Two properties or constraints have been used to transform the regression results. They are: (1) the sum of deviations for a variable about the grand mean, weighted by the number of observations in each category, must equal zero and (2) transformation of variables must not alter the differences which exist between the

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COMPARISON OF STANDARD ERRORS

Variable	Least Squares Errors	Revised Errors
Sex	.0602	.0601
Race	.055	.040
Employment Status	.073	.068
Employment Experience	.052	.049
Unemployment Benefits	.078	.077
Lower Wage	.045	.046
Same Wage	.045	.044
Relatives	.047	.039

predicted values for different categories of each factor.[14] The new reporting format is one in which the constant term represents the percent of moves for the entire sample. The difference between an individual coefficient and the sample mean, called adjusted deviations in this study, represents the deviation of that category from the sample mean while holding constant the effect of all other factors. Additionally, there is now a coefficient for each category of every variable tested. The adjusted deviations are therefore category deviations from the sample mean with the influence of other variables removed.[15]

Analysis of the results was based on the above described procedures as applied to the sample being studied. Although the definitional and statistical problems previously discussed should not be overlooked, it is believed that the analysis which follows gives: (1) a relatively accurate picture of the effects of the variables investigated on the mobility of the sample members and (2) a reasonably accurate indication of the behavior of the population from which the sample was drawn.

FACTORS AFFECTING GEOGRAPHIC LABOR MOBILITY

Geographic labor mobility can be viewed within the confines of the theory of human capital.[16] Such analysis explains the decision concerning mobility as the result of a comparison between expected future earnings resulting from moving

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[14]The general procedure which has been followed here is found in J. Lansing and W. Ladd, "An Example of the Conversion of Regression Coefficients into Deviations about the Grand Mean," unpublished note, Survey Research Center, University of Michigan (October, 1962).

[15]A discussion of testing procedures as well as the results of the regression equations are in Appendix A.

[16]For a discussion of labor mobility in the context of human capital theory see Larry A. Sjaastad, "Costs and Returns of Human Migration," The Journal of Political Economic Supplement LXX, No. 5 Part 2 (October 1962), pp. 80-93; Hans-Joachin Bodenhofer, "The Mobility of Labor and The Theory of Human Capital," The Journal of Human Resources, II, No. 4 (Fall, 1967), pp. 431-448.

and the costs associated with the move. Returns to mobility are derived primarily from increased earnings, although changes in costs of living and costs associated with employment may, in some cases, yield significant returns. Total costs of mobility include a monetary component and a nonmonetary or psychic component. Monetary costs consist of earnings forgone while moving, normally the largest portion of monetary costs, and out-of-pocket expenditures for transportation and related expenses. Although psychic costs cannot be considered a real cost in the economic sense for purposes of calculating the returns to geographic mobility, such costs are one of the most important impediments to geographic movement. Identification of the components of psychic costs is important because their existence may cause an individual to require a different rate of return to geographic mobility than would otherwise be necessary. Viewing the mobility decision within the framework of capital theory requires the assumption that mobility decisions are made in an economically rational manner. It is therefore important to determine the extent to which decisions are actually based on economic criteria and the extent to which noneconomic factors are influential. To investigate this, the factors discussed in this research have been divided into three categories: economic, demographic, and sociological.

Economic Factors in Geographic Labor Mobility

One of the most straightforward, although not necessarily the most accurate, ways to investigate motivations for geographic mobility is to ask individuals why they they moved. Detailed classification of answers would be difficult at best but some interesting and significant information can be found by placing answers in a few broad classifications. In this study, for purposes of analysis, stated reasons for mobility were divided into three broad categories:

Voluntary economic--all moves undertaken to find a more desirable work situation or higher compensation;

Involuntary economic--all moves resulting from lack of employment opportunities;

Noneconomic--all moves not in one of the other categories.

Table I shows the percentage distribution of the reasons given for moving in two time periods. The 12 month period started in September, 1969 and ended in September, 1970. Analysis was also done on a three year period beginning in September, 1967 and ending in September, 1970. In both time periods over 70 percent of the reasons given for moving were economic in nature. This finding is consistent with those of other studies, for example Lansing and Mueller, that the young are most likely to move for economic reasons.[17] Repetitive movement also took place primarily for economic reasons, indicating that those who move most frequently are likely to be highly economically motivated.

TABLE I

ANALYSIS OF REASON FOR MOVING DISTRIBUTION
BY PERCENTAGE

Move	Reason for Move	Moved 12 months (percentage)	Moved 3 years (percentage)
First move			
	Voluntary Economic	58	60
	Involuntary Economic	15	19
	Non-Economic	27	21
Second move			
	Voluntary Economic	26	31
	Involuntary Economic	21	22
	Non-Economic	53	47

There is a general belief, resulting from previous research of others, that white-collar workers and professional workers are more likely to move for economic reasons than are other occupational groups. This study found additional evidence in support of such a conclusion, with 65 percent of the white-collar workers

[17] John B. Lansing and Eva Mueller, The Geographic Mobility of Labor, p. 62.

in the sample stating that they moved for economic reasons compared to 39 percent of the blue-collar workers and 50 percent of the service workers. Generally, white-collar workers were most likely to give income related reasons for moving, while blue-collar workers were more likely to have been stimulated by unemployment.

Economic factors in geographic mobility can also be investigated by examining variations in the rate of geographic mobility among groups with differing economic characteristics. One characteristic which should be expected to have a significant influence on the rate of geographic mobility is employment status. To ascertain the effects of employment and unemployment on mobility, sample members were classified as follows:

> Currently employed--employed as of September 1, 1970 and the entire previous twelve month period;
>
> Currently unemployed--unemployed as of September 1, 1970 or had been at the time of their move during 1970.

Classification of past unemployment experience was also used to ascertain if this had any effect on mobility, that is, if there had been significant unemployment during 1968 or 1969. The unemployed portion of the sample was further classified according to whether or not they drew unemployment benefits. The means and deviations, adjusted and unadjusted, for each category are given in Table II. Both those classified as currently unemployed and those with past unemployment experience exhibited higher rates of geographic mobility than their counterparts. The effect of unemployment payments as an influence on geographic movement is less obvious.

When unemployment and mobility are examined in multivariate analysis the difference in mobility rates between unemployed and employed is substantially reduced, indicating that the unemployed in the sample possess other characteristics which are associated with geographic mobility.[18] However, unemployment is still significant in explaining geographic mobility within the sample.

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[18]The most important characteristics which are held constant in the multivariate analysis are sex, race, occupation, marital status, and proximity of relatives.

TABLE II

ANALYSIS OF THE EFFECT OF UNEMPLOYMENT
ON GEOGRAPHIC MOBILITY

Characteristic	Per cent who moved during 12 month period: Mean	Unadjusted Deviation	Adjusted Deviation
Total Sample	14		
Employment Status*			
Employed	12	- 2.0	- 0.1
Unemployed	34	+20.0	+ 1.5
Unemployment*			
Unemployed 1968 Or 1969	21	+ 7.0	+11.2
No Unemployment	12	- 2.0	- 2.6
Benefits*			
Drew Benefits	11	- 3.0	-11.9
No Benefits	15	+ 1.0	+ 0.9

*Category is significant at the .05 level.

Past unemployment experience had a pronounced effect on geographic mobility in the sample as the figures in Table II indicate. In fact, other things equal, past unemployment experience contributes more to the explanation of current geographic mobility than does current unemployment. Apparently many of those who are currently unemployed, particularly if it is an unusual occurrence for them, view their situation as temporary and are not stimulated to move. Those who have continuing unemployment experience probably develop misgivings about future job security in their present location and are induced to seek employment opportunities elsewhere.

Results from the twelve-month period were reinforced by examination of the behavior of sample members over the three-year period. Thirty-seven percent of those who moved during the three-year period under study were unemployed at the time of

their move or had experienced some unemployment during the period prior to moving.

The above results are generally consistent with the conclusions of other research regarding the effects of unemployment on geographic mobility. Even though the unemployed sample members exhibited higher mobility rates than the employed in the sample, both movers and nonmovers had unemployment rates which were above the state and national rates for the same time period. From the standpoint of economically optimal resource allocation it is probable that an even higher rate of geographic mobility than that found for the unemployed in the sample would have been desirable.

Occupation is another economic variable which has been found in previous research to exert influence on geographic mobility, with the rate of geographic movement being highest among the more skilled and specialized occupations and lowest among laborers and operatives, i.e., those usually classified as blue-collar workers. Table III shows the sample mobility rates for occupational categories and the adjusted and unadjusted deviations from the sample mean.

The most significant fact shown in Table III is that results of multivariate analysis indicate that occupational classification is only significant as a variable in explaining variations in the rate of geographic mobility at the ten percent level. Results found in this study with respect to the effect of occupational differences on geographic mobility are generally consistent with those found by previous research by others in that white-collar workers were more mobile than blue-collar workers. However, in a more specific occupational breakdown, professional-technical workers were found to be one of the least mobile classifications--the opposite of what should be expected. A possible explanation of this comes from the educational characteristics of the sample. Ladinsky found that, for a sample of professional workers only, education was an extremely important variable in explaining geographic mo-

TABLE III

ANALYSIS OF OCCUPATIONAL DIFFERENCES
IN RATE OF GEOGRAPHIC MOBILITY

Category	Mean	Unadjusted Deviations	Adjusted Deviations
	Per Cent who moved in last 12 months		
Total Sample	14.0		
Occupation*			
Professional	10.0	- 3.4	- 2.5
Clerical	24.2	+10.2	+ 7.8
Sales	5.2	- 8.7	+ 0.9
Manager-Proprietor	10.0	- 4.0	- 3.8
Service worker	20.0	+ 6.0	+ 0.6
Craftsman-Foreman	17.4	+ 3.4	+ 2.8
Operative	10.3	- 3.7	- 0.2
Laborer#	14.3	+ 0.3	- 6.4
	Per cent who moved in last three years		
Total Sample	21.9		
Occupation			
Professional	25.5	+ 3.6	- 0.9
Clerical	34.3	+12.4	+ 5.6
Sales	10.5	-11.5	- 7.3
Manager-Proprietor	25.0	+ 3.1	+ 6.7
Service worker	30.3	+ 8.4	+ 7.7
Craftsman-Foreman	26.0	+ 4.1	+ 2.2
Operative	13.9	- 8.1	- 2.9
Laborer#	17.9	- 4.1	-10.8

*Category significant at .10 level

#Includes nonfarm and farm labor.

bility rates.[19] Thus, the fact that professional workers in this sample were not more mobile than other occupational categories appears to indicate that it is the higher levels of education associated with professional workers generally which is largely responsible for their mobility rates as found in many studies and not the occupational category itself. Additionally, it has been suggested that professional workers are likely to have greater financial reserves than most other workers, thus aiding mobility. The nature of the population being studied here is such that it is unlikely that any member of the sample will have substantial financial reserves available. Based on the results of this sample it is believed that for younger workers with a high school education, other factors being equal, occupational differences are relatively unimportant in explaining geographic mobility.

Average weekly earnings for those members of the sample who moved during the twelve month period were lower prior to their move than were the average weekly earnings of nonmovers at the start of the study period. Thus it appears that lower average weekly earnings stimulate geographic mobility. Unfortunately data on the average weekly earnings of nonmovers at the time individual sample members' moves actually took place are not available, so no direct and accurate comparison can be made between earnings of nonmovers and movers prior to the move.

Results of the above analysis support the conclusion that economic factors are significant in explaining geographic mobility, thus lending support to previous research which has reached similar conclusions.

Demographic Correlates of Geographic Mobility

Geographic mobility rates have been found to vary with demographic characteristics as well as with economic characteristics. In this study four such characteristics were investigated: sex, race, age, and family status. The dif-

[19]Jack Ladinsky, "Sources of Geographic Mobility Among Professional Workers: A Multivariate Analysis," Demography, IV, No. 1 (1967), pp. 298-300.

ferences in geographic mobility rates for each category of the four variables and the adjusted and unadjusted deviations from the sample mean are shown in Table IV.

Surprisingly, females in the sample were more mobile than males, both for the twelve month period and for the three year period. When the sample was subjected to multivariate analysis, however, females were less mobile, other things being equal, over the three year period. No immediate explanation for these results has been found. It is possible that all females in the sample were heads of households and many of them moved as a result of a recent change in marital status. The findings may in part reflect the increasing independence of the female population in general. Regardless of the reason, sex is not statistically significant in explaining variations in mobility rates. In fact, for the three year regression, the sex variable made zero contribution to the portion of variance explained.

Although the pattern of migration has changed in the past twenty years from one of higher rates of geographic mobility for Negroes relative to whites to one of lower rates for Negroes, most research on geographic movement continues to find race a significant variable. In the South, including Tennessee, the outmigration of Negroes, while generally less than those of whites, contains a disproportionate number of individuals in the higher education levels.[20] This is reflected in the results of this study by the higher mobility rates for Negroes, although historically such has not been the case for the population of Tennessee as a whole.[21]

When race was considered as a variable in multivariate analysis, other factors constant, the higher mobility rates for Negroes disappeared. This result

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[20]Rashi Fein, "Educational Patterns in Southern Migration," The Southern Economic Journal, XXXII, No. 1, Part 2 (July, 1965), pp. 106-124.

[21]Henry S. Shryock, Jr., Population Mobility Within the United States (Chicago: University of Chicago Press, 1964), p. 109.

TABLE IV

DEMOGRAPHIC FACTORS AFFECTING GEOGRAPHIC MOBILITY

Category	Mean	Unadjusted Deviations	Adjusted Deviations
	Per cent who moved in 12 months		
Sample Mean	14.0		
Sex			
Male	11.2	- 2.8	- 2.1
Female	21.0	+ 7.0	+ 6.0
Race			
Negro	18.4	+ 4.4	- 1.4
Non-Negro	13.1	- 0.9	+ 0.2
Age*			
18-23	13.1	- 0.9	- 2.7
24-26	14.7	+ 0.7	+ 3.8
Family Status**			
Married, no dependents	28.8	+14.8	+ 7.6
Married, dependents	10.3	- 3.7	+ 1.2
Single, dependents	20.0	+ 6.0	+ 1.6
Single, no dependents	7.6	- 6.4	- 8.8
	Per cent who moved in three years		
Sample Mean	21.9		
Sex			
Male	19.2	- 2.7	+ 0.3
Female	30.4	+ 8.5	- 0.6
Race			
Negro	26.5	+ 4.6	+ 4.7
Non-Negro	21.3	- 0.7	- 0.7
Age			
18-23	23.1	+ 1.2	- 9.5
24-26	20.4	- 1.6	+ 0.7
Family Status**			
Married, No dependents	41.1	+19.2	+17.8
Married, dependents	15.2	- 6.7	+ 0.4
Single, dependents	48.0	+26.1	+ 4.0
Single, no dependents	8.7	-13.3	-14.2

*Significant at .05 level
**Significant at .01 level

was not unexpected as previous researchers have indicated that many of the factors which affect geographic mobility occur with greater frequency among Negroes than whites. The results found here do not suggest that these variables are peculiar to Negroes but merely that factors which affect mobility of the population in general are highly concentrated in this segment of the population.

Despite the fact that the sample is relatively homogeneous with respect to age, an attempt was made to ascertain if age differences were important, even within a narrow grouping. The sample was divided into those whose age ranged from 18 to 23 and those from 24 to 26. Table IV shows there is little difference in the average mobility rate between the two groups. However, multivariate analysis yields considerable difference. These results may in part reflect that at the time of sampling, young workers were reluctant to move while they faced military obligations. Also, it should be expected that high school graduates would have an easier time locating employment locally than nongraduates in the same age category and might be relatively unlikely to move in search of initial job opportunities. With higher levels of education, however, better opportunities are likely to become available at a later date. It is not unreasonable that in a group of 18 to 26 year old high school graduates the rate of geographic mobility will be higher at the upper age levels of the group.

Two demographic characteristics, marital status and number of dependents other than wife or husband, have been combined to give the four category variable family status shown in Table IV. This was prompted by the high correlation found between the two variables when each was introduced separately into regression analysis. Mobility rates for these sample subgroups are quite different from those found by most previous studies.

By far the most mobile grouping in the family status variable is the married without dependents category. This is not true for the United States population as a whole. Figures for 1967-68 and 1968-69 show that single household heads were

substantially more mobile than married heads for ages 14 to 24 and to a lesser extent for the 25 to 34 age group.[22] While the reasons for the results found here are not readily apparent, they are not unique.[23] If it is true as discussed earlier that high school graduates are able to find local employment and are therefore less likely to have moved for their initial employment, it may be that marriage stimulates the desire or necessity to find better employment opportunities and thus stimulates geographic mobility. Additionally, marriage is likely to create personal situations which make geographic mobility desirable. On the other hand, the greater importance of economic security which develops with the presence of children should be expected to reduce geographic mobility and the uncertainties associated with it. Thus the lower rate of mobility of families with dependent children was expected.

The significantly lower rate of geographic mobility for single members of the sample is at odds with almost every other study and there is no obvious explanation for the results. Nothing in the available data adequately explains these results. This is particularly unfortunate since family status, of the four demographic characteristics discussed, is the only one which is statistically significant for the entire time period.

Sociological Factors

Several factors which could be classed as sociological in nature have been found to exert influence on geographic mobility. Unfortunately, data available did not allow extensive testing of a large number of sociological variables; however, two of the more important, family ties and home ownership, were investigated. Both factors were found to be significant in explaining variations in

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[22] U. S. Bureau of the Census, "Mobility of the Population of the United States March 1967 to March 1968," Current Population Reports, Series P-20, No. 188 (December, 1968); U. S. Bureau of the Census, "Mobility of the Population of the United States March 1968 to March 1969," Current Population Reports, Series P-20, No. 193 (December, 1969).

[23] See for example Jack Ladinsky, Sources of Geographic Mobility, pp. 299-300.

mobility rates as can be seen in Table V.

TABLE V

ANALYSIS OF THE EFFECT OF HOMEOWNERSHIP AND PROXIMITY OF RELATIVES: ON GEOGRAPHIC MOBILITY

Characteristic	Mean	Unadjusted Deviations	Adjusted Deviations
	Per cent who moved in 12 months		
Sample Mean Moved twelve months	14.0		
Proximity of Relatives*			
Relatives live within 25 miles	9.8	- 4.2	- 3.2
No relatives within 25 miles	35.0	+21.0	+17.0
Home ownership*			
Owns home	6.5	- 7.5	- 6.4
Renter	18.1	+ 4.1	+ 3.7

*Factor significant at the .01 level

The effect of family ties on geographic labor mobility was tested by dividing the sample into two groups: (1) those who lived within twenty-five miles of immediate relatives during the entire study period or at the time a move occurred and (2) those who did not live within twenty-five miles of immediate relatives prior to moving or, if they did not move, during the entire study period.[24] Relatives living within twenty-five miles is a highly significant factor in explaining variations in the rate of geographic mobility among sample members. Family ties acted as a strong holding force on individuals who might other-

[24]Immediate relatives are defined here as father, mother, sisters, brothers, aunts, uncles, first cousins, and grandparents.

wise be expected to be geographically mobile. The results, while not unexpected, were surprising with respect to the apparent strength of the effect of this variable considering that all sample members were twenty-six years old or younger.

Personal security is the most obvious of several possible explanations for these findings. The presence of relatives means security in terms of aid in securing employment and often directly in financial terms during difficult periods. For a young person entering the labor market for the first time, such security is hard to relinquish. Where no relatives lived within twenty-five miles it is highly probable that geographic mobility occurred prior to the study. Once a move has been made, a second move is more likely to occur than would be an initial move on the part of another person. Sixty-five percent of those who moved in the twelve month period prior to the study date had moved at least once previously. Thus, those not living close to relatives have in many cases already exhibited a higher than average propensity to move. Additionally, for those moves which were return moves, family ties were perhaps influential, not as an inhibiting factor but as an inducing factor. Whatever the nature of the effect, there is no question that the results of this study found family ties to be significant in retarding geographic mobility.

Home ownership also was found to be statistically significant in affecting geographic mobility rates and, like proximity of relatives, acted to restrict geographic movement. Classifying home ownership as a purely sociological variable is not strictly correct. Home ownership may restrict geographic mobility in two ways. One is through the attachment an individual or family may feel toward their home and the second, a more economic attitude, arises if there exists the possibility of financial loss resulting from the sale of the home. Such loss would reduce the potential economic gains which might result from geographic movement.

As should be expected in a population consisting of individuals under twenty-seven years of age, the portion of the sample owning their home was small

relative to national figures, with only 37 percent of the total sample falling in this category. Still, results of the analysis indicate that home ownership is a significant factor in explaining variations in mobility rates. However, the results must be interpreted with considerable caution. If a move was anticipated or even contemplated it would reduce the likelihood that a home would be purchased. In this case it is geographic mobility that acts to reduce home ownership, not the reverse.

Effects of Geographic Mobility on Employment and Earnings

The results presented above indicate that although several noneconomic factors are influential in determining the extent of geographic mobility, economic justification, real or imagined, was usually given for moving. Thus, individual sample members generally expected to receive economic benefits from their move. Were these expectations realized? If they were, it should be expected that those who moved would exhibit higher earnings, on average, and lower unemployment rates, at least in the short-run, than those who did not.

Sample members who moved during 1970 had an unemployment rate of 15 percent as of September, 1970, while only 5 percent of the nonmovers were unemployed as of the same date. Data do not allow a proper comparison of the unemployment rates after moving with those of unemployed sample members who did not move. Generally, however, the fact that many of those who were unemployed when they moved were employed as of September, 1970, makes it reasonable to assume that mobility did in fact reduce unemployment that would otherwise have existed and to that extent was an aid to the effective and efficient utilization of resources. Also, while theory leads to the belief that unemployment should be lower among those who are geographically mobile than those who are not, it must be remembered that workers forced to move because of lack of employment opportunities will, in all probability, be workers who might experience difficulty in finding employment no

matter where they locate.

The effect of geographic mobility on earnings is difficult to ascertain. A brief review of past investigations will quickly show there is no consensus on the subject. One major problem, as pointed out by Lansing and Morgan, is that appropriate comparisons should be between earnings of mobile workers and otherwise similar individuals who have not moved.[25] Holding age and education constant, as in this study, goes a long way toward meeting the above condition, although of course all individual differences which could affect earnings have not been eliminated.

As of September, 1970, the average weekly earnings of those who had moved in the last twelve months was $116.40, compared to an average weekly earnings of $105.60 for those who had not moved during the same period. This would indicate a substantial earnings advantage as a result of geographic mobility. However, when average weekly earnings were used as the dependent variable in regression analysis, neither mobility in the past twelve months nor over the three year period was significant in explaining average weekly earnings.

In an effort to eliminate the effect of lower earnings for individual sample members at the start of the period, which might account for the above results, differentials in weekly earnings from 1968 and 1970 were compared between mobile and nonmobile workers. Almost no difference existed between the increase in earnings over the time period for the two groups.

While this brief analysis does not prove that geographic mobility does not enhance earnings, it certainly indicates that any earnings advantage which can be attributed to geographic mobility alone is at best marginal for the sample studied here. On the other hand it can be argued that such factors as occupation would not make such a difference in earnings if it were not for the fact that

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[25]John B. Lansing and James H. Morgan, "The Effect of Geographic Mobility on Income," The Journal of Human Resources, II, No. 4 (Fall, 1967), pp. 449-460.

some occupations are by their nature likely to require more mobility. Obviously, it would be desirable to have greater control over other factors when investigating the effect of geographic mobility on income.

SUMMARY AND CONCLUSIONS

Results of the analysis of sample data indicate that many factors affected geographic mobility, some economic and some noneconomic. Noneconomic variables, particularly the sociological variables, exerted their influence primarily through reduction in the mobility rates, that is, these variables had a tendency to hold individuals to a given area. However, once the economic considerations became strong enough to overcome the retarding influence of noneconomic factors, mobility did occur. Thus, results found here lend credence to the assumption that a large degree of economic rationality underlies individual decisions concerning geographic mobility. People do move for economic reasons.

The majority of those who moved gave job-related economic reasons for doing so, with the greater percentage of the reasons being related to the desire for a higher level of income. As expected, those who were unemployed at the time of their move gave unemployment or job opportunities elsewhere as their motive for moving in the majority of situations. While unemployment was found to be a definite stimulus to geographic mobility, the majority of those who were unemployed did not move. Past unemployment, particularly if there was more than one instance, was found to be a greater factor in prompting geographic mobility than being presently unemployed. Those unemployed at the time of the sampling, in general, did not indicate plans to move in the next twelve months. Apparently those who were unemployed, particularly if it was the first time, believed it to be a temporary situation. Despite the greater tendency for the unemployed to move than employed, geographic mobility did not appear to function particularly well as an alleviator of unemployment.

Family ties were one of the most important factors in reducing geographic

mobility. Even among young workers there is a great reluctance to leave the psychological security of familiar surroundings and the presence of family members. This is of course not a totally noneconomic decision. To the extent that family members aid an individual financially or indirectly through employment contacts, the costs of moving will generally be increased.

The presence of relatives did not act as a force to reduce geographic mobility in all cases, however, almost 50 percent of the sample members who moved did so to areas in which relatives already lived. It was impossible to ascertain to what extent the presence of relatives in other areas promoted geographic mobility, but it is suspected that some moves occurred that would not have been made if there had not been relatives already in the area of destination.

Although home ownership appears to retard geographic mobility, a firm conclusion to this effect would be quite hazardous. Those who are likely to be geographically mobile are also quite likely to postpone home ownership to some future date. This makes the direction of causality between home ownership, or lack of it, and geographic mobility difficult to establish. Other studies have pointed out that those who own their homes are probably relatively immobile for other reasons, and home ownership only reinforces this tendency. Despite all these qualifications home ownership was found to be significant in retarding geographic mobility when the effect of the other factors examined was held constant.

Despite the fact that as had been anticipated, there was a tendency for white collar workers in the sample to be more mobile than blue collar workers, surprisingly, other things equal, occupation was not a significant factor in determining geographic mobility. The logical inference to be derived from this finding is that it is the level of education that is necessary for many occupations that accounts for the higher rates of geographic mobility associated with these occupations. In fact, the type of professional occupations normally open to high school graduates, such as drafting, made them less mobile than high school

graduates in other white collar occupations.

It should be kept in mind that although there was a relatively large percentage of the sample who moved in the short time period under consideration, the majority of the sample did not move. In the long run, although this study did not address itself directly to the question, the immobility of the majority may have more economic significance than the mobility of the minority. The problem both from the theoretical and the practical standpoint lies more with the lack of geographic mobility than with the movement itself. There is strong indication found in this study that lack of mobility, which is in fact a decision not to move, is influenced more by noneconomic factors than by rational economic considerations. Another way of viewing this is that the effect of noneconomic factors is in many cases so strong that what would normally be considered sufficient economic incentive to cause geographic mobility is in fact too weak to induce people to move. This creates serious doubts that geographic mobility can be depended upon to eliminate interarea economic differentials or to alleviate the problems of a single area.

Still, no matter how many factors influence the mobility decision, and there are many, the results of this study support the conclusion that in general geographic mobility will occur only if the individual or family considering moving can see an economic advantage in doing so. This means that if in fact geographic mobility is the optimal method for decreasing economic differentials between areas, a policy designed to promote geographic mobility will be effective only if it can reduce the costs of moving, noneconomic and economic, or increase the financial rewards resulting from the move. In either case the net returns to geographic mobility will be increased and this is what will stimulate mobility.

APPENDIX A

REGRESSION ANALYSIS OF THE SAMPLE

The regression equations which are shown in this appendix are those used as the basis for the tables which present the adjusted deviations of each category from the sample mean. Dummy variables are used throughout as independent variables. Regressions one and two are based on the following general equation:

$$Y=E+b_{x1}X_1+b_{x2}X_2+ \cdots +b_{xn}X_m+b_{w1}W_1+b_{w2}W_2+ \cdots +b_{wm}W_m$$

$$+b_{u1}U_1+b_{u2}U_2+ \cdots +b_{uo}U_o$$

Y is moved or not moved (1 if moved, 0 is not moved).

X, W, U are sets of dummy variables for factors which explain geographic mobility such as sex, occupation, marital status, and employment status with subscripts 1 through n, 1 through m, and 1 through o representing different categories of the respective dummy variables to which they apply. A value of one is assigned if an individual observation falls into a given category of a dummy variable and zero for all other categories of that variable. Categories are defined such that each individual falls into one and only one category for each dummy variable.

b_{x1} is the partial regression coefficient of dummy variable X_1, b_{w1} the partial regression coefficient of dummy variable W_1, etc.

E is the regression constant term.

Individual regression coefficients are estimates of the net effect of belonging to that particular category of the dummy variable as opposed to the category which was ommitted from the regression to prevent there being a linear relationship among categories within the dummy variable.

The t values shown test the significance of differences between individual categories and the ommitted category and should not be interpreted as testing

significance of the individual category in explaining variation in the dependent variable.

F ratios were used to test significance of each set of dummy variables in explaining the variation in rates of geographic mobility.[1] These F ratios were calculated by re-estimating the regression equation, omitting a different dummy variable set each time. F ratios were calculated as follows:

$$F = \frac{(R_I^2 - R_{II}^2)\ (N - k_1 - k_2 - 1)}{(1 - R_I^2)\ (k_1)}$$

where:

R_I^2 = coefficient of multiple determination for the regression equation with (k_1+k_2) variables.

R_{II}^2 = coefficient of multiple determination for the regression equation with k_2 variables

k_1 = number of independent variables representing dummy set I.

k_2 = number of independent variables other than those representing dummy set I

N = number of observations

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[1] A discussion of dummy variables in general and the test statistic used here in particular can be found in Emanuel Melichar, "Least-Squares Analysis of Economic Survey Data," Proceedings of the Business and Economics Section, American Statistical Association (1965), pp. 373-385.

REGRESSION I

Dependent Variable: Moved in 12 months prior to study date

Equation R^2=.23 N =375
F = 4.13 Constant Term = .44

Independent variable	Regression Coefficient	t-Ratio
Sex		
Subject is male	- .08	1.40
Race		
Subject is Negro	- .02	0.28
Employment Status		
Currently employed	- .16	2.17**
Occupation		
Professional-technical	.04	0.48
Service	.14	1.64*
Clerical	.07	0.89
Sales	.03	0.26
Manager-proprietor	.07	0.72
Craftsman-foreman	.09	0.99
Operative	.06	0.91
Unemployment Experience		
Subject unemployed sometime 1968 or 1969	.13	2.64***
Unemployment Benefits		
Subject drew benefits	- .13	1.65*
Wage Opinion		
Believes wages higher elsewhere	.01	0.94
Believes wages same elsewhere	- .02	0.44
Vocational Training		
Received training	.04	1.15
Home Ownership		
Owns home	- .10	2.56***
Proximity of Relatives		
Relatives live within 25 miles	- .20	4.32***
Others in Household Employed		
Yes	- .04	1.20

REGRESSION I (continued)

Independent Variable	Regression Coefficient	t-Ratio
Plans to Move Next 12 months		
Has plans	.04	4.82***
High School		
Urban high school	- .04	1.05
Family Status		
Married no dependents	.16	3.04***
Married with dependents	.09	1.88*
Single with dependents	.10	1.39
Age		
18-23	- .07	1.84*

***Significant at .01 level.
**Significant at .05 level.
*Significant at .10 level.

REGRESSION II

Dependent Variable: Moved in 3 years prior to study date

Equation R^2=.27 N = 375
F = 5.24 Constant Term = .38

Independent Variable	Regression Coefficient	t-Ratio
Sex		
Subject is male	.009	.01
Race		
Subject is Negro	.05	.83
Employment Status		
Currently employed	- .14	1.61
Occupation		
Professional-technical	.10	1.06
Service	.16	1.61
Clerical	.18	1.95*
Sales	.04	.31
Manager-proprietor	.17	1.54
Craftsman-foreman	.13	1.19
Operative	.08	.98
Unemployment Experience		
Unemployed sometime during 1968 or 1969	.10	1.66*
Unemployment Benefits		
Subject drew benefits	- .11	1.18
Wage Opinion		
Believes wages higher elsewhere	.01	.05
Believes wages same elsewhere	.04	.93
Vocational Training		
Received Training	.05	1.22
Home Ownership		
Owns Home	- .08	1.67*
Proximity of Relatives		
Relatives live within 25 miles	- .36	6.56***
Others in Household Employed		
Yes	- .04	.98

REGRESSION II (continued)

Independent Variable	Regression Coefficient	t-Ratio
Plans to Move Next 12 Months		
Has plans	.36	3.47
High School		
Urban high school	- .01	.15
Family Status		
Married no dependents	.32	5.00***
Married with dependents	.14	2.34**
Single with dependents	.18	2.06*
Age		
18-23	- .01	.29

***Significant at .01 level.
**Significant at .05 level.
*Significant at .10 level.

REGRESSION III

Dependent Variable: Weekly earnings as of September 1970*a

Equation R^2=.29 N = 375
F=10.43 Constant Term = 72.17

Independent Variable	Regression Coefficient	t-Ratio
Age		
18-23	-13.68	3.03***
Race		
Negro	-11.37	1.66*
Occupation		
Professional-technical	77.03	7.59***
Service	23.08	2.14*
Clerical	30.10	3.21***
Sales	53.99	4.38***
Manager-Proprietor	80.38	6.65***
Craftsman-foreman	85.34	7.26***
Operative	57.74	6.79***
Vocational Training		
Received training	-21.01	.47
Area of Residence		
Urban	8.95	1.74*
Moved last 12 Months		
Moved	4.01	.45
Moved last 3 years		
Moved	4.29	.58
High School		
Urban	- 5.52	1.10

*aThe general form of the regression equation used here is the same as regressions I and II except the dependent variable is continuous.

***Significant at .01 level.
**Significant at .05 level.
*Significant at .10 level.

TABLE I

DUMMY SET F-RATIOS

Dummy Set	Regression I F-Ratio	Regression II F-Ratio
Sex	1.94	.00
Race	.09	.67
Employment Status	4.70***	2.59*
Occupation	3.78***	.75
Unemployment Experience	3.46**	2.73*
Unemployment Benefits	2.71*	1.39
Wage Opinion	.45	1.40
Vocational Training	1.31	1.44
Home Ownership	3.25**	2.78*
Proximity of Relatives	9.31***	21.46***
Others Employed	1.45	.96
Moving Plans	8.57***	5.99***
High School	1.08	.05
Marital Status	3.16**	12.90***
Age	3.34**	.10

***Significant at .01 level.
**Significant at .05 level.
*Significant at .10 level.

TABLE II

F-RATIOS FOR DUMMY SET REGRESSION III

Dummy Sets	F-Ratio
Age	4.60***
Race	1.29
Occupation	14.93***
Vocational Training	.13
Area of Residence	1.51
Mobility 12 months	.19
Mobility 3 years	.17
High School	1.21

***Significant at .01 level.

APPENDIX B

SAMPLE SELECTION

The original sample, hereafter referred to as the Bowlby-Schriver sample, was obtained by drawing a simple one in four random sample from former students at the nineteen Tennessee Area Vocational-Technical Schools.[1] This resulted in a gross sample of 1,701 subjects. Many of the subjects included in the gross sample did not possess the characteristics of the target population, making it necessary to reduce the sample by excluding any subject who fell into one or more of the following categories:

1. Subject was born after January 1, 1943.
2. Subject left Area Vocational-Technical School to attend college.
3. Subject left Area Vocational-Technical School after the cut-off date of January 1, 1968.

Additional exclusions from the sample were made for three reasons.

1. Subject was currently serving in the Armed Forces, resulting in data not relevant to the study.
2. Subject received less than 300 hours of instruction at an Area Vocational-Technical School.[2]
3. Records indicated that the subject had a substantial physical or emotional disability.

Subjects remaining in the sample after the above exclusions were made possessed the characteristics of the target population. Personal characteristics of the subjects such as sex, age, race, I. Q., high school grade point average and the occupation of the subject's father are distributed in the sample such that it can

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[1]Roger L. Bowlby and William R. Schriver, Effects of Vocational Training on Labor Force Experience (Memphis, Tennessee: Center for Manpower Studies, Memphis State University, 1971).

[2]Bowlby and Schriver assume 300 hours of instruction are necessary for a subject to have received "training." They readily admit this to be an arbitrary cut-off.

be assumed that the sample selected possess the same characteristics as would be found in a simple random sample of all noncollegiate Tennessee high school graduates born after January 1, 1943.[3]

Subjects obtained from the sample of Area Vocational-Technical School students were matched with noncollegiate Tennessee high school graduates possessing the same personal characteristics with the exception of attendance at a vocational school. Nine different characteristics were used in the matching process.[4] The result is a random sample selected by an application of the method of restricted sampling with unequal probabilities.[5]

Each possible combination of the nine personal characteristics used in the matching process is assumed to be a separate stratum of the target population from which three subjects will be selected, the Area Vocational-Technical School subject and two matches. By definition the subjects in each stratum are identical. The probability, p_i, of any stratum being selected for inclusion in the sample is $p_i=m_i/N$ where m_i is the number of subjects in the ith stratum and N is the total number of strata. The probability of any individual subject being selected becomes $(p_i)(1/m_i)$ where $1/m_i$ is the probability of a subject being selected from within the ith stratum. Matching subjects according to nine different characteristics means there are 362,800 possible strata of different characteristic combinations. With only 194,000 subjects in the target population many strata will have a zero

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[3]A discussion of the personal characteristics of this sample can be found in Roger L. Bowlby and William R. Schriver, Effects of Vocational Training on Labor Force Experience, pp. 13-35.

[4]For a description of the matching process see Roger L. Bowlby and William R. Schriver, "Nonwage Benefits of Vocational Training: Employment and Mobility," Industrial and Labor Relations Review, XXIII (July, 1970), pp. 502-503.

[5]A good explanation of the procedure of restricted sampling with unequal probabilities can be found in M. H. Hansen, W. H. Hurwitz and W. G. Madow, Sample Survey Methods and Theory, Vol. I (New York: John Wiley and Sons, Inc., 1953), pp. 476-480.

probability of selection. Strata with a zero probability of selection are dropped from the sample making the probability of selection for any one of the remaining stratum $p_i=m_i/R$ where R is the number of stratum containing at least one subject. Taking six as the maximum number of subjects contained in any one stratum, the probability of a particular subject being selected ranges from 5×10^{-6} to 6×10^{-6}.[6] A simple random sample of the target population would have individual selection probabilities of 5×10^{-6}. Individual selection probabilities of the sample drawn are so close to those of a simple random sample that for empirical purposes it is assumed that the Bowlby-Schriver sample possesses the essential statistical characteristics of a simple random sample.

To increase the size of the sample to be used in this study, the hours of instruction necessary to be included in the sample was reduced from 300 to 200. Additional subjects entered due to this reduction were in the original sample with the same probability of selection thus retaining the approximation of randomness for the entire sample.

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[6]Six, while arbitrary, was selected because in no case was it possible to find more than five potential matches.