FARM-NONFARM INCOME DIFFERENTIALS, U. S., 1960

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ABSTRACT

FARM-NONFARM INCOME DIFFERENTIALS, U. S., 1960

by Moshe Ben-David

Historical records of rural-farm and urban per capita income in the United States indicate a substantial disparity in earnings in favor of urban people. Many agricultural economists have interpreted this phenomenon, which has existed despite continued governmental intervention, as an indication that the farm labor force suffers from a high degree of malallocation.

The primary objective of this study was to determine whether farm labor in the United States is malallocated or fixed. There were five secondary objectives: (1) to determine if causes put forth to explain the general farm problem support the "farm labor surplus" hypothesis. (2) To determine if United States farm labor force possess specific characteristics which can be associated with the state of being malallocated, and if it possess those characteristics in greater or lesser degree than other segments of the labor force in the United States. (3) To estimate an Earnings-Capacity function for labor as a means of defining and measuring "comparable labor." (4) To apply the estimated function to specified rural-farm populations and examine the extent of their labor malallocation. (5) To recommend agricultural policies commensurate to the findings of this study.

The theoretical analysis indicated that causes put forth to explain the existence of farm labor surplus were inconclusive.

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The Earnings-Capacity function was estimated by means of ordinary least squares regressions using multiple dummy-variables. Data was obtained from the 1/1,000 sample of the U. S. Census of Population and Housing: 1960, which reports characteristics for individuals. The regressions, which incorporated 126 independent dummy-variables, were based on a subsample of 90,395 observations.

The regression results indicate that a multitude of factors, and interactions of factors, determine people's earnings. Education, for example, has a different effect on the earnings of males and females. It also has a different effect on the earnings of Whites and Nonwhites, indicating that the degree of race discrimination is positively correlated to the level of Nonwhites educational attainments. Among the Nonwhites females benefit from education much more than males.

Age also affects Nonwhites and Whites earnings differently. Nonwhites have a comparable advantage at the young and the old age levels. Age and education; sex, race, and education, were found to interact greatly.

The comparison of actual and potential earnings of rural-farm people indicated that a substantial part of the farm labor force is fixed. Those who would seem to benefit most from off-farm migration are the very young (14-19 year old) and those Nonwhites who do not migrate to the large SMSAs.

The findings that a substantial portion of farm labor in the United States is fixed may explain in part why past agricultural policies

have not achieved their stated goals. It is recommended that different policies should be directed toward different farm groups. In order to raise the level of income among farm people, the educational attainments of young farm people must be enhanced and widened. Given the democratic setting of United States society the proper policies regarding the fixed generation are those which will encourage their retraining through the acquisition of new skills.

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By

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CHAPTER I

Introduction

The Problem

The issue of income distribution is debated in economics and politics almost constantly. For the economist's income distribution indicates mainly how well the economy fared in achieving optimal resource allocation, while for the politicians it measures the degree reality conforms to society's values and aspirations, whatever they are.

Agricultural economists usually aggregate factors of production in agriculture into land, capital, and labor. After the collapse of the Feudal system and the abolishment of slavery, labor became the most prominent factor of the three mentioned. The more democratic and free societies became the more the issue of labor's income, and its comparability, or equality, was emphasized. This increase in importance might be one of the reasons why economists from time to time confuse equality with comparability, and substitute the former for the latter. A second possible reason might be the difficulties encountered in defining comparable units of labor, and the increasing social uneasiness regarding the scaling of people.

Farm people of the United States have a long history of grievances concerning their share in the national income and especially the returns to their efforts and entrepreneurship.

Politically farmers registered their contentions toward other sectors in the United States as early as the 1870's:

> The Granger movement of the 1870's with its demand for the regulation of the railroads and for anti-trust legislation, and the Populist movement of the 1890's with its demand for currency reform, reflected the pressure on agriculture of systems of transportation, distribution, and credit dominated by the nonagricultural groups.[1]

The conditions that arose the grievances in the past and feed them at the present are presented in Table I-1. Although the way by which the available data is collected and reported poses theoretical and empirical problems,[2] which makes direct comparison difficult, the gap between the income of farm and nonfarm people is assumed to be real and considerable. Realizing that part of the income of farm people originates in governmental subsidies and intervention, and assuming that at least in the short-run the elimination of governmental intervention will reduce total income, the gap between farm and nonfarm people, regarding resource allocation seems to increase.

Direct government intervention began, however, only at the outset of the 1929 depression, by the passage of the 1929 Agricultural Marketing Act. The roots of the farm problem were thought to be at first the difficulties posed by the marketing of the farm products and the relatively weak bargaining position of farmers.[3] The failure of the steps taken by the Agricultural Marketing Act of 1929 shifted the attention from the

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[1] U.S. Department of Agriculture, Agricultural Adjustment, 1937-38, A Report of the Activities Carried on by the Agricultural Adjustment Administration (Washington: U.S. Government Printing Office, 1939), p. 2.

[2] Dale E. Hathaway, J. Allen Beegle, and W. K. Bryant, The People of Rural America (Monograph on Rural Population to be published), Chapter 7. Also Dale E. Hathaway, Government and Agriculture (New York: Macmillan, 1963), Chapter 2.

[3] U.S. Department of Agriculture, Agricultural Adjustment, 1937-38, A Report of the Activities Carried on by the Agricultural Adjustment Administration (Washington: U.S. Government Printing Office, 1939), p. 2.

Table I-1. Farm-Nonfarm Relative Income, Various Measures (% Farm was of Nonfarm)

(1) Year	(2) Per Capita	(3) Per Worker[a]	(4) Per Family[b]
1910-14	----	62.3	----
1934	32.6	37.9	----
1935	44.3	40.5	----
1936	36.5	43.3	----
1937	44.4	41.6	----
1938	38.5	39.0	----
1939	37.3	38.1	----
1940	36.5	36.7	----
1941	41.3	33.7	----
1942	49.3	51.9	----
1943	57.4	59.1	----
1944	54.7	58.9	48.0
1945	56.4	65.5	49.4
1946	61.0	75.8	----[c]
1947	61.1	74.9	61.6
1948	66.9	66.1	60.0
1949	55.7	58.9	47.7
1950	57.7	52.1	56.3
1951	64.0	56.4	54.5
1952	59.2	53.2	54.1
1953	54.7	50.6	47.8
1954	52.8	46.1	44.7
1955	48.2	42.0	45.0
1956	47.8	45.2	46.9
1957	48.7	41.7	47.7
1958	55.5	48.1	51.4
1959	50.1	42.3	49.8
1960	55.0	44.2	59.5
1961	58.1	46.6	54.6
1962	58.0	45.9	55.8
1963	58.9	45.7	53.4
1964	54.2	48.0	52.7
1965	63.4	54.1	----

[a] % average annual farm income per worker in agriculture was of average annual wage per employed factory worker computed as average weekly earnings of production workers or nonsupervisory employees in manufacturing, multiplied by 52.

[b] From 1959 on the absolute figures are based on a new definition of farm population. The effect of the new definition on the relative position, farm-nonfarm, was very small and in the direction of increasing the disparity.

[c] No comparable figures for the farm population are available.

Sources: For (2), U.S. Department of Agriculture, ERS, <u>Farm Income Situation</u>, FIS-203 (July 1966), 44. For (3), <u>Ibid.</u>, 46. For (4), U.S. Bureau of the Census, Current Population Reports, <u>Consumer Income</u>, Series P-60, No. 35 (1960).

demand to the supply of agricultural products.[1] The idea was that because of the competitive structure of United States agriculture the industry is overreacting to market signals.[2] The solution was sought in demand and supply outlook marketing and production controls of various kinds, and even in direct payments for the idling of factors-of-production (land). However, as Table I-1 indicates, the mentioned policies were not very successful in reducing income disparities, which induced economists to look for different causes and solutions.

Several economists noticed that the relative position of supply and demand for agricultural produce in the United States had been permanently changed.[3] In 1945, Theodore W. Schultz applied John Stuart Mill's analysis of economic progress to the United States under conditions where the supply of farm products exceeds its demand. As Schultz stated it:

> When this development occurs, a farm problem is likely to arise. . . . The equilibrating mechanism is faced with a transfer problem, that is, the task of moving an excess supply of resources out of agriculture.[4]

The reasons proposed for the supply gaining more rapidly than the demand were: (1) The demand was lagging because the rate of population growth was declining, and (2) the income elasticity for farm products was

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[1] Robert L. Tontz, "Legal Parity: Implementation of the Policy of Equality for Agriculture, 1929-1954," Agricultural History, XIX, No. 4 (Oct. 1955), p. 177.

[2] Milton Friedman, Price Theory (Chicago: Aldine Publishing Company, 1962), pp. 80-93, especially p. 89.

[3] Theodore W. Schultz, Agriculture in an Unstable Economy (New York: McGraw-Hill Book Company, Inc., 1945), p. 49, n. 3.

[4] Ibid., p. 49.

low and declining so that growth in income could not substitute for growth in population. At the same time the growth of supply was enhanced by (3) The immense advance in input productivity through better and wide-spread technology, including improved human skills, (4) Further investment which increased land acreage and capital in agriculture, and (5) An ever-abundant supply of labor.[1]

The major consequences of the failure to equilibrate the economy are seen by Schultz to be:

> 1. We would expect a chronic disequilibrium adverse to agriculture to occur and to persist, . . .
> 2. We would expect agriculture to be burdened constantly with an excess supply of labor even when business is expanding and when there are brisk job opportunities in nonagricultural industries. The burden of equilibrating the excess supply of resources in agriculture falls primarily on the labor force, because the improvements in farm technology are largely labor-saving in their effects. Labor, furthermore constitutes the bulk of the resources employed in agriculture and workers are transferable.[2]

The farm problem analysis by Schultz has been the cornerstone of almost all succeeding analyses, with later writers adding to it mainly the notion of input fixity.[3] The hypothesis that "the burden of equilibrating the excess supply of resources in agriculture falls primarily on the labor force," or that farm labor has the highest degree of malallocation among farm resources, gained such prominence that economists accept it as an axiom. Bishop states, for example:

> It is taken as fact that the incomes of farm families are in general low relative to the incomes of comparable families employed in other industrial groups in the U.S. and that the

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[1] *Ibid.*, pp. 50-84.

[2] *Ibid.*, p. 82.

[3] Schultz mentioned "high proportion of fixed costs," but only as an explanation why farmers do not curtail their production. He does not relate input fixity to the discussion of input transferability.

> returns for labor resources employed on farms in particular are lower than the returns for comparable labor employed in other industries. These facts have been established in a number of studies, and they will be accepted in this paper.[1]

However, Bishop does not define what is "comparable labor," or "comparable families," and the studies which he referes to do not define it either. However, without such definition the validity of Bishop's statement is questionable. Similar statements can be found in many studies of agricultural economists, in which the issue of comparable labor is always left open.

In recent years the more refined expositions of the agricultural labor-surplus hypothesis suggest several characteristics of the agricultural sector that might cause its present crisis. They are: (1) A very low price and income demand elasticity for farm products, (2) Rapid rates of technological change, (3) A competitive structure, and (4) A high degree of input fixity. As Hathaway points out:

> No one of these characteristics is unique to agriculture, nor would any one of them alone suffice to explain the large and extended disequilibrium in agriculture. The combination of characteristics does appear to be unique to agriculture, and the combination will explain a large and persistent disequilibrium, especially one which results in chronically low returns for some resources in the industry.[2]

Hathaway explicitly injected into the discussion the important notion of relativity--the notion that the difference between agriculture and other industries is only in degree, not in substance. Its significance is in the emphasis put on the need for comparative studies of agriculture versus other sectors before conclusions could be drawn.

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[1] C. E. Bishop, "Unemployment and Agricultural Adjustment," presented at the Conference on National Economic Policies, May 15-17, 1963.

[2] Dale E. Hathaway, Government and Agriculture (New York: Macmillan, 1963), p. 126.

Furthermore, it views the farm sector a complex economic system which a simple, or one monistic hypothesis cannot explain.

Since an encompassing study of the economics of United States farm sector is not available this study will analyze each economic characteristic by itself, utilizing cross references to other characteristics whenever warranted. Although major emphasis will be given in the present study to the issue of labor's malallocation, by means of examining the comparability of labor, it was assumed desirable to analyze first the general framework, of which the labor-surplus hypothesis is a focal point. The reason is the belief that prior to examining any hypothesis its roots should be studied. However, the roots of the labor-surplus hypothesis are the same as those of the farm problem.

Objectives

The objectives of this study are:

1. To examine the relationships between the present farm problem in the United States and the causes forwarded to explain it.

2. To analyze the suggested reasons for the malallocation of labor in United States agriculture.

3. To define and estimate labor comparability, by means of a labor earning-capacity function.

4. To employ the function mentioned above in estimating the opportunity-costs in 1960 of specific farmers, and to compare it with measures of their actual earnings. The purpose of this comparison is to test the hypothesis of labor-surplus and to determine its extent.

5. To utilize the findings of the study in a brief analysis of present and future policies.

Data and Methodology

Secondary data will provide the basis for this study. The use of secondary data is dictated by the nature and magnitude of the study.

The major source of information will be the 1/1000 sample of the population of the United States, as sampled by the 1960 United States Censuses of Population and Housing.[1] This source was chosen because it is the only one which reports characteristics of individuals. The lowest level that the 25 per cent sample of population of the United States,[2] for example, reports is county averages. The latter source of data will, however, be utilized to estimate average earning capacity of various aggregate fractions of the farm population. Other publications by United States Department of Agriculture, especially those related to hired farm labor force, will be used.

The study will encompass three modes of analysis. The first will be the informal testing of the existing theoretical framework regarding the farm problem and the labor surplus hypothesis.

The second will be Sonquist and Morgan's Automatic Interaction Detector (AID) computer program.[3] This program is:

> . . . useful in studying the interrelationships among a set of variables. Regarding one of the variables as a dependent variable, the analysis employs a nonsymmetrical branching process,

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[1] U.S. Bureau of the Census, U.S. Censuses of Population and Housing: 1960, 1/1000, 1/10,000, two national samples of the population of the United States.

[2] U. S. Bureau of the Census, United States Census of Population, 1960, United States Summary, PC (1) - ID U.S.

[3] John A. Sonquist and James N. Morgan, The Detection of Interaction Effects, A Report on a Computer Program for the Selection of Optimal Combinations of Explanatory Variables, Survey Research Center, the University of Michigan, Monograph No. 35 (1964).

> based on variance analysis techniques, to subdivide the sample into a series of subgroups which maximize one's ability to predirect values of the dependent variable. Linearity and additivity assumptions inherent in conventional multiple regression techniques are not required.[1]
>
> The program divides the sample, through a series of binary splits, into a mutually exclusive series of subgroups. Every observation is a member of exactly one of these subgroups. They are chosen so that at each step in the procedure, their means account for more of the total sum of squares (reduce the predictive error) than the mean of any other equal member of subgroups.[2]

The AID program will be employed to facilitate the determination of the relative importance of the variables reported by the secondary data and assumed to be theoretically relevant. The relaxation of linearity and additivity restrictions, which AID incorporates, was thought to be beneficial since it enables the program to point out the existence of interaction among the studied variables.[3]

The third mode will be the estimation of the parameters of the variables chosen by the AID step. The estimation will be done by an ordinary least squares multiple regression (OLS). The variables will be incorporated mainly as dummy variables[4] for several reasons: (1) Many

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[1] Ibid., p. 1.

[2] Ibid., p. 4.

[3] For further reference see: J. N. Morgan and J. A. Sonquist, "Problems in the Analysis of Survey Data, and a Proposal," J. Am. Statist. Assoc., LVIII (June, 1963), 415-35. And from the same authors: "Some Results from A Non-Symmetrical Branching Process that Looks for Interaction Effects," the 1963 Proceedings of the Social Statistics Section of the American Statistical Association.

[4] J. Johnston, Econometric Methods (New York: McGraw-Hill, 1963), p. 221. And also: D. B. Suits, "Use of Dummy Variables in Regression Equations," J. Am. Statist. Assoc., LII (1957), pp. 548-551.

relevant variables are qualitative and are not readily scaled. (2) It enables a further relaxation of linearity. (3) It makes possible the specifying of crucial interaction points.

Two types of multiple dummy variable regression will be employed. In the first type, the dependent variable will be a continuous variable--"Total Earnings." This regression will determine the value of the parameters to be used in the prediction of earning-capacity. The second type, will be a conditional probability regression in which the dependent variable will be a dummy variable having the value "1" if the observed individual belongs to the specified group (in this case a specific occupation), or "0" otherwise.[1] This regression will be used in determining which (and how) variables affect the entry of individuals in the 1960 Census sample into the various occupations. Further discussion concerning the variable "Occupation" will follow.

Outline of the Study

Following the Introduction, Chapter II will investigate the causal relationships between the farm problem and the specific characteristics of United States agriculture which are assumed to be responsible for the present situation. Prior to the investigation several terms of reference will be spelled out in effort to secure a simple, unconfused, and realistic theoretical framework. The discussion of the general farm problem was proposed so that the main issue of this study--labor's malallocation--will acquire the proper perspective. Chapter III, based on the conclusions

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[1] J. Johnston, op. cit., p. 224-28. And: G. H. Orcutt, Martin Greenberger, John Korbel, and Alice M. Rivlin, Microanalysis of Socio Economic Systems: A Simulation Study (New York: Harper & Row, 1961), Part 3, Chapter 2.

of the previous examination, will analyze especially the theoretical foundations of the labor-surplus hypothesis. Since labor was singled out of all factors-of-production in United States agriculture, as the major input being malallocated it deserves a separate analysis. The analysis will follow the reasons given for labor acquiring such prominence. Upon completion of the theoretical examination a review of relevant literature will be attempted in Chapter IV. Major studies concerned with underemployment, necessary migration from agriculture, allocation of agricultural income, and attempts to measure the capacity of agricultural labor will be reviewed. The fifth chapter will deal with the statistical methods used in the study and the results of the AID program. The variables chosen for the estimates of the earnings-capacity function will be covered in Chapter VI. The reason for choosing the variables, what they are supposed to measure, their definition in the secondary source of data, and their limitations, will be discussed. Chapter VII will report on the empirical results of the estimation of an earning capacity function, while the last chapter, VIII, will conclude, summarize, and consider recommendation for future policies.

CHAPTER II

The General Farm Problem

The major issue of this study, as stated in the Introduction, is the examination of farm labor returns. But, since labor is only one of several agricultural factors of production, and is undoubtedly affected by the general conditions prevailing in United States agriculture it was assumed benefitial to examine first those conditions.

However, the examination could be done on several levels and with various terms of reference, which indicates the need to specify the above explicitly at the outset of the study.

Terms of Reference

Three major points will be discussed which will apply to the study as a whole and not only to this chapter. The following discussion will specify explicitly the approach this study will take concerning Positive versus Welfare economics, and Dynamics versus Statics. The third issue will be to define, in general, the term "surplus."

Positive Economics: Although economists generally agree that as far as the dichotomy between Positive to Welfare economics "little beyond convenience of exposition can be adduced for this distinction so far as it means not more than that positive economics is to explain and welfare economics is to prescribe,"[1] they realize, however, that

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[1] Joseph A. Schumpeter, History of Economic Analysis (New York: Oxford University Press, 1954), p. 1069.

"economic analysis and policy formulation require an analytical separation of the two,"[1] or as Hathaway so succinctly stated, one should always realize that there are "those who are poor but not always underpaid"[2] as well as those that "are underpaid but not always poor."[3]

In this study the emphasis will be on positive economics, or the efficiency of resource allocation. Utilizing Hathaway's presentation it can be said that this study will be mainly concerned with people who are underpaid, disregarding if they are poor or not. This decision was taken not because the problem of poverty was assumed to be less important, but as a result of the realization that poverty would not be solved as long as the question posed in this study is unanswered.

Dynamic framework: It seems futile to analyze problems concerning a sector of United States economy in a static context. Unless one assumes that the economy of the United States is a stationary one, which is very unlikely, one has to realize that this economy experiences constant change. Relaxing the theoretical and unrealistic assumption of instantaneous response and adjustment, constant change implies the inevitability of static malallocation of resources, and therefore the futility of the static analysis. Accepting the above it is suggested that the analysis will be done in a dynamic context. Dynamic system are defined in this study, following Frisch[3] and Samuelson, as systems where "behavior over time is determined by functional equations in which

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[1] D. Gale Johnson, "Contribution of Price Policy to the Income and Resource Problems in Agriculture," *J. Farm Econ.*, XXVI, No. 4 (1944), p. 633.

[2] Dale E. Hathaway, *op. cit.*, p. 164.

[3] *Ibid.*, p. 83.

'variables at different points of time' are involved in an 'essential' way."[1] The main distinction between static and dynamic systems is that the latter incorporates not only the end results of an economic activity but also the process itself. Therefore, for a dynamic analysis:

> The characterization and evaluation of the system's response to exogenous changes is of primary interest. Such questions as the following are frequently raised in this context: 'How does the system adjust to the exogenous changes?' 'To what extent are its relationship between the adjustment process, the dynamic properties of the systems, and the exogenous variation?'."[2]

Zusman continues to say that if a system is subjected to continuous exogenous changes, such as demand shifts or technological changes, a continuous adjustment process is generated:

> In this process, the system is continuously converging to an even-receding equilibrium never, in fact, attaining it. The difference 'between the current value of an edogenous variable and its long-run equilibrium value will be referred to as the dynamic discrepancy.'[3]

Studying these dynamic discrepancies in agriculture, in terms of linear systems and lagged edogenous values, Zusman comes to the conclusions that:

> . . . the dynamic discrepancy in any edogenous variable is in general, a linear combination of the <u>rates</u> of change in all exogenous variables. Furthermore, it is independent of their absolute levels. Secondly, we note that in the limit, the dynamic discrepancy is independent of <u>t</u>. Compensatory changes in exogenous variables are conceivable, but it is very unlikely that they will ever cause the dynamic discrepancy to vanish.[4]

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[1] Paul Anthony Samuelson, *Foundations of Economic Analysis* (New York: Atheneum 1965), p. 314.

[2] Pinhas Zusman, "Dynamic Discrepancies in Agricultural Economic Systems," *J. Farm Economics*, XLIV (August, 1962), p. 744.

[3] *Ibid.*, p. 744.

[4] *Ibid.*, p. 746.

Following the finding of Zusman about the foundamental role "rates of change" play in dynamic systems, this study will, when possible, emphasis comparative analysis of rates of change in the agricultural and nonagricultural sectors. The main question concerning this study will be, therefore, not if malallocation exists in United States agriculture, but if the degree of malallocation in the farm sector is higher than in other sectors of the economy, and the relative speed of adjustment.

Input surplus: The last issue, regarding the terms of reference, to be considered is that of input "surplus" (or "underemployment"). Unfortunately these terms are often used in a vague manner, which can be interpreted in several ways. It is important to have a clear definition of the term "surplus" since it is a crucial concept in the hypothesis of farm labor malallocation (or farm labor surplus), and because of the confused manner in which it was handled in the past.

A popular interpretation of "surplus" in the past, that still appears from time to time, can be labeled the "technical approach." This approach defines surplus on the basis of given "requirements" for each job on the farm, without regard to prices, MVPs, or opportunity-costs. The establishment of total man-hours required, for example, is done by multiplying the number of acres, livestock, etc. by technical coefficients. Comparing the "required" man-hours to the amount of man-hours farmers are believed to possess, indicates the existence, or non-existence, of labor-surplus. Hecht and Barton used such concept when they described what happened in the 1930's, by saying that "industrial jobs for surplus farm people were strictly limited, so many remained on farms with less than

enough work to occupy them effectively."[1] Of the World War II period, Schultz commented that "it has taken the mobilization for war to show us how great an excess of man power was attempting to derive a living from farming."[2]

The "technical approach" has two flaws. First, it has no economic connotations! It does not recognize that the number of hours a man is willing to work depends on the wage rate per hour in his present employment, the hourly wage rate in other employment, and his valuation of the worth of his leisure. The amount of man-hours demanded, on the other hand, depends, among other things, on the relative prices of labor and other inputs and the ratio of their MPPs.

Second, the technical coefficients are not economically neutral. Farmers employ specific practices and adopt specific techniques because they, on the basis of _their_ knowledge, expect them to be profitable. Applying existing technical coefficients, without further examination, suggests that farm people actions are assumed to be always economically sound. This inference seems, however, to deprive economists and economic analysis of their main purpose, the examination of how people actions comply with economical rationale. There is no need to examine people's actions if they are assumed a priori to be rational.

A second definition of labor surplus states that when labor in any industry is earning lower returns than in other industries, labor surplus exists in the lower earning industry. Schultz, for example, inferes from

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[1] Reuben W. Hecht and Glen T. Barton, _Gains in Productivity of Farm Labor_, U.S. Department of Agriculture Technical Bulletin 1020 (Washington: U.S. Government Printing Office, 1958), p. 52.

[2] T. W. Schultz, Agriculture in An Unstable Economy, _op_. _cit_., p. 91.

the relative decline of earnings per worker in agriculture during 1920-39 that "this decline is, in itself, sufficient proof that the excess of labor in agriculture was increasing."[1] Bishop asserts that "the magnitude of these persistent differences in incomes among economic sectors is consistent with the hypothesis that labor is underemployed in agriculture in the Southeast,"[2] but he nowhere defines what is a reasonable "magnitude of differences." In a recent study Waldo declares that "a continued disparity between the income of farm and nonfarm people ... suggest that the problems of underemployed labor...have not yet been solved."[3] A somewhat different approach, which incorporates welfare consideration, is taken by Schnittker and Owens. The cite "incomes unsatisfactory to many farm people"[4] as one of the indications of excess labor in agriculture.

It is significant that this line of causation is seldom applied to inputs other than labor. One seldom argues, for example, that capital loans should yield the same returns everywhere. In capital case it is common to take into account the length of the loan, the collateral, the risk involved, etc. Economists have argued for great caution when dealing with comparable returns to capital,[5] but a surprisingly low degree of

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[1] Ibid., p. 93-94.

[2] Charles E. Bishop, "Underemployment of Labor in Southeastern Agriculture," J. Farm Econ., XXXVI, No. 2 (1954), p. 270.

[3] Arley D. Waldo, "The Impact of Outmigration and Multiple Jobholding upon Income Distribution in Agriculture," J. Farm Econ., XLVII, No. 5 (1965), p. 1235.

[4] John A. Schnittker and Gerald P. Owens, Farm to City Migration: Prospective and Problems, Contribution No. 309, Dept. of Agri. Econ., Kansas Agri. Exp. Stat., Manhattan, 1959, p. 7 (mimeographed).

[5] Output, Input, and Productivity Measurement, Studies in Income and Wealth, Vol. XXV, Conference on Research on Income and Wealth, A Report of the National Bureau of Econ. Research, Inc. (Princeton: Princeton University Press, 1961).

caution is expressed by contemporary economists when dealing with labor. It is surprising because as early as 1920 Marshall indicated that:

> When watching the action of demand and supply with regard to a material commodity, we are constantly met by the difficulty that two things which are being sold under the same name in the same market are really not of the same quality and not of the same value to the purchasers. Or, if the things are really alike, they may be sold even in the pace of the keenest competition at prices which are nominally different, because the conditions of sale are not the same....But difficulties of this kind are much greater in the case of labor than of material commodities; the true price that is paid for labor often differs widely, and in ways that are not easily traced, from that which is nominally paid.[1]

Some explanation for the special treatment labor receives is given by Domar:

> But why bemoan the defects of capital? Labor also possesses longevity but not permanency, and is also subject to depreciation (as shown by the life cycle of earnings in various occupations) and retirement. The cost of its training, let alone of reproduction and upbringing, also change. The heterogeneity of labor is striking; it is also a source of future income.
>
> All these difficulties do not prevent our labor friends from merrily aggregating man-hours among industries and over time. They are, it is true, helped by several circumstances, unfortunately not available to student of capital. The first is the feeling of shame which would arise if they began depreciating the labor force (including themselves), treating labor merely as a source of earning power.[2]

However, most writers agree that, as far as economics is concerned, the relevant factor to consider in explaining human behavior is <u>real</u> returns per unit of goods or services. But, many economists tend to ignore this while analyzing labor's earnings. They disregard not only differences in productivity--implying that each person supplies the same

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[1] Alfred Marshall, Principles of Economics (8th ed.; London: Macmillan, 1964), pp. 454-5.

[2] Evsey D. Domar, "Concepts of Real Capital Stocks and Services: Comment," Output, Input, and Productivity Measurement, op. cit., p. 404-405.

amount of labor-service units--but also fail to account for personal preferences. Realizing the above Bishop states:

> If owners are guided by real returns in allocating their resources, free mobility of labor will tend toward uniformity of real wages for comparable labor services in all uses. This does not imply, however, that even in a frictionless society money wages will be equal for comparable labor.[1]

The difference between money wages and real wages, in a Hicksian sense, may be caused by: (1) Difference in the general price level, (2) Difference in the relative prices of specific items, (3) Difference in customs and preferences. Therefore, a direct comparison of money income or labor earnings is not adequate unless one assumes that all the people supply, on the average, the same amount of service units, have the same indifference map, and are confronted with the same price structure. Regarding the United States it is very unlikely that the assumption mentioned held, which induce the conclusion that money income differencials in the United States cannot be considered as indicators of labor's malallocation.

The third indication that inputs surplus exists is assumed to be the evidence of "persistent unfavorable prices,"[2] the fact that "socially and politically acceptable prices,[3] or mere "socially acceptable prices,"[4]

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[1] Charles E. Bishop, Underemployment of Labor in Southeastern Agriculture, op. cit., p. 260.

[2] Donald R. Kaldor, "Farm Policy Objectives: A Setting for the Parity Question," U.S. Congress, Joint Economic Committee, Policy for Commercial Agriculture, 85th Cong., 1st. Sess., 1957, p. 503.

[3] M. R. Benedict, "Current Imbalance of Supply and Demand for Farm Products," Policy for Commercial Agriculture, op. cit., p. 91.

[4] Fred H. Tyner and Luther G. Tweeten, "Excess Capacity in U.S. Agriculture," Agricultural Economics Research (ERS - USDA), No. 1 (1964), p. 23.

were not obtained, and that "aggregate agricultural output is greater than the amount that can be sold...at existing prices."[1] Analyzing this issue on positive economics terms,[2] "prices," as such, have meaning only if they are assumed to be those which, within the given structure, will equate the MVPs of units of service employed in farming with their opportunity-costs. But, the standardization of the common inputs in agriculture or elsewhere according to their service units has not yet been done, and the accuracy of existing measurement of MVPs is also doubtful.[3] Furthermore, in economic theory prices usually play the role of "means" for a given "end" (maximizing utility, satisfaction, or profits), but in the previous discussion it seems as if "prices" became an "end" for themselves.

The only definition of input underemployment which complies with economic rationale is, in terms of labor service:

> Economic underemployment of labor exists when the real return which owners receive for the use of labor in particular field of resource use is less than the real return which could be obtained for comparable resource services in other uses.[4]

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[1] D. Gale Johnson, "Efficiency and Welfare Implications of United States Agricultural Policy," J. Farm Econ., XLV, No. 2 (1963), p. 334.

[2] Even in a Welfare context the issue of "prices as such" is unacceptable. It implies that existing political institutions have the ability to assess accurately the social costs and benefits of economic activity and that they can predict the results of their interventions precisely. Both assumptions are very improbable.

[3] Zvi Griliches, "Estimates of the Aggregate Agricultural Production Function from Cross-Sectional Data," J. Farm Econ., XLV, No. 2 (1963), pp. 419-422.

[4] C. E. Bishop, Underemployment of Labor in Southeastern Agriculture, op. cit., p. 258.

Two properties of this definition should be emphasized: (1) The definition is given in terms of "comparable resource services," which implies service-unit standardization. (2) Only the now existing units of service are being compared. The definition does not allow past mistakes to appear as present malallocation. If the demand for specific units of service is declining, this unit should be viewed as obsolete and not as malallocated.

Once again it becomes apparent how crucial the definition and measurement of comparable inputs is for the investigation of farm inputs malallocation.

After clarifying the terms of reference of this study the main analysis of the general farm problem can proceed.

The Analysis

As was mentioned in the Introduction the main reasons believed to be responsible for the present farm situation in the United States are: (1) Demand for farm products is increasing at a relative low rate as a result of the declining rate of population growth[1] and the low price and income elasticities of demand for farm products. (2) The farm sector has experienced a high rate of technological change, which has to be adopted by all producers[2] and therefore induces a high rate of increase in farm supply relative to the increase in demand for farm products. (3) The farm sector is highly competitive. (4) The farm sector suffers from a high

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[1] U.S. Bureau of the Census, Statistical Abstract of the U.S.: 1966 (Washington, D.C., 1966), p. 5, Table 1.

[2] The assumption that technological innovations *have* to be adopted by farmers was stressed by Schults and Cochrane. Other writers, such as: Hathaway, G. D. Johnson, Bishop etc., although agreeing that the supply of farm products increased too fast relative to the demand for farm products, did not stress the necessity of adopting technological innovations.

degree of input fixity. It should be emphasized again that those causes are believed to be interrelated and commulative. Any one of them is not assumed sufficient to explain the present situation of United States agriculture. Although each one of the mentioned causes will be analyzed for itself, whenever the available data permits cross references between causes will be attempted. Following is the analysis of the four main causes.

(1) Demand-Supply Relationships: Supply increase is assumed to be in line with the increase in demand when the quantity supplied clears the market at prices which assure, for the economy as a whole, equal returns to comparable resources.[1] The rate of increase in the supply of farm products is assumed by almost all agricultural economists to be too high relative to the increase in the demand for farm products, which implies relatively low returns in agriculture for comparable resources. However, both the allocation of agricultural income to the various resources and the definition and measurement of "comparable resources" is debatable, which cast doubts on the validity of the assumption that supply of farm products, in the United States, exceeded the demand for these products.

(2) The Competitive Structure: The competitive structure of United States agriculture is assumed to affect the farm sector in several ways. A competitive structure would prevent the firms in the sector from managing the supply of farm products or the demand for resources, which assures that malallocations caused by monopolistic or monopsonistic powers would not exist. Further, the nature of a competitive structure implies

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[1] For a detailed discussion of this topic see an earlier analysis of the Input Surplus issue.

that the forces pushing toward an optimal allocation of resources are stronger in agriculture than elsewhere, and therefore implies also that the correction of dynamic discrepancies in agriculture is done quicker than in other industries. Thus, competitive structure by itself cannot cause malallocation of resources, but Schultz suggested that because of the competitive structure farmers are compelled to adopt technological changes. He stated that:

> This constitutes the second major difference between agriculture and industry insofar as technological advances are concerned. Much plant and equipment may be made obsolete by the new technology, but the introduction of the new technique in agriculture will not be postponed to maintain the capital value of such obsolete investments. Competition makes it necessary for farmers to adopt the new technology or find themselves at a disadvantage relative to other farmers who do so.[1]

Similarly Cochrane forwarded the notion of the "agricultural treadmill,"[2] implying that farmers have to adopt the new techniques because of falling prices, resulting from the increase in agricultural output caused by the new technique.

Competition and falling prices, as such, will not force farmers to adopt new techniques. Only when the adoption is expected to be beneficial, increase income or reduce losses, will farmers move to adopt the new practices. New techniques are generally assumed to reduce costs, and increase income, by reallocation of resources, which suggests that if resources were fixed, as Cochrane assumed, new techniques would not have been adopted. Conditions advocating adoption of new techniques, in the

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[1] T. W. Schultz, The Economic Organization of Agriculture (New York: McGraw-Hill, 1953), p. 112.

[2] Willard W. Cochrane, Farm Prices, Myth and Reality (Minneapolis: University of Minnesota Press, 1958), p. 96.

case where resources are fixed, are those which are expected to render the fixed resources unless since they are expected to earn no economic rent.

Regarding the determination of expectations, it is generally assumed by economists that a competitive structure reduces the reliability of such expectations and increases the degree of uncertainty, which supposedly induces malallocation of resources. Increased uncertainty, however, does not necessarily increase malallocation, rather it is more likely to increase the degree of fixity.[1] For wrong expectations to increase the level of malallocation, given a dynamic framework, an additional condition is necessary--a relative inefficient adjustment mechanism, which prevents a rapid reallocation of resources. In the case of the United States neither the degree of uncertainty nor the efficiency of the adjustment mechanism in agriculture were shown empirically to comply with the necessary conditions inducing a relatively higher degree of resources malallocation in agriculture than in other sectors. On the other hand, Glenn L. Johnson presented several convincing arguments regarding the hypothesis of agricultural resources' fixity,[2] which precludes malallocation.

In conclusion, it is not clear how the competitive structure of agriculture is contributing to the relative higher degree of malallocation in farming. On the contrary, one might argue that the malallocation in agriculture, especially of labor, stems from the non-competitive structure of other sectors which prevent labor from being transferred. If the farm

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[1] See Francis Van Gigch forthcoming Ph.D. thesis, Dept. of Agri. Econ., MSU, on the impact of U.S. policies on agricultural resources allocation: 1917-1965.

[2] See the discussion of resources' fixity in the second chapter of this study.

sector was also non-competitive its relative welfare position might have been improved, but resource allocation would very likely be worse.

(3) The Rapidity of Technological Changes: The relationships between rapid technological changes, the increase in farm supply, and the demand for farm products was discussed earlier. It was concluded that given the present knowledge the hypothesis that supply of farm products increased too fast relative to the demand for farm products can not be conclusively proven.

Another important comparison is the one between the rate of technological change in the farm and in the nonfarm sectors. Several economists have studied the development of inputs productivity in the United States, either for the economy at large,[1] the agricultural sector alone,[2] or both.[3] To assure consistency the analysis will be based on the evidence presented in those studies which estimated both sectors.

Kendrick calculated the relative increase in total factor productivity from 1899 to 1957 (Table III-1). He concludes that on the average the productivity in agriculture increased in a lower annual rate than the increase in the nonfarm sector,[4] but that since the late 1930's the annual increase in the farm sector was higher than in other industries. Denison, calculating the increase in output per unit of input comes to the same

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[1] Moses Abramovits, "Resource and Output Trends in the United States Since 1870," Am. Econ. Rev., XLVI (May 1956).

[2] Ralph A. Loomis and Glen T. Barton, Productivity of Agriculture: United States, 1870-1958, U.S. Dept. of Agri., Tech. Bul. 1238 (Washington D.C., 1961).

[3] John W. Kendrick, Productivity Trends in the United States, A Study by the National Bureau of Economic Research (Princeton: Princeton University Press, 1961). And, Edward F. Denison, The Sources of Economic Growth in the United States: and the Alternatives Before Us, Supp. Paper No. 13, Committee for Economic Development.

[4] J. W. Kendrick, op. cit., p. 136, Table 34.

conclusion[1] although his figures suggest a smaller difference in the rate of change between farm and nonfarm industries than Kendrick's. Loomis and Barton estimated the increase in agricultural productivity, from 1929 to 1957, to be approximately 60 per cent with an annual rate of only 1.7 per cent.[2] Their estimates are lower than those of Kendrick, by almost 32 per cent. On the other hand Abramovits estimated that the net national product per unit of total input increased from 1919-28 to 1944-53 by 348 per cent,[3] or more than twice what Kendrick estimated for the same period. However, the results of such studies depend highly on the basic assumptions and data used, and therefore differences in magnitudes or direction are probable. The important conclusion for this study, on which all the mentioned studies agree, is that for a substantial period of time prior to the 1930's, at least, agriculture experienced lower rate of technological advances than the nonfarm sector. The importance of this finding will become evident when the effect of technological changes on labor transferability will be analyzed in Chapter III.

Technological changes can be classified into two main groups: (1) The allocative type. Those which increase production, or reduce costs, by reorganizing existing inputs, or (2) The additive type. Those which add to the production function previously unknown input, or change an existing input so as to render it new properties.[4]

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[1] E. F. Denison, op. cit., p. 221, Table 23.

[2] R. A. Loomis and G. T. Barton, op. cit., pp. 57-58, Tables 11, 12.

[3] M. Abramovits, op. cit., pp. 8-9, Table 1.

[4] The allocative type change might be considered as a specific case of the additive type, if knowledge is viewed as a legitimate input.

Table III-1. Private Domestic Economy: Average Annual Rates of Change in Total Factor Productivity, by Industries and Subperiods, 1899-1957.

				(percent)						
Industry	Pre 1899	1899-1909	1909-1919	1919-1929	1929-1937	1937-1948	1948-1953	1953-1957	1899-1957	1929-1957
Farming	0.9	-0.2	-0.3	1.2	0.8	2.7	3.7	4.3	1.4	2.6
Mining	1.4	0.8	1.4	3.5	4.3	1.0	2.9	..	..	..
Manufacturing	1.4	0.7	0.3	5.3	1.9	1.6	2.5	..	..	..
Transportation	3.3	0.9	3.2	3.1	4.1	4.7	3.3	..	..	..
Communication and public utilities	1.2	4.6	3.7	2.5	3.3	4.3	2.7	..	..	..
Private Domestic Economy	1.2	1.2	1.1	2.0	1.6	2.3	2.7	1.9	1.7	2.1

Source: John W. Kendrick, _op_. _cit_., Table 34, p. 136; Table A - XXII and Table B - II.

Another distinction is between neutral and non-neutral technological changes, depending on the resulting input ratios. If, for example, the adoption of a new technique does not change the ratio between labor and capital, given the same price ratio, then the technique is assumed to have a neutral effect. If the ratio changes, although the prices did not, then the technique is assumed to have a non-neutral effect, which may be labor or capital saving.

Today it is assumed that most technological changes are of the additive type,[1] which implies a relative long period of adjustment. It is recognized that technological change does not instantaneously convert all similar existing inputs to the new, more productive, form,[2] and therefore implies a change in the relative demand for specific inputs. Different rates of technological change in different industries may also cause a change in the relative demand of the various industries for competing resources. If the difference in rates is large enough or sustains for long enough, some resources may become non-competing because of lack of demand for them.

The consequences of such divergence in rates of technological change with respect to labor is of specific interest for this study. The following chapter will deal with this issue in detail.

(4) Resources Fixity: The proposition that United States agriculture suffers from a high degree of resource fixity takes several forms.

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[1] Harvey Leibenstein, "Allocative Efficiency vs. 'X-Efficiency'", Am. Econ. Rev., LVI, No. 3 (1966). For further references see the References section of the mentioned article.

[2] T. W. Schultz, The Economic Organization of Agriculture, pp. 112-114.

First, is the notion of physical fixity. Land and buildings are assumed to be fixed simply because it is impossible, or very difficult to move them. However, this notion has no economic validity since the transfer of inputs need not be physical. Inputs may be shifted by changing ownership, or by changing the industry employing them.

The second proposition is that an input is fixed when it is durable. Farm equipment is assumed to be fixed since it is used on the farm for more than one production period. But, again, nothing in the nature of durable goods compels farmers to emply them more than one production period. Farmers may sell, rent, etc. such equipment if they so wish.

A third notion of fixity is the contention that in agriculture it takes relatively longer to transform inputs into final production, and that maintenance costs are higher in agriculture. The result is assumed to be a longer expectation span and a reluctancy to idle assets of production. However, I know of no conclusive study that showed these assumptions to be true, or probable.

The fourth proposition regarding fixity is that a resource is fixed if in a given time it is technically impossible to change its amount. This proposition suffers from two disadvantages: (1) It is based on an arbitrary time span and not on economic considerations; (2) It does not cover those resources, the quantities of which can technically be changed in the given time, but do not change although their present amount is not the long-run optimal one.

The fifth suggestion concerning fixity of resources is the one put

forward by Glenn L. Johnson.[1] He states that economically an input should be considered fixed when its MVP is smaller than its acquisition-cost and larger than its salvage-value. Then, and only then, would no change improve the producer position, although his production is not at the long-run high profit point. This is the only proposition which uses economic considerations in defining fixity. An additional merit of the last proposition for the present study is the recognition that a fixed input cannot be, by definition, a malallocated input. If an input is fixed then by definition its present employment is the best one it can expect, and no reallocation would be able to increase its MVP.

Upon completion of the analysis of the four main causes assumed to be responsible for the present farm situation a summary is due. (1) It is not clear that the present prices of agricultural products do not result in equal returns to comparable resources, or that the divergence of actual returns from the "equal" ones is greater in farming than in other sectors. (2) The competitive structure of United States agriculture should assure, theoretically at least, that the relative degree of malallocation in agriculture would be lower than in other sectors of the economy. (3) Since it is not known if the present farm products prices enable equal return to comparable resources, it is also impossible to conclude that the rate of increase in supply exceeds the rate of increase in demand. Present, or 1960, farm products prices were maintained with the help of government intervention. The direct subsidies in 1960

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[1] Glenn L. Johnson and Lowell S. Hardin, Economics of Forage Evaluation, Station Bul. 623 (Lafayette, Ind., Agri. Exp. Stat.), April 1955. Glen L. Johnson, "The State of Agricultural Supply Analysis," J. Farm Econ., XLII, No. 2 (1960). Glen L. Johnson, "The Labour Utilization Problem in European and American Agriculture," Agri. Econ. Journal, XIV, No. 1 (1960).

amounted to 5.2 per cent of total net agricultural income.[1] It is impossible now to predict what prices would have been had the government not intervened at all. On the other hand, it is safe to say that had the government ceased its intervention in 1960, agricultural prices would have declined and other structural changes would have occurred. However, the relevant issue is not what would have happened in 1960, but rather how rapidly agriculture would have readjusted, and at which level this readjustment would have ended. Unfortunately, at the present agricultural economists are unable to answer these questions conclusively. (4) I could find no comparative study indicating that the degree of resource fixity is higher in United States agriculture than elsewhere. Further, the asserted incidence of fixity emphasizes the imperfect knowledge of mankind (past expectations were wrong), but does not indicate that a more efficient allocation is possible at the present. It appears therefore that the analysis of the general farm problem cannot be applied directly to the understanding of the present farm labor situation. However, although the sector as a whole might not have conclusive characteristics causing malallocation, labor as an individual resource may have such characteristics and the previous analysis.

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[1] U.S. Dept. of Agri., Farm Income Situation, ERS - FIS 203, *op. cit.*, p. 40, Table 2 H.

CHAPTER III

The Farm Labor Surplus Hypothesis

In the previous chapter the applicability of the general analysis of the farm problem to the farm labor issue was discussed. The conclusion reached was that although the general analysis does not explain conclusively the present situation of United States farm labor, this labor might have specific characteristics which are responsible for its position.

Historically, the forces affecting United States agriculture were assumed to influence all resources, however, labor was singled out almost to the exclusion of all other resources. The main feature of labor responsible for the above was suggested in the Introduction, namely: Labor stands for people, the ultimate recipients of the benefits which economic analysis is supposed to produce. Other features, forwarded by Schultz,[1] are (1) Labor is assumed to constitute the bulk of the inputs employed in agriculture; (2) Technological changes are assumed to be largely labor saving; and (3) Labor is assumed to be transferable.

In the remainder of this chapter an analysis of the main features of farm labor will be attempted. The objective is to test the relationship between the labor surplus hypothesis and those specific characteristics.

(1) Labor Means People: The first feature of labor is clear enough and therefore does not need much discussion. Further, it does

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[1] T. W. Schultz, Agriculture in an Unstable Economy, *op. cit.*, p. 82.

not relate directly to the issue of resource malallocation, but rather to the welfare connotations of personal income distribution.

(2) The Relative Importance of Labor: The suggestion that labor constitues the bulk of United States agricultural resources suffers from two flaws. First, regarding solutions of the farm problem, or the adjustment of labor's malallocation, the relative importance of any resource depends on the relative response of agricultural supply to changes in the amount of the resource analyzed. Assuming that labor is the bulk of agriculture's resources does not necessarily imply that labor is also the key to the problem. To suggest that labor is the crucial factor, one has to assume that labor's elasticity of production is relatively high, or that many units of labor can be easily "adjusted," and that the elasticity of substitution for labor is low. Most estimates suggest that labor has a relative low elasticity of production, and no one has yet proven that "sufficient" units of labor are transferable.

The second flaw relates to the measurement of labor's portion in the aggregate of farm resources. Aggregation of different resources can be done only by means of aggregating values. However, to value labor one has to know its unit price and the amount of units available. Assuming a perfectly mobile economy there would exist only one price of labor units, but at the same time no malallocation issues would exist. Accepting that farm labor in the United States is out of equilibrium then its valuation should be done according to its opportunity-cost in the nonfarm sector. When stock resources such as human capital and durable goods are considered an additional problem arises: By which rate should future income streams be discounted to find their present value? Do farm and nonfarm people have similar or different time preference? If they have different time

preference the same discount rate would not secure a measure of comparable real present income.

In short, the problem of valuing agricultural resources evolves around the old issue of comparable returns, or real opportunity-costs. Until what constitutes comparable returns is known, valuing farm resources is at the best an educated guess.

(3) <u>Technological Changes and Labor</u>: Technological changes affect labor not only by means of its rate of substitution, but also by changing the relative demand for various labor properties. While discussing earlier the effect technological changes exert on resources, it was suggested that in the case different industries experience different rates of technological advances the industry advancing quicker might decrease its demand for relatively lower quality resources, and thereby causing the opportunity-costs of those relatively low quality resources to decline, relatively or absolutely. In this connection it is interesting to compare the advances of labor in the economy at large and in the farm sector.

(a) The Economy at Large - One measure of the quality of the labor force is the change in its occupational distribution. Assuming that a higher median earnings reflects a higher productivity of labor, in production terms, a change in the distribution of occupations towards the higher earning ones will indicate an increase in quality. Utilizing 55 occupational groups, Tolley[1] found that the quality of the nonfarm labor force increased by only 5 per cent from 1910 to 1950. An extension of Tolley's estimate covering the period 1950-1960 and utilizing 12

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[1] G. S. Tolley, "Measurement of Labor Input: Some Questions of Definition and the Adequacy of Data: Comment," Output, Input, and Productivity Measurement, <u>op</u>. <u>cit</u>., p. 378.

occupational groups, revealed that during this period quality advanced by another 1.5 per cent.

However, Tolley's calculations underestimate the true change in the quality of the urban labor force because he assumed that the quality within each occupational group did not change by disregarding the change in median age and median years of schooling, at least.

Table III-2 presents the change in median years of school completed by major occupations. The common trend is obvious--a steady increase in years of school completed. This trend emphasizes the inappropriateness of using occupational groups as bench marks for measuring labor quality. Not only does time affect quality within each occupation, but it affects each occupation differently. Especially significant for this study is the relative outstanding increase of schooling in "Blue-collar" occupations such as Craftsmen, Operatives, and Laborers, which are the main outlets for farm labor. This increase supports the contention of this study that technological changes, if they occur at different rates in different industries, may reduce the salvage-value of resources in the slower industry. The increased divergence in educational attainments between farm occupations and other occupations is inevitably going to reduce the relative earnings of farm people, if education is related to labor quality.

A second correction that should be made in Tolley's estimates of labor quality is an allowance for age (Table III-3). Correcting for age, however, is not straight forward since the influence of age on earnings, or assumed quality, is not expected to be the same for each occupation.

In conclusion, past trends indicate clearly that the levels of

Table III-2. Median Years of School Completed, by Occupation, 1950-1965.

(Both Sexes)

Occupation[a]	1950[b]	1959		1965	
		School Years	Index (1950 = 100)	School Years	Index (1950 = 100)
Professional	15.8	16.2	102.5	16.3	103.2
Managers	12.2	12.4	101.6	12.6	103.3
Clerical	12.4	12.5	100.8	12.5	100.8
Sales workers	12.0	12.4	103.3	12.5	104.2
Craftsmen	9.5	11.0	115.8	11.7	123.2
Operatives	8.9	9.9	111.2	10.6	119.1
Private household workers	8.2	8.4	102.4	8.9	108.5
Service workers	9.2	10.3	111.9	11.3	122.8
Laborers	8.2	8.6	104.9	9.5	115.9
Farmers	8.3	8.7	104.8	8.8	106.0
Farm laborers	8.0	8.3	103.8	8.4	105.0

[a] For the complete name and definition of the occupation-groups see: U.S., Bureau of the Census, Census of Population: 1960, _Final Report PC (1)_ - D, pp. XXVIII - XXXIV.

[b] The figures of 1950 are for the experienced civilian labor force 14 years old and over, while the figures of 1959 and 1965 are for the employed civilian labor force 18 years old and over. The difference in the population covered might cause an overestimation of the gains of occupation with low level of school years completed.

Source: 1950: U.S., Bureau of the Census, _Census of Population: 1950_ (Washington: Government Printing Office, 1956), Vol. IV, Part I, Chap. B, Table 10.

1959 and 1965: U.S., Dept. of Labor, _Manpower Report of the President_ (Washington: Government Printing Office, 1966), p. 191, Table B-12.

Table III-3. Age of Employed Persons, by Occupations, 1940-1960.

(Median Age)

Occupation[a]	Male 1940	Male 1950	Male 1960	Female 1940	Female 1950	Female 1960
Professional	38.7	39.0	38.2	33.4	36.4	41.2
Farmers	46.6	45.1	49.2	52.1	50.6	51.4
Managers	44.5	44.7	45.4	44.3	44.7	47.9
Clerical	35.2	36.4	38.0	29.9	29.7	36.0
Sales workers		37.1	39.2		37.3	43.3
Craftsmen	41.4	40.8	41.8	37.2	39.7	43.6
Operatives	34.0	36.1	38.4	31.1	36.7	41.1
Private household workers	38.7	45.9	47.2	33.6	41.1	44.8
Service workers	38.8	44.0	43.4	34.2	38.7	41.7
Farm laborers	24.9	26.6	31.2	26.6	36.1	40.0
Laborers	34.9	37.4	37.4	29.2	36.3	39.1

[a] See footnote a in Table III-2.

Source: 1940: U.S., Bureau of the Census, *Sixteenth Census of the United States: 1940* (Washington: Government Printing Office, 1943), Vol. III, Part I, Table 65.

1950: U.S., Bureau of the Census, *Census of Population: 1950* (Washington: Government Printing Office, 1953), Vol. II, Part I, Chap. C, Table 127.

1960: U.S., Bureau of the Census, *Census of Population: 1960*, Final Report PC (1) - 1D (Washington: Government Printing Office, 1963), Table 204.

education of the various occupations will increase.[1] Past trends and projections for the future suggest that the occupational distribution will also shift towards the higher skilled ones (Table III-4).

However, the most significant development concerning education and skills, for the purposes of this study, is not the evidence that educational levels increased, but that the <u>demand</u> for education and skill increased. Table III-5 reveals that during the fourteen years between 1949 to 1963 the <u>relative</u> incomes of educated people increased in accordance with the amount of school years completed. In spite of the increase in the supply of educated people their "price" increased instead of falling. The "weak" performance of those who completed 1 to 3 years of college can be explained by the change in the distribution within the group towards first year students. In 1950 the group which completed 1 to 3 years of college consisted of 38.2 per cent first year students, 42.1 per cent who completed two years of college, and 19.7 per cent of third year students. The corresponding figures for 1960 were: 40.9; 39.8; and 19.3 per cent. The same occurred within the group that completed four or more years of college.

Summarizing the developments in labor quality as reflected in the economy of the United States and especially in the nonfarm segment, it is clear that the trend has been towards increased productivity of the labor force by means of higher education, better training, and heavier emphasis on highly skilled occupations.

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[1] Issac K. Beckes, "Alternative Approaches to Post-High School Education," <u>Increasing Understanding of Public Problems and Policies</u> (Chicago: Farm Foundation, 1964), p. 60.

Table III-4. Actual and Projected Employment, by Major Occupation, 1950-1975.

(Percent Distribution)

	Actual			Projected	
Occupation[a]	1950	1960	1965	1970	1975
Professional	7.5	11.2	12.3	13.7	14.9
Managers	10.8	10.6	10.2	10.3	10.4
Clerical	12.8	14.7	15.5	16.3	16.5
Sales workers	6.4	6.6	6.5	6.5	6.5
Craftsmen	12.9	12.8	12.8	12.8	12.8
Operatives	20.3	18.0	18.6	17.5	16.7
Service workers, inclusive	11.0	12.5	12.9	13.5	14.1
Laborers	5.9	5.5	5.3	4.6	4.2
Farmers, managers, laborers	12.5	8.1	5.9	4.8	3.9

[a] See footnote a in Table III-2.

Source: U.S., Dept. of Labor, Manpower Report of the President (Washington: Government Printing Office, 1966), Table A-10, p. 165 and Tabel E-6, p. 217.

(b) The Farm Sector - One basic fact regarding farm people that was too often ignored in past analyses, is the realization that United States agriculture is not a homogeneous entity, and therefore different groups in the farm population react differently to the same developments Hathaway mentions the difference in the capacity to adjust of different age groups in agriculture,[1] while Nelson states:

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[1] Dale E. Hathaway, "Migration From Agriculture: The Historical Record and its Meaning," *Amer. Econ. Review*, L (May, 1960), pp. 386-88.

> It would be a serious error to assume that all farm people are affected by technological advances in the same manner or to the same extent. While all may be affected in one way or another, directly or indirectly, there are wide differences in their opportunities to take advantage of new developments.[1]

Table III-5. Annual Mean Income of Males 25 Years Old and Over, by Years of School Completed, Selected Years 1949-1963.

Years of School Completed	1949	1956		1963	
	Dollars	Dollars	Index[a]	Dollars	Index[a]
Elementary:					
Less than eight years	2,232	2,979	133.5	3,641	163.1
Eight years	2,988	4,079	136.5	4,921	164.7
High School:					
1 - 3 years	3,279	4,634	141.3	5,592	170.5
4 years	3,820	5,553	145.4	6,693	175.2
College:					
1 - 3 years	4,489	6,505	144.9	7,839	174.6
4+ years	6,236	8,716	139.8	10,062	161.3

[a] Index: 1949 = 100

Source: U.S., Bureau of the Census, Statistical Abstract of the U.S.: 1960 (Washington: Government Printing Office, 1966), p. 116, Table 158.

The difference in the opportunities to take advantage of technological advance is assumed to be due to: (1) Wide diversities in natural resources, (2) Variation in the size of the farm, and (3) Diversity in

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[1] Lowry Nelson, "Education in a Changing Rural Life," Education in Rural Communities, Fifty-First Yearbook of the National Society for the Study of Education, Part II (Chicago: University of Chicago Press, 1952), p. 11.

the socioeconomic characteristics of the population.[1] Of these three causes the one that seems to have the greatest significance is the third one. The diversity of natural resources by itself cannot explain the difference in the rates of technological adoption. If the natural resources are not suitable a solution is for labor to move to another area. If people are assumed to be equally capable and transferable, then there is no reason that they will not move to where their capability would return the most. The variation in the size of the farm is essentially a reflection of diversity in managerial capability and in the stock of capital. Managerial capability clearly belongs to item (3) above, and recent studies indicate that capital rationing may also be related to those socioeconomic factors.

Hesser and Janssen, examining "what factors could be associated with farmers' use and non-use of credit"[2] found that farmers' reaction to uncertainty, their knowledge of credit resources and policies, and their attitude toward using credit were statistically significant factors affecting the internal capital rationing. In a series of two studies Lindsey reports on an examination of the problem of "how low income farm families may reorganize their farm operations in order to increase the income available for family living."[3] The method of investigation was to provide representative families with the credit and managerial information needed and watch their progress. Serious difficulties were encountered

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[1] Nelson, loc. cit.

[2] Leon F. Hesser and Melvin R. Janssen, Capital Rationing Among Farmers, Research Bul. 703 (Nov. 1960), Purdue Univ. Agri. Exp. Stat., Lafayette, Ind., p. 2.

[3] Quentin W. Lindsey, Transforming Low Income Farms into Profitable Commercial Farms, A.E. Information Series No. 76, Dept. of Agri. Econ., North Carolina State College (Raleigh, N.C.), May 1960, p. 3.

which appeared to stem from prices declining below expectations, and managerial problems becoming too complex to permit the operators to master the technical knowledge, and to effectively allocate labor and managerial time. In his second report Lindsey says:

> A farm must continue to grow in response to changes in the economic environment in which it exists; otherwise it faces extinction as a commercial farm.
>
> The term reorganizational capacity may be used to refer to the ability of a farm to continue to grow.[1]

The capacity to reorganize is clearly dependent on the managerial ability of the farmer as well as on other socioeconomic factors.

Additional evidence supporting the contention that the size of farm operation depends to a significant extent on socioeconomic factors is present in Table III-6. The positive correlation between gross farm sales and education appears clear. It is also evident that even in agriculture high volume farm operation and no formal education is incompatible.

Thus it appears that socioeconomic factors determine to a large extent the capacity of farm people to take advantage of technological changes. Nelson points out that the retention of mother tongue (other than English), tenure, age, formal education, etc., clearly hampers the capacity to adjust.[2]

Of the mentioned factors affecting adjustment only two can be directly measured, age and formal education. That farm operators are on the average older than people in other occupations was shown in Table III-3. A discussion of the relative position of rural-farm people with

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[1] Quentin W. Lindsey, Financing the Development of Commercial Farms, A.E. Information Series No. 77, Dept. of Agri. Econ., N. Carolina State College (Raleigh, N.C.), June 1960, p. 3.

[2] Nelson, *op. cit.*, p. 16.

regard to formal education follows.

Table III-6. Percentage Distribution of Operators of Farms, by Amounts of Gross Sales and School Years Completed, 30 States, 1962.

School Years Completed	Less than $250	$250 to $1,499	$1,500 to $2,499	$2,500 to $4,999
None	1.0	1.5	2.8	1.0
1 - 4	12.5	11.8	10.4	8.7
5 - 7	22.4	23.0	23.5	19.2
8	24.9	26.0	30.1	29.9
High School and College	31.4	33.6	30.6	38.4
Unclassified	0	4.0	2.9	2.8

School Years Completed	$5,000 to $9,999	$10,000 to $14,999	$15,000 to $24,999	$25,000 and over
None	1.0	0	0	0
1 - 4	3.5	2.3	1.4	.9
5 - 7	16.2	9.1	6.6	5.0
8	32.9	36.4	32.1	32.9
High School and College	44.2	48.0	57.4	60.2
Unclassified	2.0	4.0	2.5	1.0

Source: E. J. Moore, E. L. Baum, and R. B. Glasgow, Economic Factors Educational Attainments and Aspirations of Farm Youth, Dept. of Agri., ERS, Agri. Econ. Report No. 51, April 1964, p. 22, Table 17.

Median years of school completed by persons 25 years old and over was lower in the rural-farm sector than in the urban one. This trend appears during the last two decades, at least, as shown in Table III-7.

Table III-7. Meadian Years of School Completed for Persons 25 Years Old and Over, 1940-1960.

Residence	1940		1950		1960	
	Median Years	Index	Median Years	Index	Median Years	Index
Urban	8.7	100.0	10.2	117.2	11.1	127.6
Rural Farm	7.7	100.0	8.6	111.7	8.8	114.3

Source: 1940: U.S., Bureau of the Census, Statistical Abstracts of the U.S.: 1950 (Washington: Government Printing Office, 1950), p. 113, Table 133.

1950 and 1960: E. J. Moore, E. L. Baum, and R. B. Glasgow, _op. cit._, p. 4, Table 2.

Three remarks regarding Table III-7. First, the definition of rural-farm residence in the 1960 Census is different from that which was employed in the 1950 Census. However, the reduction in rural-farm population caused by the change in residence definition was distributed among rural-farm age groups almost evenly.[1] The effect of the new definition on the median years of school completed by rural-farm persons 25 years old and over was negligible.

Second, the age structure of rural-farm and urban populations of persons 25 years old and over was not the same. In 1960, 27.0 per cent of the urban population were 25-44 years old, 20.7 per cent were 45-64 years old, and 9.1 per cent were 65 years old and over. The corresponding figures for the rural-farm popultion in 1960 were: 21.1 per cent, 23.3 per cent, and 9.3 per cent respectively.[2] It is interesting to note

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[1] U.S., Bureau of the Census, Dept. of Agri., _Farm Population_, Series Census - AMS (p-27), No. 28 (April, 1961), _p. 13_, _Table 1_.

[2] Hathaway, Beegle and Bryant, The People of Rural America, _op. cit._, Chap. 3, Table 3-2.

that in 1960 the difference between the median years of school completed by urban and rural-farm people of 25-29, and 55 and over years of age was less than one year. However, the difference in median years of school completed for 30-54 year old persons was more than two years of schooling, with the largest difference (more than three years) in the age group of 40-44 years old.[1] Realizing that in 1960 the highest earnings were by persons 35-54 years old,[2] the difference in educational attainment between urban and rural-farm people revealed in Table III-7 might be underestimated, since it is not weighted according to the age-education-earnings relationships.

Third, it should be recognized that different levels of education (Elementary school, High school, etc.) have different effect on earnings. Therefore, the quality of labor with regard to earnings depends also on the distribution of levels of education. Table III-8 indicates that in 1940 and 1950 the measure of median years of school completed overestimated the relative quality of rural-farm people and in 1960 it underestimated the relative quality. The "quality" of rural-farm people, measured in educational attainment, in 1940, 1950, and 1960 is indicated in Table III-7 as: 89, 84, and 79 per cent respectively. The corresponding estimates in Table III-8 are: 82, approximately 82, and approximately 86 per cent respectively. Table III-8 indicates also that in the last decade rural-farm people increased their labor quality, measured by formal years of schooling, twice as fast as urban people.

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[1] U.S., Bureau of the Census, Census of Population: 1960, Final Report PC (1), p. 404, Table 173.

[2] Ibid., p. 580, Table 219.

Table III-8. Quality of Labor Input Farm vs. Urban as Measured by Changes in Years of School Completed.

Males, 25 yrs. & older		Median Income 1959, Total Population	Distribution of years of school completed					
			Urban			Rural Farm		
Year of School Completed		$	1940[a]	1950[a]	1960	1940[a]	1950[a]	1960
None		1,439	3.6	2.4	2.2	5.3	3.7	2.8
Elementary:	1-4	1,844	8.4	7.5	5.6	17.7	16.0	11.3
	5-7[b]	3,062	18.5	14.6	13.0	26.9	24.2	20.2
	8	3,885	26.1	19.5	16.2	29.1	27.3	26.7
High School:	1-3	4,847	15.6	17.9	19.5	11.0	13.0	14.3
	4	5,437	14.7	20.7	22.2	6.3	10.9	17.8
College:	1-3	5,980	5.9	8.3	9.8	2.5	3.1	4.4
	4	7,646	7.2	9.1	11.5	1.2	1.8	2.5
Quality measure								
Dollars			4,246	4,563	4,780	3,474	3,696	4,020
Index (1940 = 100)			100	107	113	100	106	116
Index (Urban = 100)			100	100	100	82	81	84

Female, 25 yrs. & older		Median Income 1959, Total Population	Distribution of years of school completed					
			Urban			Rural Farm		
Years of School Completed		$	1940	1950	1960	1940	1950	1960
None		687	3.6	2.4	2.2	4.2	2.6	1.8
Elementary:	1-4	734	7.2	6.6	4.6	13.8	11.5	6.8
	5-7[b]	898	17.7	14.1	11.8	26.1	22.2	17.1
	8	1,111	25.2	19.0	16.4	27.7	25.4	23.2
High School:	1-3	1,616	16.5	18.3	20.1	13.2	15.5	16.7
	4	2,186	18.9	25.6	28.9	9.2	14.9	23.5
College:	1-3	2,402	6.4	8.1	9.5	4.4	5.7	7.8
	4	3,751	4.5	5.9	6.5	1.4	2.2	3.1
Quality measure								
Dollars			1,519	1,674	1,766	1,245	1,379	1,561
Index (1940 = 100)			100	111	116	100	111	125
Index (Urban = 100)			100	100	100	82	82	88

[a] The figures for 1940 and 1950 were corrected to exclude the "not reported" group to make them consistent with 1960 figures.

[b] 1940 breakdown was 5-6 and 7-8 years of elementary school completed. To comply with income figures of 1960 the present grouping was devised. 1950 relationships of 7 and 8 in the 7-8 category were used to break down the 1940 category. Because of the upward trend in education the adjustment overestimates the quality of 1940, or underestimates the increases in 1950 and 1960.

Source: Median Income: U.S., Bureau of the Census, *Census of Population: 1960*, Final Report PC(1)-1D (Washington: Government Printing Office, 1963), Table 223.

Rural Farm: 1940: Zvi Griliches, "Measuring Inputs in Agriculture: A Critical Survey", *J. Farm Econ.*, XLII, No. 5 (1960), p. 1415.

1950: As for 1940.

1960: U.S., Bureau of the Census, *Census of Population: 1960*, Final Report PC(1)-1D, Table 173.

Urban: 1940: U.S., Bureau of the Census, *Sixteenth Census of the United States: 1940*, (Washington: Government Printing Office, 1943) Vol. II, Part I, Table 13.

1950: U.S., Bureau of the Census, *Census of Population: 1950* (Washington: Government Printing Office, 1953), Vol. I, Part I, Table 44.

1960: U.S., Bureau of the Census, *Census of Population: 1960*, Final Report PC(1)-1D (Washington: Government Printing Office, 1963), Table 172.

In summary, the previous discussion suggested that the quality of farm labor, measured by earning capacity, is lower than the urban labor with regard to age and formal education. However, there is evidence that the rural-farm population began in the last decade to close the gap.

(3) Labor Saving Technological Changes - Another effect that technological changes are assumed to have on farm labor is the substitution of capital for labor. The term "labor saving" is an ill defined concept which takes different meanings with different economists. If labor saving technique is understood to mean a technique with which a given output can be produced with fewer workers, then every innovation or even reallocation of resources might be called labor saving. It is doubtful if such definition will be useful, since any technological advance, even in a complementary resource, will enable the production of a given output with fewer labor resources. The labor saving postulate might gain meaning if it were reserved for those technological changes which reduce the marginal rate of substitution, given the price ratio, of labor for capital. There is, however, no conclusive evidence that such a reduction in rates of substitution really occurred. The fact that more units of labor service than of other resources outmigrated from agriculture is not sufficient proof, since this may be the result of labor having better alternatives rather than the result of substitution.

The factor shares method of allocating income to various resources suggests, for example, that on the average technological advances in United States agriculture were neutral. In two studies almost 20

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[1] D. Gale Johnson, "Allocation of Agricultural Income," *J. Farm Econ.*, XXX, No. 4 (1948), pp. 724-749. And D. Gale Johnson, "Output and Income Effects of Reducing the Farm Labor Force," *J. Farm Econ.*, XLII, No. 4 (1960), pp. 779-796.

years apart, D. Gale Johnson came to the same tentative conclusion that during 1910-1959 labor showed a relative stability in its share of agricultural income which "suggests the possibility that the underlying production function may be of the Cobb-Douglas type and that technological change has been neutral throughout the period."[1]

Similar conclusions, at least till 1946, were reached by Ruttan and Stout.[2]

Chandler,[3] pursuing the avenue of neutral technological changes, and using Solow's[4] method, concluded for the period 1946-1958 that the recent farm experience in the United States indicates that most of the technological revolution occurred "on the strength of other productivity factors with increasing capital intensity serving primarily as a complimentary force.[5]

Because "the problem of identifying and measuring the aspect and the effect of technological change that are embodied in physical capital and the aspect and effect that are associated with intangible factors. . . is eminent,"[6] the best that can be concluded is that the "labor-saving"

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[1] D. Gale Johnson, Output and Income Effects of Reducing the Farm Labor Force, _op_. _cit_., p. 792.

[2] Vernon W. Ruttan and Thomas T. Stout, "Regional Difference in Factor Shares in American Agriculture: 1925-1957," _J_. _Farm_ _Econ_., XLII, No. 1 (1960).

[3] Cleveland A. Chandler, "The Relative Contribution of Capital Intensity and Productivity to Changes in Output and Income in the U.S. Economy, Farm and Nonfarm Sectors, 1946-58," _J_. _Farm_ _Econ._, XLIV, No. 2 (1962), pp. 335-348.

[4] Robert M. Solow, "Technical Change and the Aggregate Production Function," _Rev_. _Econ_. _and_ _Statistics_, XXXIX (Aug., 1957), pp. 312-20.

[5] Chandler, _op_. _cit_., p. 347. Other productivity factors include changes in intensity or average degree of skill of labor; changes in the effectiveness of organization and administration; etc.

[6] _Ibid_., p. 335.

hypothesis has no strong support and therefore should be viewed with doubt.

Here again, it should be emphasized that United States agriculture is not homogeneous, and as Bachmura describes:

> It may come of something of a surprise to some readers to learn that, in a decade of rapid mechanization, both within the study area and the nation, the number of horses and mules on farms increased in ten of the twenty-four counties considered.[1]

Therefore, when analyzing general trends in United States agriculture one has always to keep in mind the diversity in the farm sector.

(4) Labor Is Transferable: Of the four main features of the farm labor the assumption that labor is transferable is the most important one; it is the crux of the labor surplus hypothesis.

Labor's transferability was not conceived as a mere physical movement but a method to "correct the excess supply of labor in the farm sector by internal migration."[2] The migration of labor out of agriculture was assumed to be beneficial on two accounts: (1) "Those who remain benefit by an increase in farm-labor returns caused by a reduction in the supply of agricultural labor,"[3] and (2) "Those who leave farming for more rewarding jobs or work off the farm benefit directly by an increase in earnings."[3] Each account will be examined separately in the following, and first the benefits to those who remain in agriculture.

(1) One of the basic premises of production economics is that a change in the relative amounts of various factors of production changes their marginal physical product (MPP). In the case of agriculture the

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[1] F. T. Bachmura, "Migration and Factor Adjustment in Lower Mississippi Valley Agriculture: 1940-50," J. Farm Econ., XXXVII (Nov. 1956), p. 1040.

[2] T. W. Schultz, Agriculture in an Unstable Economy, op. cit., p. 84.

[3] A. D. Waldo, "The Impact of Outmigration and Multiple Jobholding upon Income Distribution in Agriculture," J. Farm Econ., XLVII (Dec., 1965), p. 1235.

above is translated into the assumption that outmigration of labor from agriculture will raise the MVP of labor in agriculture and therefore its income.

It seems, however, that several basic conditions would have to be satisfied first before the Law of Variable Proportions[1] could be applied to the analysis of the farm labor problem. Those conditions are: (1) The resources considered must be variable (mobile), (2) The units of each resource considered must be equal, so that it would not matter which specific unit moves in or out of production, or in an extreme case (3) The MPP, or MVP, of the considered resource is negative at the time of the analysis and therefore may increase no matter which unit of resource is migrating.

The second condition, which specifies equality of units of resource, might be relaxed, for the case in which the observed units of resource incorporate different amounts of service, if one assumes that the units having the lowest MVP's are always the first to outmigrate. However, the last assumption implies first that units of resource with low MVPs are the most mobile, and second that the relative difference between present MVPs and future opportunity-costs is larger the lower the present MVPs.

Applying the mentioned conditions to the reality of United States agriculture in 1960 reveals that two necessary conditions are missing and another is in doubt. First, it is generally assumed that negative MPPs do not exist in the farm sector of the United States. It is also obvious, although generally ignored, that the observed units of resources, especially in the case of labor, do not possess equal amounts of services.

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[1] Milton Friedman, op. cit., p. 123.

Third, there is no conclusive evidence that those who migrate from the farm have the lowest MVPs, or that a negative correlation exists between the MVPs of resources in agriculture and their salvage-value in other sectors.

In conclusion, it is not imminent that outmigration from agriculture will result in increased returns to farm labor remaining in agriculture. Hathaway observed it for the period 1920-1950 stating that "Where migration has occurred its selectivity has created conditions tending to retard the recombination of remaining resources."[1] Bachmura[2] found that the rank correlation between median county income and inmigration is positive, high and very significant, however, Cheng[3] found that in spite of a higher rate of outmigration from low-income regions the income disparity between the higher income regions in Michigan and the lower income ones has increased.

The same was found for urban communities. Myers reports that "there was little evidence that voluntary movement had the effect of reducing differentials in rates for comparable jobs, as economic theory assumes."[4]

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[1] Dale E. Hathaway, "Migration From Agriculture: The Historical Record and its Meaning," Am. Econ. Review, L (May, 1960), p. 385.

[2] F. T. Bachmura, "Migration and Factor Adjustment in Lower Mississippi Valley Agriculture: 1940-50," J. Farm Econ., XXXVIII (Nov. 1956), p. 1027.

[3] Kenneth C. I. Cheng, "Economic Development and Geographical Wage Rates in Michigan 1940-57" (unpublished Ph.D. dissertation, Dept. of Agri. Econ., Michigan State University, 1959).

[4] Charles A. Myers, "Labor Mobility in Two Communities," Labor Mobility and Economic Opportunity, Essays (Cambridge, Mass.: The M.I.I. Press, 1954), p. 71.

Thus, the proposition that mere outmigration from agriculture would correct the income disparity between the farm sector and the rest of the economy is a doubtful one.

(2) The second reason outmigration is believed to increase the returns to labor is the assumption that those who leave farming find more rewarding jobs. As it stands this proposition is unquestionable since no one will leave farming and stay in the nonfarm sector for a substantial period unless he believes that his nonfarm earnings are higher, or equal, to his farm ones. But, the real question should be: Is there a demand in the nonfarm sector for the existing farm labor and at which "price"?

Short of having a complete model of the economy of the United States it is almost impossible to answer this question unequivocally. However, there are indirect indications, in times based on specific assumption, which can be inferred.

(1) The historical trends of migration from agriculture have been documented by Hathaway.[1] Between 1920 to 1960 the net outmigration from the farm sector amounted to almost 32 million people,[2] the size of the total farm population in 1920. The annual rates of change ranged from 2.0 per cent in the decade of 1920-30 to 5.3 per cent in the decade 1950-60.[2] There are no studies of occupational mobility in the United States by decades to enable a comparison of the occupational mobility of farm people, revealed in the mentioned figures, to the mobility of other occupations. The studies which are available are for specific years only. In 1955 and 1961 the Bureau of the Census conducted two national surveys

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[1] Dale E. Hathaway, "Migration from Agriculture: The Historical Record and its Meaning," J. Farm Econ., L (May 1960), pp. 379-391.

[2] Banks, Calvin, Beale and Bowles, op. cit., p. 20, Table 3.

to examine the extent of job changing. In the reports of these two surveys[1] indirect information on occupation mobility was given. Table III-9 indicates first that mobility rates are not constant. One reason for the difference between the mobility rates in 1955 and 1962 could be the difference between the unemployment rates of the nonfarm sector in these two years. The rates of unemployment in the nonagricultural sector were 4.2 per cent in 1955 and 6.7 per cent in 1962.[2] Second, it appears that the mobility rate of farm occupations, allowing for the various characteristics which reduce mobility, is at least not different than other occupations. The mentioned characteristics are: Age, assets, and education. It has been observed that age reduces mobility[3] and since the median age of farmers was in 1960 higher than of other occupations (Table III-3) one should expect a relatively lower rate of mobility. The possession of assets has also been observed to reduce mobility.[4] Since most farmers are associated with relatively more assets than people in other occupations their mobility should be expected to be relatively lower. A third characteristic that has been found to effect mobility is education.[5] Rural-farm people, mostly occupied in farm occupations,

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[1] U.S., Bureau of the Census, Job Mobility of Workers in 1955, Current Population Reports, Labor Force, Series P-50, No. 70 (Feb. 1957). And, Gertrude Bancroft and Stuart Garfinkle, Job Mobility in 1961, Bureau of the Census, Special Labor Force Report No. 35.

[2] Manpower Report of the President: 1966, op. cit. (see Table III-2), p. 169, Table A-15.

[3] U.S., Bureau of the Census, Lifetime Occupational Mobility of Males: March 1962, Current Population Reports, Technical Studies, Series P-23, No. 11 (May 12, 1964).

[4] C. A. Myers, op. cit., p. 74.

[5] G. S. Tolley and J. C. Matthews, Migration Adjustments in Relation to the Pattern and Pace of Southern Growth, p. 12.

Table III-9. Rates of Occupational Mobility in the U.S., 1955 and 1961.

(Percent of occupational shifts of the total population in the Occupation)

Occupation[a]	1955 Number of occupational shifts (000)	1955 Rate of occupational mobility	1961 Number of occupational shifts (000)	1961 Rate of occupational mobility
Professional	197	3.4	172	2.2
Managers	305	4.7	222	3.1
Clerical	496	5.9	258	2.6
Sales workers	574	14.5	289	6.5
Craftsmen	603	7.3	528	6.1
Operatives	1,263	9.9	862	7.3
Private household workers	233	12.0	320	3.7
Service workers	637	12.4		
Farmers	197	5.2	307	5.9
Farm laborers	643	22.7		
Laborers, exp. farm	1,002	27.3	688	19.8

[a] See footnote a in Table III-2.

Source: No. of occupational shifts: 1955 = Job Mobility of Workers in 1955, op. cit., p. 23, Table 10. 1961 = G. Bancroft and S. Garfinkle, op. cit., p. A9, Table F. Rate of occupational mobility was calculated on the basis of occupational employment figures from Manpower Report of the President: 1966, op. cit., p. 164, Table A-10.

have lower levels of education than urban people, who are occupied mostly in nonfarm occupations (Table III-2). Since lower attainments of education reduce mobility a comparison between occupation should take it into account. Concluding, it seems that the observations reported in the

surveys mentioned earlier support Bishop's assumption that standardization would show a relatively high rate of mobility (migration) among the farm population.[1]

(2) A second indication of the awareness of the farm population to economic opportunities elsewhere can be found in the study of the relationship between outmigration and the conditions of the general economy. Hathaway has shown that outmigration is responsive to employment cycles.[2] Sjaastad concluded that "a rise in national unemployment from 3 to 7 per cent is associated with a drop in the per cent of farm people that leave agriculture annually by up to 1 percentage point.[3] Figure III-1 indicates that except for 1948-1951, net outmigration from the farm sector react immediately and vigorously to any change in the rate of unemployment in the nonfarm sector. One should always keep in mind that the discussion till now was done in terms of <u>net</u> outmigration (as opposed to gross outmigration), which as Sjaastad pointed out[4] is very likely to modulate the observed effects. The proposition that agricultural labor is sensitive to economic opportunities is supported by additional evidence. First, there is the evidence that labor is not malallocated within agriculture.[5] Second, there are several partial

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[1] C. E. Bishop, Unemployment and Agricultural Adjustment, *op. cit.*, p. 5.

[2] D. E. Hathaway, "Agriculture and the Business Cycle," *Policy for Commercial Agriculture*, pp. 54/55.

[3] L. A. Sjaastad, "Occupational Structure and Migration Patterns," *Labor Mobility and Population in Agriculture* (Ames: Iowa State Univ. Press 1961), p. 1.

[4] Larry A. Sjaastad, "The Costs and Returns of Human Migration," *J. Political Econ.*, LXX (Sup.: Oct., 1962), p. 81.

[5] Earl O. Heady and Russell Shaw, "Resource Returns and Productivity Coefficients in Selected Farming Aieas," *Journal of Farm Economics*, XXXVI, No. 2 (1954), pp. 250-51, Table 4. And, C. E. Bishop, *Underemployment of Labor in Southeastern Agriculture*, p. 268.

studies which confirm rural-farm people sensitivity. Bachmura asserted that rural-farm people in the lower Mississippi Valley respond readily to alternative employment opportunities.[1] Bishop reported that if net migration from farms during 1940-1950 is compared to farms income (State averages) a negative correlation appears.[2] Diehl, in a recent study of the Southeast region, confirmed that farm people migrate in response to income incentives.[3] In a cross-county study of Minnesota,[4] Winkelmann found that the response to income incentives is sensitive enough to cause different rates of migration from different counties. Hathaway stated that not only outmigration is sensitive to nonfarm opportunities but "both the number of days of nonfarm work and the average wage per day are highly sensitive to nonfarm employment conditions."[5]

(3) A third approach to test the demand for farm labor in the nonfarm sector would be to examine the absorption capacity of the latter sector. Since a complete model of the economy of the United States is not available this examination would be based on partial assumptions, such as: (1) The relative farm per capita income of 1948 would be maintained, assuming that the 1948 farm-nonfarm income ratio is

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[1] F. T. Bachmura, op. cit., p. 1034.

[2] C. E. Bishop, "The Mobility of Farm Labor," Policy for Commercial Agriculture p. 444.

[3] William D. Diehl, "Farm-Nonfarm Migration in the Southeast: A Costs-Returns Analysis," Journal of Farm Economics, XLVIII, No. 1 (1966), p. 11.

[4] Don Winkelmann, "A Case Study of the Exodus of Labor from Agriculture: Minnesota," Journal of Farm Economics, XLVIII, No. 1 (1966), p. 20.

[5] D. E. Hathaway, Government and Agriculture, op. cit., p. 180.

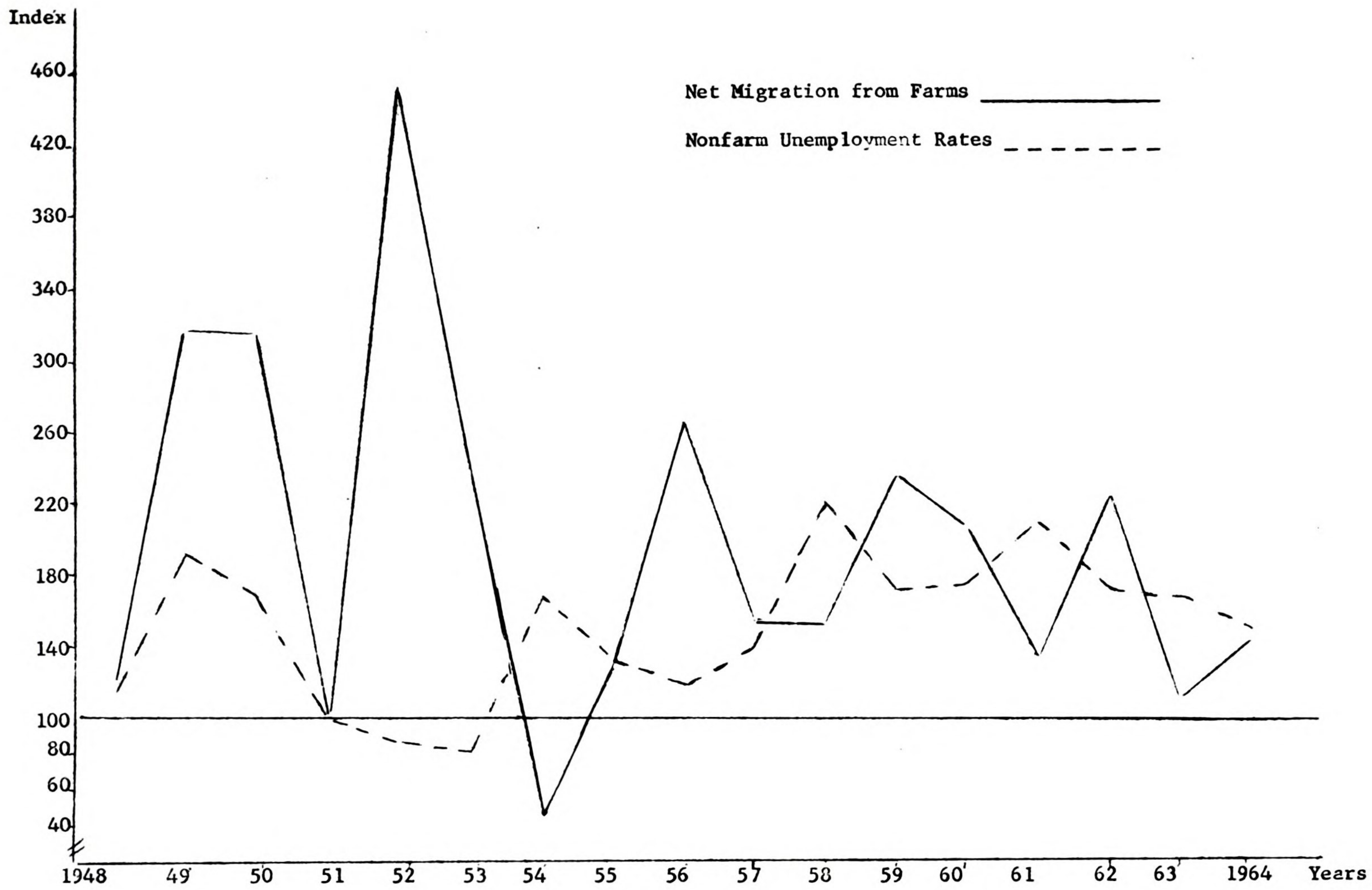

Figure III-1. Trends in Net Migration from Farms, and Nonfarm Unemployment Rates, 1948-1964.
(Indices)

satisfactory,[1] (2) The demand for agricultural products per capita is completely inelastic; (3) The real advances in labor productivity, as measured by the index of output per man-hour, are incorporated; (4) All other structural parameters of the economy are assumed to be unchanged; and (5) The income of nonfarm people is assumed to be constant. Table III-10 presents the results of calculations based on these assumptions. The second set of assumptions in the table contains assumptions (1) to (4) of the first with a changed fifth assumption, which reads: (5) The increase in nominal per capita income of the nonfarm population is incorporated.

According to the first set of assumptions, in seven years out of the 17 analyzed the hypothetical change in farm population should have been positive: To maintain 1948's relative per capita income the gross inmigration should have been larger than it actually was. Relaxing the assumption of constant urban per capita income changes the picture and only two years, 1954 and 1961, are left with positive hypothetical inmigration. It might be significant to note that both years are considered years of low economic activity. Given the hypothetical additional outmigration needed to maintain per capita farm income of about 67 per cent of the nonfarm per capita income, a comparison with the actual employment situation can be made. Table III-11 represents such a comparison. The increase in nonfarm unemployment if the hypothetical

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[1] Income per capita in agriculture in 1948 was 66.9 per cent of income per capita in other sectors. In his study "Labor Mobility and Agricultural Adjustment," Agricultural Adjustment Problems in a Growing Economy, D. Gale Johnson suggested that 68 per cent of nonfarm income per capita is a comparable income per capita for the farm population.

Table III-10. Needed Hypothetical Adjustment in Farm Population to Maintain 1948's Relative Income Per Capita, 1948-1964.

Period	First set of assumptions						Second set of assump.	
	Annual increase in total population, %	Annual increase in farm labor productivity, %	Total change needed in farm population,[a] %	Actual change in farm population, %	Additional change in population needed,[a] %	Annual Additional change in farm population needed,[a] (000)	Annual increase in per capita disposable income of nonfarm population, %	Annual total additional change in farm population needed,[a] %[b]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1947-48	1.7	7.7	-6.0	-6.2	+0.2	---	---	---
1948-49	1.7	2.9	-1.2	0	-1.2	-290	0	-1.2
1949-50	1.7	12.1	-10.4	-5.3	-5.1	-1,175	7.0	-11.6
1950-51	1.7	2.9	-1.2	-5.5	+4.3	+941	6.2	-1.5
1951-52	1.7	7.5	-5.8	0	-5.8	-1,261	3.9	-9.6
1952-53	1.7	10.2	-8.5	-8.8	+0.3	+ 60	4.2	-3.7
1953-54	1.8	6.2	-4.4	-4.8	+0.4	+ 76	0.1	+0.3
1954-55	1.8	2.3	-0.5	+1.7	-2.2	-420	5.6	-7.5
1955-56	1.8	6.6	-4.8	-3.3	-1.5	-281	4.4	-5.7
1956-57	1.8	7.4	-5.6	-5.2	-0.4	- 71	2.8	-3.1
1957-58	1.7	13.2	-11.5	-3.6	-7.9	-1,353	0.7	-8.8
1958-59	1.7	2.9	-1.2	-1.9	+0.7	+116	4.3	-3.6
1959-60	1.6	8.5	-6.9	-5.8	-1.1	-172	0.8	-1.9
1960-61	1.7	4.3	-2.6	-6.1	+3.5	+518	1.8	+1.7
1961-62	1.6	5.8	-4.2	-2.2	-2.0	-286	3.9	-5.8
1962-63	1.5	6.3	-4.8	-6.7	+1.9	+254	3.1	-1.1
1963-64	1.4	4.4	-3.0	-4.8	+1.8	+233	6.6	-4.4

[a] Change needed to maintain 1948's relative per capita income.

[b] Calculated as: [100.1 - (5)] X [100.0 - (7)]

Sources: (1) U.S., Bureau of the Census, Statistical Abstract of the United States: 1965 (Washington: Government Printing Office) Table 5. (2) 1948-1957: Kendrick, *op. cit.*, p. 366. 1958-64; U.S., Department of Agriculture, Changes in Farm Production and Efficiency Statistical Bulletin 233 (June, 1966), p. 32, Table 19. (4) U.S., Department of Agriculture, Farm Income Situation, ERS - FIS 203 (July, 66) Table 5H. (7) *Ibid.*, p. 44, Table 6H.

Table III-11. Comparison of the Hypothetical Outmigration from the Farm with the Actual Nonfarm Unemployment, 1949-1964.

	Rate of Nonfarm unemployment, %	No. of Nonfarm unemployed, (000)[a]	Hypothetical Outmigration from Farms, (000)	The addition to Nonfarm unemployed, %	Hypothetical increase in nonfarm employment, %[b]	Hypothetical increase in GNP to keep unemployment constant %[c]
	(1)	(2)	(3)	(4)	(5)	(6)
1949	6.2	2,914	290	10	0.6	2.1
1950	5.4	2,624	2,674	102	5.8	20.3
1951	3.2	1,576	328	21	0.7	2.5
1952	2.8	1,394	2,088	150	4.3	15.1
1953	2.6	1,320	735	56	1.5	5.3
1954	5.4	2,763	+ 57	---	---	---
1955	4.2	2,194	1,431	65	2.9	10.2
1956	3.8	2,049	1,067	52	2.1	7.4
1957	4.5	2,454	547	22	1.1	3.9
1958	7.1	3,923	1,507	38	2.9	10.2
1959	5.5	3,076	597	19	1.1	3.9
1960	5.6	3,202	297	9	0.6	2.1
1961	6.7	3,898	+ 251	---	---	---
1962	5.5	3,245	829	26	1.5	5.3
1963	5.4	3,258	147	5	0.3	1.1
1964	4.8	2,961	569	19	1.0	3.5

[a] These figures were calculated from data about the rate of nonfarm unemployment and total persons employed in the nonfarm sector.

[b] The increase in nonfarm employment needed to keep unemployment constant in view of the hypothetical addition of people from the farm sector.

[c] See text.

Sources: (1) Manpower Report of the President: 1966, p. 169, Table A-15. (2) No. of Nonfarm Employed: Manpower Report of the President: 1966, p. 163, Table A- The calculation was done according to the following equation: (No. of Nonfarm employed) ÷ [100.0 - (1)] x (1). (3) From Table III-12.

outmigration had occurred would have been between 5 and 150 per cent, with an average of 42 per cent. The increase in nonfarm employment which would have been needed to keep the rate of nonfarm unemployment constant ranges from 0.3 to 5.8 per cent, with an average of more than 1.9 per cent. The increase in the GNP of the United States which will accommodate such an increase in employment, keeping the rate of unemployment constant, was estimated, following Okun,[1] as ranging between 1 to 20 per cent, and mostly above 2.5 per cent. It should be realized that this increase in GNP is over and above the actual increase in GNP that occurred in those years.

(4) The most direct indication of the demand of the nonfarm sector for farm labor is the study of those who migrated from the farm. Recently, two studies pertaining to this subject were pbulished. The first is a study by Perkins and Hathaway who report that of the off-farm movers included in the continuous register sample of Social Security records which they examined, only 71 per cent remained in the nonfarm sector for at least two years.[2] Furthermore, they state that "the data on income gains strongly support the notion that failure to attain expected gains is a major factor behind back movement into agriculture."[3]

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[1] Arthur M. Okun, "The Gap Between Actual and Potential Output," The Battle Against Unemployment, ed. A. M. Okun (New York, 1965). Okun estimated that for the U.S. the GNP would have to grow by 3.5 per cent annually for every 1 per cent growth in employment required to keep unemployment constant.

[2] Brian Perkins and Dale E. Hathaway, The Movement of Labor Between Farm and Nonfarm Jobs, Research Bulletin 13, M.S.U., Department of Agricultural Economics, Agricultural Experiment Station, 1966, p. 11.

[3] Ibid., p. 30.

Perkins and Hathaway concluded that:

> In general, it appears that mobility from the farm sector is largely a function of the income expectations of movers and the extent to which these expectations are achieved. The fact that mobility rates for persons with various characteristics is highly consistent with the income experience of such persons suggests that farm people may have a realistic evaluation of their nonfarm employment opportunities.[1]

The second study is by Gallaway[2] and is based also on the 1 per cent Continous Work History Sample maintained by the Social Security Administration. Analyzing the net flow of labor into agriculture and the correlation between net labor flows and 1960 industry wages, Gallaway observes an outflow of labor from agriculture which is very high for people under 20 years of age, and decreases with age. The outmigration of labor from agriculture was the lowest at the 35-39 years of age group, only 1.1 per cent.[3] As the age increases the flow of labor reverses itself and the net migration is <u>into</u> agriculture. The rate of inmigration at the 50-54 years old group is 11.3 per cent. The correlation between the net flows described above and the relevant industry wages is relatively high, except for the age groups 25-29, 30-34, and 55-59.

Regarding income, Gallaway observes that almost no increase had occurred in the relative income of hired agricultural workers between 1957 and 1960. In 1957, the mean estimated earnings of hired farm workers were 38.8 per cent of those of all workers; in 1960, they were 39.0 per cent.[4] However, markedly different patterns may be observed

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[1] *Ibid.*, p. 31.

[2] Lowell E. Gallaway, "Mobility of Hired Agricultural Labor: 1957-1960," *J. Farm Econ.*, XLIX (Feb., 1967).

[3] *Ibid.*, p. 43, Table 3.

[4] *Ibid.*, p. 44-45.

when a detailed analysis is done. Those who migrate to the farm sector between 1957 and 1960 had earnings which were only 34.1 per cent of 1960 earnings for all workers; the earnings of hired farm workers who did not move were 42.1 per cent of the earnings of all workers in 1960, and those who outmigrated between 1957 and 1960 had earnings amounting to 47.4 per cent of the earnings of all workers. It appears evident from the figures that the difference between those who stayed in agriculture and those who moved out is not large, especially in view of the lower opportunities for elder people. It is also evident that the failure of relative earnings of hired agricultural labor to rise between 1957 and 1960 is due to an influx of workers into agriculture, presumably because they could not get higher earnings elsewhere.

In conclusion, the estimates and evidence presented in the preceding subsections (1) to (4), indicate that farm people of the United States are sensitive to changes in the economic conditions of the economy at large. They are at least as mobile as nonfarm people and respond to the slightest change in nonfarm unemployment rates. It is doubtful if a higher rate of net outmigration could have been maintained, since it is unlikely that the needed increases in the GNP of the United States would have been possible. Without such increases in the GNP of the United States the opportunity-costs of people in the farm sector, on the average, would have been very low, and very likely lower than their real income in agriculture.

Regarding the issue of the farm-labor surplus it seems that statements, such as:

> If resources were sufficiently mobile, an hour of labor would earn as much in agriculture as it would in other

economic sectors not enjoying monopoly profits.[1]

are at least doubtful. The present study forwards the hypothesis that, on the average and in a dynamic context, agriculture is not suffering from a higher degree of labor malallocation than other sectors of United States economy. The hypothesis is that, given the specific characteristics of farm people, and especially their low levels of education[2] (which for Farm laborers did not increase in the last two decades)[3] as well as their average age, a significant portion of rural-farm population "have had no real alternative but to settle for the depressed, salvage value of the skills they possess."[4] In short, as Hathaway states: Farm people may be poor but not underpaid.

The testing of the hypotheses presented in this study rests on the ability to define and measure "Comparable Labor Real Earning." It is necessary to identify the important factors affecting earning capability, and to estimate what could have been the earnings of specific farm people would they chose to migrate from the farm.

Comparable labor real earnings evoke two issues: (1) What are real returns, and (2) How are labor capabilities going to be standardized? The first issue will receive only slight attention in this study, while the emphasis will be on the second. In the following chapters an "Earning Capacity Function" will be constructed in effort to define and

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[1] E. O. Heady, E. O. Haroldsen, L. V. Mayer, and L. G. Tweeten, Roots of Farm Problem (Ames: Iowa State University Press, 1965), p. 11.

[2] Arnold Katz, Educational Attainment of Workers: 1959, U.S., Department of Labor, Special Labor Force Reports, No. 1, p. 114.

[3] D. Gale Johnson, "Efficiency and Welfare Implications of United States Agricultural Policy," Journal of Farm Economics, XLV (May, 1963), p. 340.

[4] T. W. Schultz, Investing in Poor People: An Economists

measure the socioeconomic variables that affect earnings. First, however, will come a description and critique of previous studies which dealt with comparable earnings of farm people.

CHAPTER IV

Review of Literature

Several studies, assumed to be pertinent to issues discussed earlier, such as: Attempts toward a comparative study of the farm and nonfarm sectors; The factor-shares method of allocating income as a tool of analyzing malallocation; Evidence of farm labor malallocation, and Attempts to measure comparable labor, will be reviewed in this chapter. Several other studies relevant to this study subject were mentioned during the previous discussion and will not be mentioned here.

As mentioned in Chapter I, Hathaway stressed the importance of analyzing United States agriculture as a whole and in comparison to other sectors of the economy. Unfortunately, the challenge was accepted only by two scholars in their joint study--Tolley and Smidt.[1] For the purpose of this study the report on the study of Tolley and Smidt is excessively limited. The figures for past periods were not published and the crucial question of labor's comparability--the ratio between the skills of farm and nonfarm labor--was left open. It might, however, be interesting to examine the projections for 1980 generated by the economic model of the mentioned study. Among several possibilities, Tolley and Smidt investigated the results in 1980 of the following assumptions:

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[1] G. S. Tolley and S. Smidt, "Agriculture and the Secular Position of the U.S. Economy," Econometrica, XXXII, No. 4 (October 1964).

(a) An annual increase in farm productivity of 3.1 per cent (which is higher than the past average. See Table III-1) and no decline in the disparity of farm nonfarm labor earnings; (b) A 2.1 per cent annual increase in farm productivity accompanied by a gradual decline in the gap between farm and nonfarm labor earnings. In both cases a slower rate of farm-labor outmigration is generated than United States agriculture has experienced in the past.[1] Thus the study by Tolley and Smidt does not support, at least, the hypothesis that the mobility of farm labor was relatively low.

The most commonly used method of determining the relative income position of farm people is the factor-shares method of allocating income to factors of production.[2] The results of such allocation are valid, however, only if several restrictive assumptions hold, which are, following Ruttan and Stout:[3] (1) The economy is characterized by homogeneous production function, and (2) the economy experiences a competitive equilibrium. The equilibrium referred to should be a long-run equilibrium, which is rarely specified, otherwise a divergence might exist between intrasectorial and intersectorial prices of fixed resources.

The issue of which type of production functions fits United States agriculture is still debatable. As far as a competitive equilibrium is concerned the assessment seems more conclusive, and negative. Several

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[1] Ibid., pp. 572-74.

[2] D. Gale Johnson, "Allocation of Agricultural Income" and "Output and Income Effects of Reducing the Farm Labor Force," op. cit.; V. W. Ruttan and T. T. Stout, op. cit.; C. A. Chandler, op. cit.; Robert H. Masucci, "Income Parity Standards for Agriculture," Agri. Econ. Research (ERS-USDA), XIV, No. 4 (1962); U.S., Dept. of Agri., Parity Income Position of Farmers (Unpublished study done by ERS).

[3] V. W. Ruttan and T. T. Stout, op. cit., p. 52.

conditions which can be observed in United States agriculture exclude the possibility of it being in a long-run competitive equilibrium. The conditions observed are: (1) "A very large proportion of all types of agricultural resources do not receive a market return nor have a market determined price";[1] (2) There exists fixed resources in agriucltured; and (3) More than one resource is fixed.

Accepting the empirical limitations as necessary compromise, Still renders inferences from factor-shares analyses as questionable. Determining "if the income received by comparable resources are equivalent in different employments"[2] by means of a factor-shares analysis is logically inconsistent and self-defeating. The assumption of competitive equilibrium, on which the factor-shares method is based, states that income of comparable inputs, by definition, must be equal in all employments. It appears therefore as if the hypothesis to be tested is assumed a priori true, but then why test it?

A different approach to the problem of labor malallocation, or of "equal returns to comparable resources," was taken by Tyner and Tweeten.[3] Basically they tried to utilize Cobb-Douglas production functions to estimate equilibrium proportions of various inputs and thereby to indicate malallocations. To avoid the problem of "highly correlated 'independent' variables"[4] they chose to estimate the production elasticities by the factor-shares method, and relaxed its equilibrium assumption

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[1] D. Gale Johnson, "Allocation of Agricultural Income," op. cit., p. 725.

[2] Ibid., p. 745.

[3] Fred H. Tyner and Luther G. Tweeten, "Optimum Resource Allocation in U.S. Agriculture," J. Farm Econ., XLVII (Aug., 1966), pp. 613-631.

[4] Fred H. Tyner and Luther G. Tweeten, "A Methodology for Estimating Production Parameters," J. Farm Econ., XLVII (Dec., 1965), pp. 1462-1467.

by applying a Nerlove's Distributed Lags Model.[1] The rationale was that economic systems adjust towards equilibrium not instantaneously but at a given rate. The elasticities of production were estimated for five periods of ten years each, beginning in 1912 and ending in 1961. Nine inputs were included, such as fertilizers, feed, labor, machinery, and real estate. Inputs and outputs were estimated according to ERS series, with labor estimated according to the series of man-hours used in farmwork. Since the series of man-hours used in farmwork is crucial in the context of this study it deserves a special discussion.

The mounting interest in analyzing technological changes in United States agriculture brought about the creation of the series "Farm Labor Requirements" which was later changed to be "Man-hours of Labor Used for Farmwork."[2] The title change, from "required" to "used," has been a misleading one. The series discussed has never reported the number of man-hours _used_ in agriculture, but rather the amount of man-hours _required_ to produce a specific output, assuming specific state of arts. Even the Department of Agriculture recognizes that "required" and "used" are not comparable terms and cautions the user that "the estimates of number of workers must be adjusted to the rates of performance of available workers as compared with experienced adult male workers."[3]

Further, even the definition of the "man-hour of farmwork" is

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[1] Marc Nerlove, _Distributed Lags and Demand Analysis for Agricultural and other Commodities_, U.S., Dept. of Agri., Agri. Handbook 141, (1958).

[2] U.S., Dept. of Agri., _Major Statistical Series of the U.S. Department of Agriculture_, Vol. II, Agricultural Production and Efficiency, Agri. Handbook 118, p. 10.

[3] _Ibid._, p. 13.

unclear. The first study of labor requirements was Hopkins[1] 1941 study, which went back to 1909. This study does not report on the definition of the units by which labor requirements were measured. Moreover, the study states explicitly that the estimates of labor requirement were prepared "for leading farm enterprises.[2] In 1943 and 1947 the Bureau of Agricultural Economics sponsored two studies of labor requirements for specific farm enterprises and for agriculture as a whole. The 1943 study[3] specified that "the labor requirements shown are State averages, arrived at by taking into consideration many variations from the average. They are not the result of any special survey, but were 'built up' from available data collected by Federal and State agencies.[4] Thus, it is very likely that the requirements were not based on one definition of workers' capacity, since each Federal and State agency probably had its own. The 1947 study was a follow-up and companion to the 1943 study.[5] Labor requirements were expressed "in hours or in some other fitting unit of time required for an average [emphasis added] adult male worker to perform a certain farm task.[6] It is very doubtful that the different Federal and State agencies which provided the basic information would have the same interpretation of an "average adult male worker." However, the Major Statistical Series' description of the man-hour series implies

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[1] John A. Hopkins, Changing Technology and Employment in Agriculture, U.S., Dept. of Agri. (BAE), (May, 1941).

[2] Ibid., p. III.

[3] M. R. Cooper, W. C. Holley, H. W. Hawthorne, and R. S. Washburn, Labor Requirements for Crops and Livestock, U.S., Dept. of Agri., BAE-F.M. 40, (May, 1943).

[4] Ibid., p. 1.

[5] Reuben W. Hecht, Farm Labor Requirements in the United States: 1939 and 1944, U.S., Dept. of Agri., BAE-F.M. 59, (April, 1947), p. 3.

[6] Ibid., p. 2.

that they refer to "experienced [emphasis added] adult male workers.[1] Thus, it is obvious that the unit of measurement was changed through time and even today is vague and undefined: "Experience" is an undefinable term and clearly changes with time.

In short, the series of man-hours is an inappropriate tool for measuring labor's input, because: (1) The unit of measurement is undefined; (2) Different units are used to measure labor inputs in different regions of the United states; (3) The unit of measurement changes over time (age, education, training, etc.) without allowing for this change; (4) There is almost no way to convert the "man-hours" data to terms of real people, or to terms of actual hours worked on farms; and (5) There is no analogue labor unit in the nonfarm sector to enable earning comparison. The suggestion that this hypothetical unit of labor in order to have comparable returns should earn the same as "the average hourly earning of all employees in manufacturing[2] is therefore unwarranted.

Returning to Tyner and Tweeten's study two additional problems regarding labor and its measurement should be analyzed. First, in estimating an equilibrium situation it is crucial to have the correct opportunity-costs of the various resources. Tyner and Tweeten did not estimate the same opportunity-costs of labor in the two stages of their study. While estimating elasticities of production they assumed that the hired-labor wage rate (presumably farm hired-labor) was the appropriate opportunity-cost,[3] but when fitting the production function they

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[1] U.S., Dept. of Agri., Agricultural Production and Efficiency, op. cit., p. 13.

[2] R. H. Masucci, op. cit., p. 125.

[3] F. H. Tyner and L. G. Tweeten, Estimating Production Parameters, op. cit., p. 1465.

assumed the opportunity-cost to be either the nonfarm wage rate (which is an unspecified rate), or 85 per cent of it.[1] As the estimates are affected by this change in relative prices of labor, the validity of the resource allocation estimates is doubtful. The utilization of Hathaway's[2] and G. Johnson's[3] estimates of what would have been comparable returns to farm labor was also inappropriate. These estimates apply to specified years only, since several factors affecting the resulting adjustments do change over time. The proper way to incorporate estimates of comparable labor earnings would be, therefore, to estimate the adjustment needed anew for each year or period.

The second issue to be emphasized regarding the use of man-hour series is a structural one. To avoid multicollinearity Tyner and Tweeten preferred to use an adjusted factor-share method, but by their own action introduced multicollinearity by the back door. The man-hour series is estimated given current farming practices. Any change in the latter changes the amount of man-hours required. Changes in farming practices are usually very highly correlated with changes in capital items, such as real estate, or machinery. Thus, the assumption that the variables in the fitted production function are independent of each other is wrong, and the parameters biased. The degree of bias is expected to be especially high in the case of labor and machinery, because of the close relationship between those two in estimating the required man-hours for farm work.

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[1] F. H. Tyner and L. G. Tweeten, Optimum Resource Allocation in Agriculture, _op_. _cit_., p. 618.

[2] D. E. Hathaway, Government and Agriculture, _op_. _cit_., p. 37.

[3] D. Gale Johnson, "Labor Mobility and Agricultural Adjustment," _Labor Mobility and Population in Agriculture_ (Ames: Iowa State University Press, 1961), p. 165.

Because of the theoretical and empirical problems concerning labor which Tyner and Tweeten's study encountered, it is doubtful if their conclusion of a high degree of labor malallocation in United States agriculture holds. It is clear, however, that the problem of defining a comparable unit of labor was not solved.

A third approach to the measurement of farm income comparability was taken by the United States Department of Agriculture in a recent unpublished Parity Income study.[1] The approach was basically of the factor-shares type with respect to nonhuman capital items, refined by an estimation of labor's earning capacity. In estimating parity returns to capital, the study discusses the valuing of farm real estate. Recognizing that relatively small percentage of farm real estate is sold each year, the study declares that "this is similar to the way in which the current value of common stock is estimated."[2] However, several characteristics of the farm real estate market suggest that the comparability may be only limited.

According to the Department of Agriculture, the source of land value data, the farm real estate market is "unorganized and no standards of quality exist"[3] to enable a reliable valuing of unsold real estate. Since farm real estate is mostly immobile only nearby buyers can evaluate

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[1] U.S., Dept. of Agri., "Parity Income Position of Farmers" (Unpublished study of the Economic Research Service).

[2] Ibid., p. 4.

[3] U.S., Dept. of Agri., Major Statistical Series of the U.S. Department of Agriculture, Vol. VI: Land Values and Farm Finance, Agri. Handbook 118 (Oct., 1957), p. 3.

with relative ease the true income stream flowing from the given farm asset.[1] In comparison, common stock, especially of United States companies, can be compared with relative ease by anybody that wishes to do so. As a consequence, it is impossible to refer to United States farm real estate market, but only to an aggregate of relatively small and unsophisticated local markets. The price structure in such markets depends highly on the specific conditions of nearby buyers and therefore is very likely to reflect mainly the expected MVPs in those specific conditions. Applying the same value to real estate of land prices, which are determined by specific conditions to areas where different environments exist is therefore inappropriate. In contrast, the common stock market is a very large market and in many cases a worldwide one. Local, or special, demands are not likely to affect its prices.

The choise of "net realized income" as the counterpart of parity returns also raises questions. "Net realized income" excludes, among others, the "net change in farm inventories," which "reflects the physical changes during the year in all livestock and crops on farms, except crops under CCC loan, with the changes valued at average prices for the year.[2] However, the expenses, positive or negative, of building such

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[1] The immobility of land, the major component of farm real estate, introduces into the price structure an additional monopolistic element, that of "site," which further limit the comparability of farm real estate to common stock. For further discussion see: William Elvidge Kost, "Investing in Farm and Nonfarm Equities" (Unpublished M.S. thesis, Dept. of Agri. Econ., Michigan State University, 1967).

[2] U.S., Dept. of Agri., <u>Farm Income Situation</u> (ERS), F 15-203 (July, 1966), p. 49, n. 1.

an inventory are deducted as production expenses. During the sixteen years 1950-1965 the average "net change in farm inventories" amounted to 4.9 per cent of "net realized income" with 13 years having positive changes (averaging 4.9 per cent) and 3 years having negative changes (averaging 4.9 per cent).[1] Thus, the measure of "net realized income" is biased by at least 4.9 per cent.

A crucial issue in any study of parity income is the definition and measurement of comparable returns. The Parity Income study defines parity returns as the:

> Returns required to make the current rate of returns to the labor, capital and management employed in farm production equal to the current rate of return to comparable resources employed in other segments of the economy.[2]

Regarding capital the Parity Income study suggests several alternatives for estimating comparable returns for farm capital, however, none comply with the definition given above. The sum total of farm capital, under any of the alternatives suggested, remains unchanged implying that no capital outmigration is assumed by the suggested alternatives and therefore no measurement of comparable capital. This approach might be warranted for the individual farmer, but fails to measure the comparable returns for capital on the industry level. For one, the Parity Income study assumes implicitly that all farm capital is mobile, an assumption shown to be unrealistic.[3]

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[1] Ibid., p. 39, Table 1H; p. 49, Table 11H.

[2] U.S., Dept. of Agri., Parity Income Position of Farmers, op. cit., p. 3.

[3] T. W. Schultz, The Economic Organization of Agriculture, op. cit., p. 112; C. A. Chandler, op. cit., p. 345; J. A. Schnittker and G. P. Owens, op. cit., p. 14; C. Leroy Quance, "Farm Capital: Use, MVPs, and Capital Gains or Losses, United States: 1917-1964" (Unpublished Ph.D. Thesis, Dept. of Agri. Econ., Michigan State University, 1967).

The most interesting feature of the Parity Income study, for present purposes, is the estimation of the parity rates of return to farm labor. The parity returns to labor were estimated by the Parity Income study as follows: earning capacity in the nonfarm sector was assumed to be affected mainly by age, education, and sex. In 1959 income data of persons in various age-education-sex cells, residing in central cities of urbanized areas were regressed on the three characteristics mentioned. The resulting equation was as follows:[1]

$$Y = -3471.3235 + 226.60418\ X_1 - 51.64458\ X_2 + 2{,}094.5807\ X_3$$
$$- 2.44571\ X_1^2 + 14.94676\ X_2^2.$$

The variables X_1 (Age), X_2 (Education), and X_3 (Sex) were generally significant at the .001 level except for X_2 which was significant at the .20 level only. The R^2 for the equation was 0.89. Interaction terms were found to be insignificant and without effect on R^2. After estimaing the total income, people having the characteristics of farmers could earn in the central cities of urbanized areas, the hourly wage and salary income was estimated in several steps. Hourly income estimates for 1964 and 1965 were calculated assuming that the change in hourly income paralleled the change in average manufacturing wage rates.

The assumption that the crude measures of age, education, and sex employed are sufficient to predict probable incomes ignores previous attempts of estimation indicating the opposite. Moreover, the study does not estimate the income capacity of persons of specific

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[1] U.S., Dept. of Agri., Parity Income Positions of Farmers, op. cit., p. 113.

characteristics, but rather the income capacity of a conglomerate which happened to average in a specific way. Estimation by group averages might have been permissible if no interaction between the factors affecting income existed, however, previous examinations of income data indicate strongly that such interactions exist.[1] Further, it has been shown that aggregates usually generate higher levels of significance and larger R^2 without providing better estimates of the structural parameters.[2]

Summarizing, the estimation of labor's parity returns attempted in the Parity Income study is a step in the right direction, but in this simple form has a low level of reliability.

The most significant and comprehensive study regarding the measurement of relative per capita farm and nonfarm incomes consistent with equal returns for comparable labor was done in 1958 by D. Gale Johnson.[3] The factors that D. G. Johnson considered were: sex, age, labor capacity (due to race, education and other unspecified factors), dependency (which measures voluntary non-participation in labor force), relative share of labor earning in total per capita income, difference in price level between farm and nonfarm residence, and difference in income tax burden.[4] Two important features of D. G. Johnson's study are: (1) The results apply to 1950, and to this year only, and (2) The income data used include income from all sources and not from farming alone.[5]

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[1] Herman P. Miller, Income of the American People, Census Monograph Series (New York: John Wiley & Sons, Inc., 1955).

[2] Martin E. Abel, and Frederick V. Waugh, "Relationships Between Group Averages and Individual Observations," U.S., Dept. of Agri., Agri. Econ. Research, XVIII, No. 4 (1966), pp. 105-115.

[3] D. Gale Johnson, "Labor Mobility and Agricultural Adjustment," Agricultural Adjustment Problems in a Growing Economy (Ames: Iowa State College Press, 1958).

[4] Ibid., p. 165.

[5] Ibid., p. 164.

The conclusion of this study is that for farm per capita income to be consistent with equal real returns for comparable labor, it has to be approximately 65 to 70 per cent of nonfarm per capita income.[1]

In general two limitations of Johnson's study are apparent. First, it compares real returns only in the sense that money has the same purchasing power, but it disregards differences in preferences and values, or other non-money income factors that affect real income. The "real returns" referred to by D. G. Johnson do not reflect equal utility or satisfaction. Second, the study assumes that the effect of the factors mentioned are additive and no interaction exists.

As far as the treatment of each factor is concerned there are several additional limitations.

Sex composition: It was realized that females earn less than males and therefore a different sex composition might affect relative earnings in different sectors. However, the correction for sex was done according to the proportions of male and female in the different populations, weighing females as .65 of males, which might not reflect correctly the proportions of male and female labor resources invested in the various productions. The optimal correction would have been according to hours actually worked, with the second best being participation and unemployment rates. The latter differ among different residence areas.[2]

Age composition: A proper definition of the term "comparable labor" should incorporate experience in the specific occupation and on the job training. The age correction is therefore biased upward in

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[1] _Supra._

[2] U.S., Bureau of the Census, _Census of Population:_ 1960, p. 1-487, Table 194.

favor of farm people, since a 55 year old or a 65+ year old farmer, once he migrates, is very likely to earn in the nonfarm sector less than an established nonfarm worker of the same age.

Dependency: Since the source of income data reported "per capita income" while the study intended to measure comparable labor (= earners) the proportion of earners in the population is important. Further, income was defined as "income from all sources," which renders the age distribution of the dependents important. Elderly people usually have a higher percentage of nonlabor income than younger ones.[1]

Relative share of labor earnings: Basically this factor reflects the results of factor-shares calculation estimating the share of labor in total income. The criticism of the factor-shares method apply also here. A change in assumptions, or source of data, will affect this calculation. D. G. Johnson estimates the share of labor in agricultural income to be 66 per cent,[2] while Ruttan and Stout estimate it to be, for 1954-1957, approximately 44 per cent.[3] Kendrick estimates labor's share, in 1948-53, to be 79.2 per cent[4] and Chandler concludes that for 1950 labor's share in agricultural income is 73.4 per cent.[5] The variation in these estimates is important, because an increase of 10 per cent in labor's share of agricultural income reduces the ratio of farm-nonfarm per capita income needed to assure equal returns to comparable labor by almost 10 per cent, from 68 per cent to 62 per cent. The high dependence of D. G. Johnson's estimates on the relative share of labor earnings

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[1] D. G. Johnson, Labor Mobility and Agricultural Adjustment, *op. cit.*, p. 164.

[2] *Ibid.*, p. 165.

[3] V. W. Ruttan and T. T. Stout, *op. cit.*, p. 63.

[4] J. W. Kendrick, *op. cit.*, p. 358.

[5] C. A. Chandler, *op. cit.*, p. 338.

reduces the significance and reliability of the results.

Purchasing power of income: The issue of whether and how the purchasing power of money can be compared between two populations is debatable. It has been assumed that patterns of consumption of farm and nonfarm people converge, but several recent studies indicate that the gap in pattern of consumption is still substantial, at least for part of the farm population.[1] The purchasing power correction is only one of several standardizing real returns. As mentioned earlier, the precise definition of "real" returns is not one of the objectives of this study.

Labor capacity: The correction for this factor, which encompasses the effects of race, education, intelligence, manual dexterity and other sources of variance, was established in an earlier study by D. G. Johnson.[2] The measure of farm labor capacity is defined as:

> The job distribution that a random sample of the farm labor force would have in nonfarm employment if each worker held the job which for him had the greatest net advantage.[3]

The job distribution of farm migrants in nonfarm employment was estimated from the income experience of migrants during January 1, 1935 and to the time the 1940 Census was taken, standardized for age, sex and color.

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[1] R. O. Herrmann, "Household Socio-Economic and Demographic Characteristics as Determinants of Food Expenditure Behavior" (Unpublished Ph.D. thesis, Dept. of Agri. Econ., MSU, 1964); D. W. Price, "Age-Sex Equivalents Scales for U.S. Food Expenditures--their Computation and Application" (Unpublished Ph.D. thesis, Dept. of Agri. Econ., MSU, 1965); Pius Weesgerber, "Characteristics of Low Income Rural Families Related to Expenditure and Consumption Patterns" (Unpublished Ph.D. thesis, Dept. of Agri. Econ., MSU. 1966).

[2] D. Gale Johnson, "Comparability of Labor Capacities of Farm and Nonfarm Labor," Am. Econ. Rev., XLIII (June, 1953).

[3] Ibid., p. 296.

A migrant was defined as a person who, in 1935, lived in a county or city of 100,000 or over different from the one in which he lived at the time the 1960 Census was taken.[1]

The basic assumption of the study was that farm-nonfarm migrants represent a random sample of the parent farm population standardized for age, sex and race. The assumption is based on three counts: (1) The educational attainment of farm migrants; (2) The relation between rates of migration and regions' level of farm income; and (3) The nonselectivity of migration. A separate examination of each count follows.

(1) Educational attainment: Johnson claims that the educational attainment of migrants seems to be almost equal to that of farm population of the same age--about 8 years of schooling. However, the proportion of people that had some college education was 30 per cent greater among migrants, and the proportion of those who graduated from college was 13 per cent higher.[2] D. Gale Johnson assumes implicitly that each year of schooling, disregarding the level of school, has the same effect on earning capacity or job distribution--an assumption shown to be wrong earlier. Thus, until the relative value of a year of schooling in the various school levels is estimated, D. Gale Johnson conclusion that "it does not appear that the farm migrants were appreciably better educated than the farm nonmigrants"[3] is debatable.

(2) Migration and income levels: The argument is that during the period 1930-40 no positive relation between rates of migration and the regions' level of farm income has been established. This contradicts

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[1] Ibid., p. 297.

[2] Ibid., p. 298.

[3] Supra.

the observations of Bishop[1] and Hathaway[2] that during this period a higher rate of migration occurred from medium and high-income farming areas. This observation ties with the fact that nonfarm employment opportunities were limited during this decade. Rather than observing the regional distribution among the migrants, D. Gale Johnson should have observed the different rates of migration from the various regions. Had the rates been negatively related to the regional size of farm population (which they seemed to be) then the result might very well have been an even regional distribution among the migrants.

(3) Is migration selective: Following Sorokin and Zimmerman[3] Johnson arrived at the conclusion that there is no valid evidence that migration selects the better physically, vitally, mentally, morally, or socially, while leaving in the farm the poorer in all these respects, but that there is also no evidence to the contrary. Migration from the farm is affected not by the absolute levels of farm income, but by the relative gap between the farm income and the opportunity in the nonfarm sector. There is no evidence or necessity that this gap is related linearly to farm income, or to other farmer characteristics. Moreover, there is evidence, mentioned earlier, that the distribution of the gap among farmers of different characteristics is not stable, but is highly affected by changes in the nonfarm labor market. Furthermore, analyzing net migration data instead of gross outmigration data may contribute to the inconclusiveness of the results.

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[1] C. E. Bishop, "The Mobility of Farm Labor," Policy for Commercial Agriculture, *op. cit.*, p. 444.

[2] D. E. Hathaway, Migration from Agriculture: The Historical Record and its Meaning, *op. cit.*, p. 381.

[3] P Sorokin and C. C. Zimmerman, *Principles of Rural-Urban Sociology* (New York: Henry Holt and Co., 1929), p. 582.

To conclude, D. G. Johnson's assumption that the migrants he examined were a random sample of the same age group in the parent population appears to be too strong relative to the evidence he presents.

In examining the occupational experience of rural farm migrants to nonfarm areas, D. G. Johnson contends that "rural farm migrants to urban areas had almost identically the same employment status as the urban population."[1] However, one should remember that the employment status calculations are based on those migrants who remained in the nonfarm sector for two and a half years, on the average. These are _net_ figures, excluding persons that migrated to the nonfarm sector and returned back. Perkins and Hathaway indicate in their study that "in every age group both the number of quarters of employment and rate of pay was lower among those who returned to the farm sector in 1957."[2] It is therefore not unexpected to find that after an adjustment of several years only those migrants who have the same employment status as nonfarm residents stay in the nonfarm sector. However, in measuring the incidence of unemployment all migrants should be considered, not only those who remain in urban places. Inclusion of all migrants is likely to show that unemployment rates were higher for migrants than for the total population, a relationship which should affect the estimated job distribution and the measurement of farm labor capacity.

Labor capacity was defined as the difference in the relative job distribution of farm migrants and urban nonimigrants. Assuming that

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[1] D. Gale Johnson, "Comparability of Labor Capacities of Farm and Nonfarm Labor," _op_. _cit_., p. 300.

[2] B. Perkins and D. E. Hathaway, _op_. _cit_., p. 31.

migrants "found employment as readily as nonmigrant,"[1] D. G. Johnson turns to job distribution. It was argued earlier that the job distribution of the sample of migrants covered by the study does not represent the job distribution of all migrants, but only of those who remained in the nonfarm sector for at least 2.5 years. Moreover, the job distribution presented in the study[2] indicates that the study's sample of migrants does not represent only occupational mobility but also residential mobility. Five per cent of the farm migrants were employed as farmers, farm managers, and farm laborers. For the purpose of estimating the comparable capacity of farm labor these occupations should have been excluded. Furthermore, D. G. Johnson argues that the farm migrants were relatively younger than the urban population and therefore part of the difference in earnings is due to the fact that younger people earn less. The correction for age is done in the study under the assumptions that: (1) The age distribution of each occupation is the same and parallel to the distribution in the migrant population, (2) Age has the same effect for all occupations, and (3) The relative gap in labor capacity is equal for all ages.

The first assumption has been shown to be unrealistic. Perkins and Hathaway show that the age distributions of various industries are different from each other, and that a higher proportion of persons under 25 and 55 or over were employed in agriculture, forestry and fisheries.[3] The second assumption was not tested, and given the age differentials of

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[1] D. G. Johnson, Comparability of Labor Capacities of Farm and Nonfarm Labor, p. 301.

[2] Ibid., p. 302, Table II.

[3] Perkins and Hathaway, op. cit., pp. 22-23, Tables 8a - 8b.

various occupations is unlikely. The third assumption is debatable. Young farm migrants might earn less when they begin to work, but their relative present discounted value of future income streams is higher than that of an old farm migrant, which increases their opportunity-costs.[1] The relative lack of experience in nonfarm occupation is also much smaller for young farm migrants than for older ones, at least because their counterparts in the nonfarm sector do not have much experience either. The conclusion is that the relative earning capacity of elderly farm people is lower than the relative earning capacity of younger ones.

In summarizing, one should emphasize that the studies by D. Gale Johnson were pioneering ones. Although the studies suffer from limitations due to assumptions and insufficient data they are the only encompassing studies done until the present. The studies might overestimate the relative capacity of farm labor, and exclude several additional factors influencing the comparability, but it surely indicates the way following examinations could take. The major limitation of the study seems to be the assumption that the various characteristics analyzed affect earning and capacity in an additive manner. The present study will try to refine the analysis by introducing interaction variables as well as several other socioeconomic characteristics which are assumed to affect earnings.

In a recent study Morgan, David, Cohen and Brazer[2] examined a

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[1] Chennareddy Venkareddy, "Present Values of Expected Future Income Streams and Their Relevance to Mobility of Farm Workers to the Nonfarm Sector in the United States, 1917-62" (Unpublished Ph.D. Thesis, Dept. of Agri. Econ., Michigan State University, 1965).

[2] J. N. Morgan, M. H. David, W. J. Cohen and H. E. Brazer, Income and Welfare in the United States (New York: McGraw-Hill, 1962).

related problem. They analyzed family attitudes, histories, and motivations that determine income. The population studied was a cross section of the noninstitutional population of the United States and a supplementary sample of low income families. The cross section sample was selected from the National Sample of the Survey Research Center of the University of Michigan. The National Sample is a multistage area probability sample. The supplementary low income sample, including families with head of family under 65 years of age, was taken from the 1960 Survey of Consumer Finance by the same institution.

For the purpose of the present study the most relevant part is the analysis of hourly earnings of "spending unit" heads and wives. The characteristics tested, in order of relative importance, were: Education and age, sex, occupation, population of cities, urban-rural migration, movement out of Deep South, extent of unemployment in states, supervisory responsibility, attitude toward hard work, race, ability to communicate, geographic mobility, physical condition, and rank and progress in school. The statistical procedure was a multivariate analysis utilizing dummy-variables. The conclusion was that many characteristics, including demographic, economic, sociological and psychological, affect the capacity to earn.[1] Another important conclusion for the present study, was that interaction between the various characteristics exists and exerts considerable influence.[2] It was also found that the effect of various characteristics is non-linear, the function of which usually takes the form of an inverted-u shape.[3] Other specific finding that have relevance

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[1] *Ibid.*, p. 48.

[2] *Ibid.*, p. 61.

[3] *Ibid.*, p. 49, Table 5-2, and p. 60, Table 5-16.

to the present study are: (1) Migration from farms to urban places increased hourly earnings when the transfer was to cities of 50,000 population or more. When the transfer was to towns of 2,500 - 49,900 people the hourly earning declined relative to earnings on farms. (2) Local unemployment affected earnings more than State unemployment, indicating a general slow process of economic adjustment.

The 84 subclasses of 14 characteristics accounted for only 34 per cent of the variance in hourly earnings of Spending Unit heads.[1]

Following Morgan _et al._, the present study will examine those socioeconomic characteristics which are thought to be theoretically relevant; are available, as far as suitable statistical data exists; and which comply with the technical limitation of the Michigan State University computer. High emphasis will be placed on interaction variables since the hypothesis is that earnings are affected by a multitude of factors with no single variable having conclusive importance. Several characteristics which were tested by Morgan _et al._ and found to have significant effect will not be tested in the present study because of unavailability of the proper data. It is expected that the larger population examined and the ability to include more characteristics and their interactions will enable the present study to achieve a higher proportion of explained variability.

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[1] _Ibid._, p. 48.

CHAPTER V

Statistical Methods

Introduction

As emphasized in the previous chapter, the crucial point in the analysis of resource allocation in United States agriculture is the definition of "comparable resources," and especially "comparable labor." In other words, an economic labor unit has to be established since at equilibrium only comparable resources are supposed to receive equal real returns. The need to establish a labor unit is based on the assumption that human beings do not contribute equally to production, and even their potentials in any given time are not equal. It should be emphasized again that this study does not refer to welfare considerations, but strictly to production aspects. The concept of "equality" referred to in this study should not, therefore, bear any value connotations.

In an economy in equilibrium with no divergence between private and social costs or benefits, each person is supposed to be remunerated according to his highest marginal contribution to production. Assuming that the difference between people is quantitative (amount of labor units), or could be converted to quantitative measures, the remuneration which a person receives, in the mentioned conditions, reflects the amount of units of labor he provides.

While real returns to each unit of labor should be equal at equilibrium there is no necessity that money returns should be equal. If real returns are defined, following Hicks,[1] as the same level of utility gained it is obvious that personal characteristics and preferences of different people might cause equal money returns to generate unequal amounts of utility, or unequal money returns generate equal real returns. Conditions that might affect the evaluation of money returns in terms of real returns are objective such as the general level of prices, or, subjective, such as the type of work, work schedule and conditions, prospect for future employment and advancement, geographic location, and all other conditions affecting the work or the employee's life.[2]

If the economy is not in a long-run equilibrium, persons may not receive equal real returns although they provide equal units of labor. The existence of economically fixed resources indicates that the economy is not in its long-run equilibrium, a case in which the mobile resources may be the only resources enjoying equal real returns. Emphasizing again, in a partial equilibrium situation malallocation can be defined only among the mobile resources, since the fixed resources are by definition in their best employment at the given time. Thus, in testing for for malallocation, one should examine if the specific resource, at the time of examining, could receive a higher real return than the one it

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[1] J. R. Hicks, Value and Capital (London: Oxford University Press, 1946), pp. 30-33.

[2] Edward F. Denison, The Sources of Economic Growth in the United States and the Alternatives Before Us, Supp. paper 13, Committee for Economic Development, 1962, p. 162.

receives in its current employment. Comparable resources, therefore, are not those which have equal potentialities, given the possibility to develop, but only those resources which at the time of investigation can deliver to society the same value of output.

Establishing agricultural labor malallocation necessitate, therefore, a proof that a higher proportion of labor in agriculture, than in other sectors, can receive higher real returns elsewhere, and that the adjustment mechanism is slower in agriculture than in the other sectors. On the other hand, if the indications are that farm people would receive in other employment approximately that which they are receiving in agriculture, the hypothesis of malallocation loses ground.

Estimating the earning capacity of labor in 1960 to enable a test of the hypotheses that farm people would receive in other employment that which they receive in agriculture, is one of this study's objectives. To do so the relevant characteristics available in the sample data have to be identified, their effect on earnings, in 1960, be measured, and then applied to identified homogeneous groups of farm people.

The source of data was the 1/1000 sample of the 1960 population of the United States[1] which is reported for individuals. Total earnings were regressed on several characteristics that were reported in the above source and thought to be relevant in explaining the variance in total earnings. Total earnings was assumed to reflect the relative contributions of labor to total output.

Although the proportion of the variance in total earnings explained

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[1] U.S., Bureau of the Census, U.S. Censuses of Population and Housing: 1960, 1/1000, 1/10,000, Two national samples of the population of the United States.

by the chosen variables was expected to be higher than in previous studies it was not expected to be very high. Several factors are responsible for the restricted explanation possible.

Cross-section: The analysis of 1960 data is a cross-section of "total earnings." Total earnings of 1960, however, are affected not only by what happened in this specific year, but also by decisions made in previous years. The structural parameters of the economy which determine earnings are not expected to be constant over time, and adjustments in the wage structure are not instantaneous, which implies that earnings at any point of time are an average outcome of a mixture of previous marginal decisions by employers and employees. Part of the variance caused by this factor could be explained if measures of experience, duration of occupation, or occupational mobility in specific age groups, were available. For the purpose of this study this puts an additional restriction on the findings: The estimate of the opportunity-cost of elderly workers, at least, is bound to be biased upward, since it is assumed that a person aging on the job would receive higher earnings than a new-comer of the same age.

Out of equilibrium: Equal real returns to comparable resources is assumed to occur only when the economy is in a long-run competitive equilibrium. It is also postulated that an economic system of the magnitude and complexity of the United States is never in a perfect equilibrium. Thus, it is very likely that real returns were not equal for comparable resources in different industries and sectors, in 1960. If a measure of the relative gap between reality and a competitive structure, such as has been described in the Introduction to this study, would have been reported for each major industry, or sector, the unexplained

variance in labor earnings could have been further reduced.

Real returns: Economic theory postulates that at a competitive equilibrium, real returns are equal for comparable resources, and assumes further that people react to real opportunities. However, earnings data are reported in money terms, the conversion of which to real returns depends on subjective and objective factors, partially unknown, unmeasurable, or unreported. Factors such as differentials in the level of prices between various residence areas, might have been incorporated by proxy variables; but those factors indicating value systems, or other psychological preferences, are usually excluded because of lack of data.

Missing variables: There is no doubt that the variables examined in this study do not exhaust the list of relevant variables affecting earnings. Several variables mentioned earlier which might have been important, such as experience, duration of occupation, seniority, degree of monopoly, were undefined or not reported. Other variables which were proven to be significant in previous studies,[1] such as supervisory responsibility, attitude toward hard work, ability to communicate, etc., were also not reported in the source of data used. However, the influence of several other variables such as level of prices, or efficiency of the labor market, may be inferred from proxy variables such as regions, size of SMSA, or type of place.

The Study Sample

The population examined in this study is all persons 14 years old and over who had non-zero "total earnings" in 1959. The sample for

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[1] Morgan, David, Cohen, and Brazer, op. cit.

this study was established by a random subsample of the 1/1000 Sample of Population and Housing mentioned earlier. The latter includes 179,563 persons of whom 90,394 satisfy the definition of the population to be examined and therefore constitute the sample used in this study.

The reason all persons 14 years old and over who had non-zero "total earnings" in 1959 were sampled (and not only nonfarm people) were two: (1) It was thought desirable to test the role of "occupation" in determining earnings and therefore all occupations should be represented. (It was technically impossible to construct two samples) (2) Assuming that farm labor is malallocated and that the demand for farm labor in the nonfarm sector is not perfectly elastic, labor earnings in farming should be below equilibrium level while in the nonfarm sector they will be above equilibrium level. Including both sectors was expected to affect the relevant parameters towards a weighted average which may reflect better an equilibrium level.

The AID Method

The use of the AID program was devised to facilitate the determination of the relative importance of the variables thought to be instrumental in explaining earnings variance, and to indicate possible interactions. The program, written by Sonquist and Morgan, employs:

> A nonsymmetrical branching process, based on variance analysis techniques, to subdivide the sample into a series of subgroups which maximize one's ability to predict values of the dependent variable.[2]

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[1] J. A. Sonquist and J. N. Morgan, The Detection of Interaction Effects, op. cit.

[2] Ibid., p. 1.

The AID program divides the sample in the following manner:

(a) Consider all feasible divisions of the parent group of observation on the basis of each explanatory factor included, and find this split which will provide the largest reduction in the unexplained variance (unexplained by the mean). The reduction in the unexplained variance (error sum of squares) has the same size but opposite sign, as the increase in the explained sum of squares.

For the group as a whole, the variance explained by the mean is

$$N\bar{X}^2 = \frac{(\Sigma X)^2}{N} ,$$

and the total sum of squares unexplained by the mean is

$$\Sigma(X-\bar{X})^2 = X^2 - \frac{(\Sigma X)^2}{N} .$$

Dividing the parent group into two groups, the explained variance would be

$$N_1\bar{X}^2_1 + N_2\bar{X}^2_2$$

The difference between the total sum of squares explained by the two means and the sum of squares explained by the parent group mean should be maximized.

(b) The actual reduction in error sum of squares has to be larger than one per cent of the total sum of squares for the whole sample (other limits can be chosen).

$$N_1\bar{X}_1^2 + N_2\bar{X}_2^2 - N\bar{X}^2 > .01\,(\Sigma X^2 - N\bar{X}^2)$$

(c) Among the groups so segregated, the next group to be examined for split will be that one which has the largest within unexplained sum of squares,

$$X_{ij}^{2} - N_i\bar{X}_i^{2} = \text{largest}$$

This process stops when all within unexplained sum of squares are less than two per cent of the total variance.

Because of computer memory limitations, the AID program could handle only 2,5000 observations while testing 23 independent variables (see Table V-1). This limitation was found to be very restrictive, since the variation in the population was relatively high. Two random subsamples of approximately 2,500 observations each were taken from the studied sample and tested by the AID program. The splits resulting were not the same for both samples and several variables appearing in each results were different. The reason for these results is thought to be the high variance in the population relative to the small size of the subsample tested. However, several characteristics appear in both subsamples. First, it was obvious that interaction is an important factor in explaining the variance of total earnings. Interaction appeared mainly between: Sex and Education, Sex and Age, Sex and Race, Age and Education, Age and Race, Race and Education, Education and Worker Class, and Worker Class with Associate's Education.

Second, the number of weeks worked in 1959 was always the first variable to be split and explained 19.0 to 21.0 per cent of the variance in total earnings. Relationship to head of family, sex, and age were intercorrelated and explained 8.7 to 11.7 per cent of the variance in

total earnings. Education explained 5.3 to 9.4 per cent of the variance, with the highest figure occurring when relationship to head of family was excluded. Worker class appeared important only in the second subsample and explained 4.3 to 5.0 per cent of the variance in total earnings. The level of education of the "associate" person (the wife in the case of a husband, etc.) also appeared only in the second subsample and explained 2.8 per cent of the variance.

SMSA2, Industry, Family labor, Race, Type of place, appeared in the solution of both subsamples but each explained only approximately 1 per cent of the variance. Variables that did not appear at all, appeared only in one sample, or were statistically unimportant were: Mobility A and B, Work year, Family size, and Family labor. Total family income was excluded from further analysis because of high correlation to "total earnings." The total percentage of variance explained (R^2) by the independent variables was 38.1 to 46.7 per cent depending on the variables included.

Because the main purpose of this study was to construct an earning capacity function capable of predicting earnings, several variables included in the AID runs were excluded from further steps. The earning capacity function should include only the basic structural parameters, which are supposed to be causative. The number of weeks worked in 1959, or the number of hours worked in the week before the Census was taken, are indicative rather than causative variables and therefore were excluded. Unless the number of weeks worked in 1959 is assumed to be a random phenomenon, this variable reflects a mixture of various influences that should be measured separately. Examining the characteristics of the split on the variable "1959 weeks" indicated that Age, Sex,

Table V-1. Variables Used in AID Program.

No.	Name [a]	Description
2	Total earnings	Wage and Salary + Self-employed; Dependent
3	Residence	Region of residence in 1960 (N. East, N. Central, South, West)
4	Type of place	Urban inside places, urban outside places, rural nonfarm, rural farm
5	Size of SMSA1	Size of SMSA[b] in the central city of which the person resides
6	Size of SMSA2	Size of SMSA[b] in the remainder of which the person resides
7	Age	Age of person; Divided into six age-groups
8	Sex	Sex of person
9	Rel. to Head	Relationship to head of family
10	Race	Race of person; including White, Negro, Indian, etc.
11	Birthplace	Place of birth: Regions and foreign
12	Mobility A	Comparing 1955 SMSA residence with 1960 one
13	Mobility B	Comparing 1955 Metropolitan residence with 1960 one
14	Education	Highest grade of school completed; seven groups
15	Work hours	Number of hours worked in week before Census
16	Work year	The year last worked if negative answer in 15
17	Worker class	Private, Government, Self-employed, unpaid family, etc.
18	Work place	Place of Work in SMSA[1]
19	1959 weeks	Number of weeks worked in 1959
20	Family size	Number of persons in person's family
21	Family labor	Number of family members in the labor force
22	Family employed	Number of family members employed
23	Total income	Total income of person's family
24	Assoc. Educ.	Highest grade of school completed by associate person in family
25	Industry	Industry person worked in; 12 groups

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[a] For the definition of the variables and their subclassifications, see: U.S., Bureau of the Census, U. S. Censuses of Population and Housing: 1960, 1/1,000, 1/10,000, two national samples, Description and Technical Documentation, pp. 18-77.

[b] SMSA stands for Standard Metropolitan Statistical Area.

Relationship to head of family, Race, Education, Place of work, and Education of associated person were highly associated with it. The group that worked more than 40 weeks in 1959 included a higher percentage of people in their prime age, males, heads of family, whites, higher educated persons, people working in central city, and people who have associates with a high school or college education. It was expected, therefore, that the incidence of unemployment would be reflected in the earning capacity function by means of the other mentioned variables.

The Earnings Capacity Function

Upon completion of the AID analysis, variables which were assumed relevant and important were included in a least squares regression with "total earning" as the dependent variable. Computer and time limitations restricted the variables to those reported in Table VI-1. To avoid the assumption of linearity in the variables and to enable a better estimate of interaction effects, the variables were transformed to the dummy-variables form. Each basic variable was subclassified and each subclassification was assumed to be a new variable. To facilitate the discussion, the derivatives of each basic variable analyzed together will be called a "topic group" while the term "variable" will be retained for each subclassification. For example, the basic variable "Type of Place" was subgrouped into four classes: Rural farm, rural nonfarm, urban (outside places), and urban (inside places). After one of those classes was omitted to avoid singularity of the regression matrix, the remaining classes were numbered as individual variables. In the case of "Type of Place" the class "Rural farm" was omitted and the remaining classes received the numbers X_3, X_4, and X_5. The group of X_3 to X_5, which

Table VI-1. Variables Included in Earning Capacity Regression

Topic Group	Variable	Name and Description[1]
	X_0	Constant
Income	X_1	Total Earning; Dependent; Continuous
	X_2	Other Income; Continuous
Single Dummy Variables		
Type of Place	X_3 to X_5	Respectively: Rural Nonfarm, Urban outside places, Urban inside places, Omitted: Rural Farm.
Age	X_6 to X_{11}	Grouped into the following age classes, respectively: 18-24, 25-34, 35-44, 45-54, 55-64, 65+. Omitted: 14-17.
Sex	X_{12}	Female. Omitted: Male
Race	X_{13}	Non-White. Omitted: White
Rel. to head	X_{14}	Head of the family. Omitted: Non-head.
Education	X_{15} to X_{19}	Grouped according to level of schooling completed, respectively: 5-8 Elementary, 1-3 High School, 4 High School, 1-3 College, 4+ College. Omitted: 0-4 Elementary.
Occupation	X_{20} to X_{30}	Respectively: Professional, Farmer, Manager, Clerical, Sales Worker, Craftsmen, Operatives, Private Household Workers, Service Workers, Farm Laborers, Laborers (exp. farm laborers). Omitted: Not Reported.
Worker Class	X_{31} to X_{32}	Respectively: Salaried and Self-employed. Omitted: Unpaid family workers, Armed Forces, and Other, which did not work since 1949.

Table VI-1 - Continued

Industry	X_{87} to X_{100}	Respectively: Agriculture, Mining, Manufacture Durables, Manufactures Nondurables, Transportation and Communication; Wholesale, Retail, Finance, Business, and Repair services, Private Household, Personal services, Entertainment, Professionals, Public Administration. Omitted: Not Reported.
Size of SMSA	X_{101} to X_{103}	Respectively: Less than 100,000 persons, Between 100,000 and 1,000,000 persons in the SMSA. Omitted: Outside the SMSA
Assoc. Education	X_{124} to X_{126}	Grouped according to the following classes, respectively: Elementary education, High School, College. Omitted: No formal education.
Region	X_{127}	Not South. Omitted: South.
Interaction Dummy Variables		
Education & Age	X_{32} to X_{62}	30 cross classifications of the single variable classes. Omitted: Any cross classification involving either 0-4 Elementary education, or 14-17 years of age.
Education & Sex	X_{63} to X_{67}	5 cross classifications of the single variable classes. Omitted: Cross classifications involving either 0-4 Elementary, or Male.
Education & Race	X_{68} to X_{72}	5 cross classifications of the single variable classes. Omitted: Cross classifications involving either 0-4 Elementary, or White.
Sex & Age	X_{73} to X_{78}	6 cross classification of the single variable classes. Omitted: Cross classifications involving either Male or 14-17 years of age.

Table VI-1 - Continued

Race & Age	X_{79} to X_{84}	6 cross classifications of the single variable classes. Omitted: Cross classifications involving either White, or 14-17 years of age.
Sex & Race	X_{85}	Non-White Female. Omitted: All White, or Male.
Sex & Rel. to Head	X_{86}	Female head of family. Omitted: All Male, or non-heads of family.
Type of Place & Education	X_{104} to X_{118}	15 cross classifications of the single variable classes. Omitted: Cross classifications involving Rural farm people, or 0-4 Elementary education.
Sex & Race & Education	X_{119} to X_{123}	5 cross classifications of the single variable classes. Omitted: All Male, or White, or 0-4 Elementary.

[1] See footnote a in Table V-1.

relates to the original variable "Type of Place," and the omitted class, is called the "type of Place topic-group." The relation of variables to their topic-groups is reported in Table VI-1.

When utilizing dummy variables, the usual transformation is of the form

$$X = \begin{cases} 1 \text{ if in group i} \\ 0 \text{ otherwise} \end{cases}$$

however, Ruble[1] pointed out that when interaction effects are also studied the above is incorrect. The F-test using the above transformation will automatically incorporate another assumption: Namely, that there is no interaction between the single topic-group, and the omitted class of the other topic-group with which the first group is suppose to interact. To relax this additional assumption, Ruble suggests the use of a transformation which discriminates between the variables in the topic-group and the one which was omitted: Assume $X_1. \ . \ . \ . \ .X_{k+1}$ to be a topic-group (k+1 levels of education interacting with sex, for example). To enable a determinate solution, omit X_{k+1} and now transform the remaining classes into dummy variables by

$$\begin{array}{ll} X & = 1 \text{ if in group } i;\ i \neq k+1 \\ & 0 \text{ if in groups } 1, \ . \ . \ . \ , i-1,\ i+1. \ . \ . \ . \ k \\ & -1 \text{ if in group } k+1 \end{array}$$

The proper transformation of X_{ij} is calculated technically, by multiplying the individual transformations of X_i and X_j,

$$X_{ij} = (X_i)\ (X_j)$$

The latter trnsformation was used in this study.

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[1] William Ruble, Analysis of Covariance and Analysis of Variance with Unequal Frequencies Permitted in the Cells, *Stat. Series Description No. 18*, Agr. Expt. Sta., Michigan State University, December, 1966.

Because of the size of the problem studied (90,394 observations and 127 variables) and the relatively limited computer memory, several least squares computer routines were employed.[1] The following have been tested: The individual significance of each variable (significance of differing from zero), the significance of each topic-group, total $\bar{R}^2$, the contribution of each variable to $\bar{R}^2$. Because of the use of dummy variables, multicollineantly could be tested only indirectly and intuitively, by examining the effect on the parameters of omitting specific topic-groups. The results are examined in Chapter VII, and the basic regressions are reported in the Appendix to this study.

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[1] Michigan State University, Agri. Expt. Sta. Calculation of Least Squares (Regression) Problems on the LS Routine, Stat Series Description No. 7 (Mar. '66). Michigan State University (OLSHC overlay), Stat Series Description No. 11 (Mar. '66).

CHAPTER VI

Earning-Capacity Function Variables

In the previous chapter the variables reported in the 1/1000 sample of U. S. Population and Housing: 1960 were screened according to their theoretical and statistical relevance. It was also decided that only causative variables would be included in the estimate of the Earning-Capacity function. The variables chosen, including interaction variables, are reported in Table VI-1.

In this chapter the relation between the dependent and the independent variables suggested to be included in an earning-capacity function, as well as problems involved in using the available data and the limitations imposed by the available data will be discussed.

Total Earnings: Total income measured by the Census includes: Wage or salary income, Self employment income, and Income other than earnings.[1] Wage or salary income is defined as "total money earnings received for work performed as an employee." The definition of Self-employed income is "net money income (gross receipts minus operating expenses) from a business, . . . [in] which the person was engaged on his own account." Income other than earning includes: net rents, royalties, interest, dividends, and transfer payments. The source of data utilized in this study reports also on Total earnings, which

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[1] U. S., Bureau of the Census, United States Census of Population, 1960, U. S. Summary, PC (1) - 1D, p. XXXIX.

comprise of Wage or salary income plus Self-employed income.

The income data reported poses several problems regarding the present study. First, money income or earnings reported excludes income or rearnings in kind. This is especially important in the case of farm people.

Assuming that total operating expenses would have been unchanged had farm products not been consumed directly by farm households, it is estimated that products consumed directly on the farm in 1960 amounted to 10.4 per cent of total net income from farming, or 7.2 per cent of total disposable personal income of the farm population from all sources.[1]

Second, the returns farmers receive include direct and indirect governmental subsidies. Part of the subsidies is clearly a transfer payment which should be excluded from the analysis. However, economic activities are not additive, in most cases, and a simple subtraction would not do. Short of a complete economic model incorporating transfer payments as a structural variable the subtraction of governmental subsidies would produce biased results. The results of this study should be interpreted therefore as referring to the specific situation of 1960 including the specific amounts of subsidies given through specific programs.

Third, to comply with the stated aim of this study to concentrate on resource allocation, "earnings" should have been adopted rather than "income." But, farmers' income, including both labor and owned capital returns, is reported as Self-employment income, which is the main reason

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[1] U. S., Dept. of Agri., Farm Income Situation, ERS-FIS-203 (July, 1966), p. 49, Table 11H; p. 39, Table 1H; p. 42, Table 4H.

why Total earnings (Wage and salary income + Self-employment income) was chosen as the dependent variable. Additional reasons were: (1) Farm people have additional income working off-farm, and it is reported in Wage and salary income. (2) The main outlets of farm migrants are wage occupations. (3) The inclusion of the variables "Salaried" and "Self-employed" as independent variables was intended to measure entrepreneurship returns and the returns to owned capital. The difference between the parameters of those variables may therefore give an estimate of the money returns for being independent.

Constant Term: In the case of a dummy variable multiple regression in which one class in each topic-group is omitted, the constant term stands for the composite effect that all the omitted classes are assumed to have on total earnings plus the overall constant. In other words, assuming that all the independent variables, beside the constant, take the value zero, then "total earnings" will be equal to the constant term. The person to whom this applies should have the following characteristics: Having no other income, residing in rural farm area, of the age 14-17 years, male, white, not a head of family, having 0-4 years of elementary education, and so forth for the omitted variable of each topic-group.

Type of Place: This variable, as several others, was adopted as a proxy for differentials in the general level of prices, which might affect total earnings; differentials in the efficiency of the labor market in the various residence areas; differentials in the structure and mix of industries in which labor can find employment; and differentials in labor capacity other than those which could be explained directly by other variables included in the regression. One such effect

might be different preferences of the population in the various residence areas. In this case, however, it will be impossible to infer directly if the differences in money returns reflect malallocation or differences in intangible income.

Age: This topic-group was generally subclassified into groups of ten years each. Fourteen years of age was chosen to be the starting point to parallel the limits of the labor force as defined. The first subclassification 14-24 year old, was further divided into 14-17 years of age, and 18-24 old. This division was made in order to test the opportunities of young people entering the labor force after completion of high school. The inclusion of the 24 year olds with the 18-23 group and not with the 25-34 group was done since 25 year olds were assumed to have completed, at least, part of their college education and therefore to be in the stage of crucial occupational decisions. Further, those 24 year old and less comprise the largest portion of farm migrants.[1] Persons over 25 years old were grouped by ten year differences, plus an open-ended group 65 years of age and over.

Sex: There is ample evidence that females earn less than males.[2] The reasons might be sex discrimination, differences in capacity, differences in attitudes toward work which cause women to prefer part-time jobs, temporary jobs, etc. Therefore, a variable measuring these effects was included.

Race: This variable was included in purpose to measure race

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[1] Perkins and Hathaway, op. cit., p. 13, Chart 2; p. 17, Table 4.

[2] For the situation in 1960: U.S., Bureau of the Census, Census of Population: 1960, Final Report PC (1) -1D, p. 1-570, Table 218. That sex-effect is significant see: Morgan, David, Cohen, and Brazer, op. cit., p. 48, Table 5-1.

discrimination in earnings, apart from the differences in education, place of residence, etc. Discrimination could be practiced by giving lower wages for the same job, by preventing the entry to various occupations, etc.

Relation to Head of Family: The reason this variable was included besides sex, is that it was assumed that head of family would have higher motivation to exhaust employment possibilities and find the best offered. Other members of the family might have other responsibilities, such as rearing children, or attending school, which may cause them to work less and have smaller earnings.

Education: Education stands in this study as one measure of quality, recognizing the serious limitation it involves. First, education is measured in terms of "regular" school years completed[1] and does not include other educational institutions as vocational schools, special courses, on the job training, etc. Second, the measure assumes that each formal year of schooling, over the entire United States and over the time period during which the 1960 population was educated, has the same effect on earnings, or in other words, are of comparable quality. These implied assumptions are known to be wrong and will be discussed later regarding the interaction between education and residence. Part of the quality effect of being in school in different decades might be measured by the education-age interaction variables.

That education has a direct effect on earnings had been shown

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[1] U. S. Census of Population: 1960, Final Report PC (1) -1D, op. cit., p. XVIII.

in several studies. Kendrick,[1] Schultz[2] and Denison[3] indicate that the main factors raising real wages in recent decades were the shift in industry and occupational mix toward higher skill levels, and the increase in demand for skills and education. These factors parallel the large investment in education. Schultz suggests that "Most of the differences in earnings are a consequence of differences in the amounts that have been invested in people."[2]

Education is also related to the ability to adapt to changing economic conditions. In recessions, workers with the least amounts of schooling suffer the heaviest burden, while in a booming economy, those with higher levels of schooling gain relatively more than the lower levels.[4] Education has also an important effect on the rate of labor force participation,[5] on the rate of unemployment,[6] and on the incidence of part-time work because of economic reasons.[7]

But, education has also indirect effects on earnings. Perkins and Hathaway report that the results of their study "provided further support for the notion that off-farm mobility is related to education and labor skills."[8] Brunner et al., as reported by Nelson, found that

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[1] Kendrick, _op. cit._, p. 89-90, 106.

[2] T. W. Schultz, "Reflections on Investment in Man:, _op. cit._, p. 1; and "Investing in Poor People: An Economist's View," _op. cit._, pp. 515, 518-519.

[3] E. F. Dennison, The Sources of Economic Growth in the U.S., _op. cit._, p. 68.

[4] A. Katz, _op. cit._, p. 115.

[5] _Ibid._, pp. 116-118.

[6] _Ibid._, pp. 118-119. And U.S., Dept. of Labor, _Mobility and Worker Adaptation to Economic Changes in the United States_, Manpower Research Bul. 1 (July 1963), p. 11.

[7] A. Katz, _op. cit._, p. 19.

[8] Perkins and Hathaway, _op. cit._, p. 18.

of the rural farm youth between 1935 and 1940 (twenty-five to thirty-four years of age in 1940) who had had four or more years of college, 49.5 per cent went to urban centers," while of those completing six grades and less, only approximately 20 per cent moved to urban centers.[1] In a recent study, Gisser found that, while education increases the demand for labor in agriculture, it increases the demand for farm labor in the nonfarm sector by far more.[2] The conclusion is therefore that education motivates off-farm migration.

Hughes, Jr.,[3] Burchinal,[4] and Payne[5] report on the effect of education, and educational aspiration, on occupational aspiration, aspiration in general, and earning possibilities. Thus it appears that education has short-run as well as long-run effects that might affect earnings in 1960.

Occupation: As mentioned earlier in this study the variable "occupation" posed several difficulties. The major issue was that it is yet unknown why people engage in the occupations in which they are employed. Haller and Miller in 1963 state that "at present, we do not have a valid theory to explain and predict exactly what occupation a

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[1] L. Nelson, op. cit., p. 36.

[2] M. Gisser, "Schooling and the Farm Problem, "Econometrica, XXXIII, No. 3, 1965, pp. 582-592.

[3] R. B. Hughes, Jr., Population Adjustments and Economic Status of Southern Farmers (Mimeograph, Univ. of Tennessee, Dept. of Agri. Econ., 1956).

[4] Lee G. Burchinal, Career Choices of Rural Youth in a Changing Society, North Central Regional Publication 142, Agri. Expt. Stat., Univ. of Minnesota, Station Bul. 458 (Nov., 1962), pp. 12-14.

[5] Raymond Payne, "Development of Occupational and Migration Expectations and Choices Among Urban, Small Town, and Rural Adolescent Boys," Rural Sociology, XXI, No. 1-4 (1956).

person will enter."[1] Keuvlesky and Bealer in a recent article[2] point out the gross factors affecting occupational attainments and make clear that very little is known and that even what is known is not always comparable.

On the other hand there is evidence that a substantial proportion of people follow their father's occupations,[3] which suggests a strong traditional tie and not necessary economic reasoning. In short, the issue is whether the evidence that a person is in a specific occupation reflects on his capacity, or whether it is to a large extent a historical incident.

To test if being in a specific occupation reflects one's labor capacity, conditional probability regressions, utilizing dummy-variables, were run. Each occupation-group was regressed on those variables assumed to determine earnings. The rule for accepting the hypothesis was decided to be: Accept the hypothesis if a distinct pattern appears for specific occupations and/or if the socioeconomic variables seem to determine the occupation in which a person is engaged (the size of $\bar{R}^2$).

Eleven regressions were run, one for each occupational group as reported in Table VI-1. The independent topic-groups included in those regressions were: Type of Place, Age, Sex, Race, Education, Education and Age, Education and Sex, Education and Race, Sex and Age, Race and

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[1] Archibald O. Haller and Irwin W. Miller, The Occupational Aspiration Scale: Theory, Structure, and Correlates, Tech. Bul. 288, Michigan State University, Agri. Exp. Stat. (1963) p. 5.

[2] William P. Keuvlesky and Robert C. Bealer, "A Classification of the Concept 'Occupational Choice'", Rural Sociology, XXXI, No. 3 (1966) pp. 256-76.

[3] U.S., Bureau of the Census, Lifetime Occupational Mobility of Adult Males, March 1962, Current Population Reports, Tech. Studies, Series P-23, No. 11 (May 12, 1964), p. 9, Table 4.

Age, Sex and Race, Sex and Relation to Head, Size of SMSA, Type of Place and Education, Associate's Education, and Region. The $\bar{R}^2$ ranged from 0.2190 (for professional) to 0.0208 (for service workers), with seven of the regressions explaining less than 10 per cent of the variance in each occupation-group, and the other two explaining 13 per cent.

None of the occupational group tested revealed a distinct pattern, and only in few specific variables indicated a relative importance. For example, in the case of the occupational-group professionals, the exclusion of the topic-group Age (proper) reduced the degree of variance explained by only 5 per cent, while the exlusion of Education (proper) reduced the $\bar{R}^2$ by even less - 2 per cent. In the case of Farmers, the topic-group Type of Place is responsible for 3.6 per cent of the total explainable variance of 13.3 per cent, which reduces the causative explanation of the variance to less than 10 per cent. Among the 11 regression only four revealed topic-groups which affected the $\bar{R}^2$ by more than 10 per cent. The private household workers regression revealed that 42 per cent of its very low level of explanation ($\bar{R}^2 = .0498$) is due to the Sex variable. The contribution of topic-groups such as Education and Age, and Sex and Age to the low degree of variance explained in the service workers occupational-group ($\bar{R}^2 = .0208$) is 12 and 17 per cent respectively. Sex contributed 20 per cent in the case of Laborers. In the case of Farm Laborers the major contributor was the topic-group Type of Place (14 per cent), which is indicative rather than causative.

In conclusion, since the rule of acceptance was not met, the hypothesis that being in an occupation indicates one's labor capacity

was rejected. Therefore, "occupation" as a variable, was excluded from the ultimate earnings-capacity function.

Several statistical notes are in place here. First, one possible reason for the $\bar{R}^2$ to be so low may be the degree of occupation grouping. Each single occupation spans a range of socioeconomic characteristics. By aggregating the single occupations into occupational-groups this range is very likely to increase, causing a decline in the importance of each restrictive individual characteristic.

Second, the conditional probability regression used in this study is heteroscedastic, which violates one of the least square assumptions. Heteroscedasticity tend to decrease the efficiency of the regression and therefore reduce the significance of the estimated parameters.[1] However, as was shown by Orcutt, Greenberger, Korbel, and Rivlin[2] in their study of observed and expected labor force participation the reduction in efficiency in the case of large samples declines.[3] Since the size of the sample used in this study is 30 times larger than the size of sample used in the study by Orcutt *et al*., the reduction in efficiency is believed to be acceptable.

Worker Class: The reasons for including these variables were discussed earlier while discussing Total Earnings.

Industry: If there are serious malallocations in the economy of the United States of 1960 it is very likely to follow industry lines.

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[1] J. Johnston, Econometric Methods, *op. cit*., p. 228-9.

[2] G. H. Orcutt, M. Greenberger, J. Korbel, and A. M. Rivlin, *op. cit*., p. 224-250.

Thus, differences in labor earning between the various industries, assuming equal preferences of employers and employees, and equal units of labor per worker might suggest the degree the economy is out of equilibrium. However, preferences are not equal and it is unlikely that workers on the average provide the same amount of labor units. Therefore labor earning differentials are a weak measure of malallocation. Nevertheless, industry parameters may help estimate better the opportunity-costs of farm migrants if the industry mix in probable labor markets is known.

Size of SMSA: As in the case of Type of Place this variable was designed to be a proxy for unavailable data related to the size of the communities in which persons are occupied, and which might not be reflected by the Type of Place topic-group.

Associate's Education: The evidence as reported in the literature indicates that the level of education of the associate member of the family is related to earnings. However, the line of causation is not clear. Do persons earn more because their associate has a higher level of education, or do persons who have high level of earnings marry someone who has a relatively higher level of education.

Education and Age: This interaction topic-group is designed to test if education affects earnings similarly over the life cycle. It was suggested that the marginal benefits of an addition to education is different for different age-groups. However, because of the nature of the data this variable would measure the composite effect of the former and the effect of different qualities of education in the past, effects of obsolete skills and education, effects of improved knowledge because of additional experience, etc. The end result of those contradictory

effects, as they are reflected in the population in 1960, is hard to predict. Previous studies[1] indicate at least one strong effect of education on life cycle earnings namely that earnings increase at a slower rate, but reach higher levels.

Education and Sex: Again, the purpose of this interaction variable was to test if education affect male and female alike. It was assumed that higher education might affect females relatively more than males, since it enables females to overcome part of the discrimination against them and to enter higher paying part-time jobs. It was also assumed that higher education will motivate females to increase their participation in the labor force.[2]

Education and Race: Assuming that the effect of race will be found significant, this interaction topic-group is included to test, given the social and economic condition of 1960, if education affects both races similarly. The issue is mainly whether, in the short-run, education is increasing the opportunity-costs of non-whites. Changes in people's attitudes toward different occupations as result of attaining higher levels of education is taken into account.

Sex and Age, Sex and Race, Race and Age: These variables were included to test if the single variables involved (Sex, Age, Race) have different effects in different circumstances. The issues were: Does age have the same effect on male and female? How does the sexes fair in discrimination? And is the life-earning cycle similar for both races?

Sex and Relation to Head: It became apparent from the AID

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[1] Morgan, David, Cohen, and Brazer, op. cit., p. 49, Table 5-2.

[2] A. Katz, op. cit., pp. 116-118.

analysis that the incidences of being the head of family and a male are correlated, but it was not known if sex has a separate effect. The inclusion of this variable is to test if the incidence of a head of family being a female will have a different effect on earnings than the additive effect of head of family and female.

Type of Place and Education: It has been known for quite awhile that formal years of schooling is a very crude measure of education because the quality of the schools is not equal over the various residence areas.

Abstracting from the difference in value systems and educational aspirations between rural-farm and urban youth, which were discussed by Burchinal,[1] the discussion here will be in terms of "technical" efficiency. To be sure, this decision does not imply that the values or aspirations are irrelevant or unimportant, but it is assumed that they should be discussed in a welfare context.

One measure of performance or quality might be the degree of retardation and acceleration in the various schools. Retardation is defined as being enrolled in grades below those expected, considering age, while Acceleration is defined as being enrolled in grades higher than expected for the specific age.[2] The relative performance of urban and rural-farm schools is shown in Table VI-2. The general level of performance was lower in the rural-farm population relative to the urban one in both 1950 and 1960; retardation being almsot double and

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[1] Lee G. Burchinal, Career Choices of Rural Youth in a Changing Society, op. cit., especially pp. 12-14.

[2] James D. Cowhig, Age-Grade School Progress of Farm and Nonfarm Youth: 1960, Dept. of Agri., Agri. Econ. Report 40 (ERS) (August, 1963) p. 5.

Table VI-2. Number of Persons 7-18 Years Old Enrolled and Accelerated or Retarded, and Percent of Total Enrollment, 1950-1960.

		Urban				
		1950		1960		
		Thou.	% of enroll-ment	Thou.	% of enroll-ment	Progress[a]
Accelerated:		626	5.5	1,053	5.2	1.1
Retarded:	Total	1,611	14.0	1,755	8.7	1.6
	One grade	1,056	9.2	1,284	6.4	1.4
	2 and more	555	4.8	471	2.3	2.1

		Rural-Farm				
		1950		1960		
		Thou.	% of enroll-ment	Thou.	% of enroll-ment	Progress[a]
Accelerated:		164	3.8	108	3.8	1.0
Retarded:	Total	1,214	28.1	388	13.6	2.1
	One grade	649	15.0	242	8.5	1.8
	2 and more	565	13.1	146	5.1	2.6

[a] Progress is defined as the percent in 1950 divided by the percent in 1960. In the case of retardation the larger the ratio the greater the progrss. In the case of acceleration the smaller the ratio the greater the progress.

Source: 1950: Eleanor H. Bernert, America's Children (New York: John Wiley & Sons, 1958), p. 171, Table E-3.

1960: James D. Cowhig, Age-Grade School Progress of Farm and Nonfarm Youth: 1960, Dept. of Agri., Agri. Econ. Report No. 40 (ERS), August 1963, pp. 13-14, Tables 10, 11.

acceleration only 75 per cent of the urban figure. The relative improvement between 1950 and 1960, however, was much greater in the rural-farm

sector. Acceleration dropped in the urban sector while in the rural-farm it was maintained. The relative decline in retardation percentage was more than 30 per cent larger in the rural-farm sector than in the urban sector.

Another measure of performance is the rate of dropouts. It is recognized that values and aspirations have influence on the rate of dropout, but it cannot account for the whole difference. The school dropout rate for 18 and 19 year-olds in rural areas was 33.4 per cent compared with 25.8 per cent for central cities and 23.7 per cent for all urban areas. Further, while almost half of the urban dropouts completed 10 grades, only 29.8 per cent of the farm dropouts reached this level.[1]

A third measure of quality is the length of school-year. In 1959-60 a school-year meant 171 school-days in Vermont, but only 149 days in Mississippi.[2]

The low quality of rural schooling is indicated also by Folkman's study of rural and urban students entering Iowa State University.[3] In the fall of 1955 rural students had twice as many deficiencies as urban students. The proportion who graduated with special honors also differed markedly, 3.3 per cent compared to 6 per cent, respectively.

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[1] U. S., Dept. of Agri. (ERS), Rural People in the American Economy, Agri. Econ. Report 101 (Oct. 1966), p. 21.

[2] T. W. Schultz, "Underinvestment in the Quality of Schooling: The Rural Farm Areas," Increasing Understanding of Public Problems and Policies: 1964, (Chicago: Farm Foundation, 1964), p. 16.

[3] William S. Folkman, Progress of Rural and Urban Students Entering Iowa State University, Fall 1955, Agri. Econ. Report 12, Dept. of Agri. (ERS) (July, 1962).

Assuming that a correlation exists between the salary a teacher receives and his relative expertise, the relative ability reflected by the level of salary of rural teachers is low. According to Schultz's presentation, the average annual salary of instructional staff in the 101 most rural counties in 1955-56 was $2,933, while the average annual salary in the three highest states in the United States was almost twice that amount--$5,092.[1]

School size is also assumed to be related to quality of education. In 1961-62 there were an estimated 13,000 one-teacher schools, nearly all of them rural. For high schools, approximately 71 per cent of the small high schools (fewer than 300 pupils) in 1958-59 were in communities of fewer than 2,500 people.[2]

One of the very few studies of the relation between school size and quality of education is Woodham's.[3] Measuring the "Breadth of Educational Opportunity" in terms of units of educational opportunity, which reflect the variability of subjects offered and the amount of special and administrative services employing trained staff members,[4] Woodham found a high correlation (.73-.81) between the size of secondary schools and the number of units of educational opportunity provided.[5]

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[1] T. W. Schultz, op. cit., p. 20.

[2] Rural People in the American Economy, op. cit., pp. 21-22.

[3] William Jesse Woodham, Jr., "The Relationship Between the Size of Secondary Schools, the Per Pupil Cost, and the Breadth of Educational Opportunity," (Unpublished Ph.D. Thesis, University of Florida, 1951).

[4] Ibid., pp. 71-72.

[5] Ibid., pp. 80-84.

Further, although the unit of educational opportunity was primarily designed to measure the quantity of educational opportunity, there are indications that it is also associated with quality. The correlation between the number of units of educational opportunity and the percentage of teachers having five or more years of college training was between .68 and .75.[1] A similar relationship was found between the number of units of educational opportunity and the scores made on the Florida Statewide High School Twelfth Grade Testing Program.[2] Thus, the size of a secondary school is strongly related, on the average, to the quality of education it provides.

Optimally one would want a measure of the size of school in which a person was educated and the area in which this school was located. However, the data available provides only the place of residence in which a person was residing at the time the Census was taken. From the answers to the question on "Place of birth" it appears that 70 per cent of the population of the United States were living in 1960 in the same state in which they were born.[3] If the population of the United States behaved similarly with respect to "type of place," the interaction variables "Type of Place and Education" can be expected to reflect some of the difference in the quality of education.

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[1] Ibid., p. 94.

[2] Ibid., pp. 94-95.

[3] U. S. Censuses of Population and Housing: 1960 (1/1,000 1/10,000), op. cit., p. 96 (Item 20, Code 0).

CHAPTER VII

Earning-Capacity Function: Empirical Results

Introduction

The previous chapters have outlined the reasons for this study and especially for the need of an estimate of peoples' earning-capacity, as a proxy for their opportunity costs. The methods to be used, the variables which are believed to affect earning-capacity, and several limitations were also discussed. In this chapter the empirical results of the various regression will be presented and analyzed.

A few general notes regarding the order of presentation and several technical issues, are appropriate at the outset of the chapter.

General Notes

The proportion of variance in "Total Earnings" explained by the variables included in this study is larger than the explained portion in previous studies. The study by Morgan *et al*.[1] explained approximately 34 per cent of hourly earnings of Spending Units heads, while one of the regressions of this study explains almost 47 per cent of the variance in "Total Earnings" of all the population 14 years old and over having non-zero earnings. Even after deleting "Occupation," "Industry," and several other topic-groups the $\bar{R}^2$ remains more than 20 per cent higher. However, as was expected the absolute size of the $\bar{R}^2$ is still low.

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[1] J. N. Morgan, M. H. David, W. J. Cohen, and H. E. Brazer, *op. cit*., p. 48.

Technical, and especially time, limitation prevented further examination, although it is believed that the sources of data on which this study was based can yield more information than is reported here. Inclusion of additional, or different proxy variables, or different aggregation of the available data is believed to reveal further information.

The Regressions: Table VII-1 presents, in brief, four regressions out of several more that were run. Regressions A-1 to A-3 were only trial runs, and the runs following A-7 did not prove to add significantly to the information contained in the four reported.

Regression A-4 is an all inclusive one. It contains all the 126 variables which have been described in preceding chapters. Because of its inclusiveness the following discussion of the various topic-groups will utilize the actual coefficients of A-4 to demonstrate several points. Throughout the analysis, unless explicitly referred to, the coefficients reported are those of regression A-4. Whenever the pattern of the coefficients of single variables within topic-groups changes from one regression to another it will be explicitly mentioned.

Several topic-groups in A-4 contributed insignificantly to the $\bar{R}^2$ of the regression; others were of an inconclusive nature since it could not be decided if they are indicative or causative. The topic-groups referred to above were: "Other Income," "Type of Place and Education," "Sex and Race and Education," and "Associate's Education." The above plus "Occupation" were deleted in constructing regression A-5.

The difference between A-5 and A-7 is only the deletion of "Industry" in the latter, to enable an examination of the effects "Industry" exerts on other factors.

A-6 is a non-interaction regression that was run to measure the

effect interaction has on the $\bar{R}^2$ of the regression and on the individual coefficients.

The decision regarding which of the regression should be utilized as the Earnings-Capacity functions is left for future users, since it depends on the accuracy wanted, the available data, and the limitation of resources. It is suggested, however, that unless further study will indicate that one's occupation is related to his labor capacity, regression A-4 should not be used in a predictive capacity. If an estimate of the industrial "mix" of the probable area of migration is available, regression A-5 could be utilized and yield more information than A-7.

A complete description of the four regressions reported can be found in the Appendix to this study.

Multicollinearity: Correlation among the independent variables is referred to as multicollinearity. When multicollinearity is present the variance of the estimated coefficients increase, and it is difficult to get significant coefficients. Since almost all the variables used in this study are in the dummy-variable form, the degree of correlation among the independent variables could not be calculated. The extent of multicollinearity could therefore be assessed only intuitively by examining the effect on specific parameters of the elimination of specific topic-groups. There is no doubt that multicollinearity is present, especially between the simple topic groups and the interaction ones, but since it did not affect the significance of any topic-group its effects were not considered as important.

When multicollinearity exists and some variables are deleted the estimated coefficients of remaining correlated variables will be biased. The estimated coefficient for a given variable will include,

Table VII-1. Topic-groups Included (+), and Excluded (-), in the Various Regressions Reported.[a]

Regression	A-4	A-5	A-7	A-6
Topic-groups				
Constant	+	+	+	+
Other Income	+	-	-	-
Type of Place	+	+	+	+
Age	+	+	+	+
Sex	+	+	+	+
Race	+	+	+	+
Relation to Head of Family	+	+	+	+
Education	+	+	+	+
Occupation	+	-	-	-
Worker Class	+	+	+	+
Education and Age	+	+	+	-
Education and Sex	+	+	+	-
Education and Race	+	+	+	-
Sex and Age	+	+	+	-
Race and Age	+	+	+	-
Sex and Race	+	+	+	-
Sex and Relation to Head	+	+	+	-
Industry	+	+	-	+
Size of SMSA	+	+	+	+
Type of Place and Education	+	-	-	-
Sex & Race & Education	+	-	-	-
Associate's Education	+	-	-	-
Region	+	+	+	+
$\bar{R}^2$	.4659	.4457	.4286	.4015
Number of Topic-groups	23	18	17	11
Number of Variables	126	92	78	39

[a] A complete description of the regressions reported can be found in the Appendix to this study.

beside what it is designed to estimate, part of the effects due to a deleted but correlated variable. Since the purpose of this study was primarily to estimate opportunity-costs as a total rather than individual parameters, this limitation was not crucial.

The Topic-Groups

As mentioned earlier all reported coefficients will be those of regression A-4, unless explicitly specified to the contrary.

Although all topic-groups were significant, single variables within topic-groups were insignificant at times. Due to difficulties in comparison and interpretation, in case single variables rather than whole topic-groups were deleted, it was decided not to delete single variables even though they were insignificant.

The discussion of the empirical results will take the following pattern: (1) A general discussion of the top-group under consideration. (2) The effect that deleting various topic-groups, in the given regression, has on the coefficients of the topic-group under consideration. (3) The effects that the deletion of the topic-group analyzed has on the coefficients of various topic-groups.

Unless otherwise specified, the deletion of topic-groups was done one at a time with all other topic-groups included in the regression held constant. The deletions were not intended as new regressions, but rather as a tool to test the significance of the various topic-groups. Therefore, and because of space limitation only the "parent" regression are reported. Through the discussion, whenever it was deemed necessary coefficients for the deleted runs are also reported.

Single variables which were insignificant at the .10 level and were retained since their topic-group was significant are indicated in the Appendix by a gray cover-line.

The order in which the topic-groups will be discussed is not that reported in Table VII-1, but rather a subject-oriented one. Related topic-groups, such as: "Type of Place," "Size of SMSA," and "Region"

will be discussed successively. The same will be done regarding single and interaction topic groups.

Constant: The nature of the constant term in a dummy-variables regression was explained in Chapter VI. The absolute magnitudes of the constant term in the various regressions were from \$1759, when "Industry" was deleted (A-7) to \$2954 when all interaction variables were deleted (A-6). It is believed that the effect which the deletion of "Industry" has on the Worker Class topic-group causes the reduction in the constant term.

Other Income: From the outset of the trial runs of the model it became obvious that this topic-group (one variable) although significant at the .02 level does not contribute to the reliability of the regression (the $\bar{R}^2$ increases by deleting it). Further, it has the lowest coefficient and also the lowest beta weight. It was decided to delete this topic-group from all the regressions following A-4.

Type of Place: The expected correlation with "Region" were detected. However, the correlation with "Occupation" and "Industry" topic-groups is of particular interest.

In regression A-4, which includes "Occupation" and "Industry," the earnings associated with a rural-nonfarm residence are significantly lower than those associated with rural-farm residence. The coefficient of urban (inside places)--"Urban"--is insignificant while urban (outside places)--residence "Urban Out"--is associated with higher earnings than rural-farm. However, the deletion of "Occupation" raises the coefficient of "Rural-nonfarm" by 29 per cent, yields a significant coefficient for "Urban" and raises the coefficient of "Urban Out" by 65 per cent. Deleting "Industry," while retaining "Occupation," leaves

the coefficient of "Urban" still insignificant and increases the other coefficients far less than in the case of deleting "Occupation."

Regression A-5, which does not include the topic-group "Occupation" reveals similar characteristics to those of A-4 after the deletion of "Occupation": all the coefficients are significant, but larger than in A-4 because of the deletion of the interaction topic-group "Type of Place and Education." However, the deletion of "Industry," in regression A-7, renders the coefficient of "Rural-nonfarm" insignificant and doubles the coefficients of the other variables. Regression A-6 presents the same features. A summary of the coefficients of the various regressions and deletions follows:

Regressions / Variables	Undeleted	A-4 "Occupation" Deleted	A-7 "Industry" Deleted
Rural-nonfarm	-170	-122	0
Urban	0	91	231
Urban Out	94	155	302

The correlation between "Type of Place" and "Occupation," or "Industry," is interesting on two accounts. First, it indicates that a short-distance move of farm people might in several cases hinder their earnings opportunity. This conclusion is supported by a recent case study of migration patterns in Beech Creek, eastern Kentucky.[1]

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[1] Harry K. Schwarzweller and James S. Brown, "Social Class Origings, Rural-Urban Migration, and Economic Life Chances: A Case Study," Rural Sociology, XXXII (March, 1967), pp. 5-19.

The authors of the study state:

> In 1961, when the follow-up survey was made, of the 271 persons in the study population, about 60 per cent were residing in areas outside eastern Kentucky, about 25 per cent in the original Beech Creek neighborhoods, and the remainder, 15 per cent, in a small town or neighborhoods adjacent to Beech Creek. The latter, for the most part, were persons from intermediate or low-class families in Beech Creek.[1]

Second, the correlation sheds light on the phenomenon found by Hathaway[2] and Bryand[3] that, although earnings are negatively correlated to distance from urban-industrial development centers, the hypothesis that the performance of the existing economic systems is also negatively correlated to proximity to urban centers[4] is not born out.[5] The results of this study support Hathaway's suggestion that:

> It appears that the main result of urban-industrial development is not so much to change the relative income differentials more favorable to farmers but to change the occupational "mix" [and the industrial one] or distribution in favor of higher paying occupations.[6]

A further investigation into the distribution of specific occupations among specific industries, and the distribution of industries over the various residence areas would appear very fruitful.

Size of SMSA: In all regressions, regardless of which topic-groups were included, the coefficient of the variable "Standard Metropolitan Statistical Areas of 100,000 persons and less" was not significantly

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[1] Ibid., p. 8.

[2] Dale E. Hathaway, "Urban-Industrial Development and Income Differentials Between Occupations," J. Farm Econ., XLVI (Feb., 1964), pp. 56-66.

[3] Wilford Keith Bryant, "An Analysis of Inter-Community Income Differentials in Agriculture in the United States" (Unpublished Ph.D. thesis, Dept. of Agri. Econ., Michigan State University, 1963).

[4] T. W. Schultz, "Reflections on Poverty within Agriculture," J. Political Econ., LVIII (Feb., 1950), pp. 1-15.

[5] D. E. Hathaway, op. cit., pp. 60-65.

[6] Ibid., p. 66.

different from zero, which implies that this size of SMSA is not associated with earnings higher than areas outside a SMSA. This supports again the hypothesis of the need for a relatively long-distance migration to enhance rural peoples' earnings. All the regressions confirm also the observation that earnings in SMSAs having between 100,000 and 1,000,000 people is higher than earnings in SMSAs having 1,000,000 and more persons, with the differences ranging from 40 to 120 percent.

Deletion of topic-groups such as "Occupation," "Industry," and "Age," did not affect the coefficients of the SMSA topic-group substantially in any of the regressions. However, in regression A-6, which excludes all interaction variables, the deletion of "Education" increased the gap between the intermediate and the large SMSAs by more than 50 per cent (the difference increased from 120 to 189 per cent), mainly by increasing the coefficient of the SMSAs with 100,000 to 1,000,000 people (the coefficient was raised from 243 to 306 dollars, or by more than 25 per cent). This indicates, at least, a partial explanation for the difference between the various SMSA, namely that the smaller SMSAs have a higher proportion of people with higher levels of education, or that education is valued in these SMSAs relatively more. Second, it indicates, indirectly, the effect of education on earnings. A similar relation has been found between "Education" and "Type of Place" (in regression A-6), however, it was not so profound. The effect of deleting the topic-group "Type of Place" did not indicate a high correlation with the SMSA topic-group. The relatively low correlation of "Occupation," or "Industry" with "Size of SMSA" cast doubt on the hypothesis that the larger the SMSA the greater, on the average, the occupational opportunities. It may well be that the situation in

1960 was such that internal growth and past migration increased the supply of labor to larger SMSAs at a higher rate than to smaller SMSAs. The effect of differences in the general level of prices in the various SMSAs could not be measured, however, the observed gap between the earnings in the various categories of SMSAs is larger than what could be expected to be explained by price-level differentials.

Region: The coefficient of the topic-group "Region," which includes only one variable, decreased in absolute size and in importance (Beta weight) with successive deletion of topic-groups. This may indicate that the difference in earnings in 1960 between the South and other regions of the United States is associated not with a specific inherent characteristic of the South but with a different "mix" of characteristics, the same characteristics which can be found elsewhere in the United States.

"Race" is correlated with "Region," and the deletion of "Race" in each of the regressions, increases the coefficient of "Region," indicating the increase in the difference between earning in the South and elsewhere on account of the South's larger Nonwhite population. The deletion of "Size of SMSA" has a much larger effect which increases the gap between the South and the other regions in the United States by 17 to 22 per cent, depending on the specific regression. It appears that the prominence in the South of very small SMSAs explains the direction of the observed effect. The deletion of "Occupation," or "Industry," has an effect on the coefficient of "Region" of the same magnitude, but in an opposite direction. The deletion of "Occupation" reduces the gap in earnings between the South and the other regions by 6 per cent, while the deletion of "Industry" increases it by the same

amount. One can only speculate what the explanation might be, even though earlier results might help a little. The deletion of "Occupation" renders significance to the coefficient of the variable "Urban" and increases the coefficient of the variable "Rural-nonfarm." If the predominant residence areas in the South are rural and urban (inside places) the above might explain part of the reduction in the earnings gap associated with deleting "Occupation." Similarly, the deletion of the topic-group "Industry" leaves the coefficient of the variable "Rural-nonfarm" insignificant and mainly increases the coefficient of the variable "Urban Out." If the proportion of the residence areas urban (outside places) is substantially larger in regions other than the South this can explain, in part, why the earnings gap between the South and elsewhere increased by deleting "Industry."

Age: The expected inverted U-shape function was observed in the estimated coefficients. The prime age, as far as "Total Earnings" is concerned, was found to be between 45-54 years of age, with the age group 35-44 year old following very closely. Only in one case--in regression A-6, which excludes interaction variables--has the age group 35-44 years of age a larger coefficient than the 45-54 year old age-group.

In all the regressions the lowest coefficients were for those who were 65 and over years of age (this pattern changes only when educational variables are deleted). The second lowest earners observed were the 18-24 year old group. The low earning capacity of elderly people was expected and can be explained by reduction in productivity, restrictions in employment, etc. However, as will be emphasized later, higher education more than compensates the disadvantages of old age.

When interaction variables are excluded (regression A-6) the negative difference in earnings of the older group increases almost two fold (from -689 to -1067), which beares on the opportunity-cost of elderly farmers who usually have low levels of educational attainments.

The negative coefficient for the 18-24 year old group, which was not expected, might indicate the higher rates of unemployment among new entrants to the labor force. However, it is more likely that the lower earnings of the 18-24 year old group, relative to the 14-17 year old group, indicate that the latter group have a higher proportion of full-time employees than the former one. The 14-17 year old group (having non-zero"Total Earnings") includes the school drop-outs, those that because various reasons have to work, even if they still study, and is affected by the relative higher earnings opportunities of younger non-whites which have relatively more full-time employees.

Deletion of the topic-group "Education" decreases the difference among the age-groups discussed, resulting in higher indicated wages and salaries for the 18-24 year old presumably because of their higher educational attainment. However, the deletion of the topic-groups "Education and Age" or "Race and Age," increases the observed difference in earnings between the 14-17 year old and the 18-24 year old, substantially. This indicates first a higher proportion of part-time earners in the 18-24 year old group because of continued study (see the coefficient of the topic-group "Education and Age") and second, the relative deteriorating earnings opportunities of non-whites in the intermediate age groups (see the coefficients of the topic-group "Race and Age").

Sex: As expected, it was observed in all regressions that being a female reduces the relative earnings opportunities. Whether this is a result of sex discrimination, or one's own decision (kind and length of work, etc.) was impossible to determine. For the purpose of this study, however, the important issue is that a difference was observed and any female outmigrating from the farm to urban employment would be affected by it. Even though the present study is not suitable for examining the issue of sex discrimination, there are several observations which might have relevance. It was observed in regressions reported in the Appendix, that the deletion of the topic-group "Occupation," or "Industry," or both, increases considerably the negative coefficient associated with being a "female," with "Industry" having the more pronounced effect. This might indicate that there exists some occupational and industrial selectivity to the disadvantage of women.

A very high intercorrelation was observed between the topic-groups "Relation to Head of Family" and "Sex and Race" and the topic-group "Sex." The deletion in A-4, of "Relation to Head of Family" increases the negative coefficient of "Female" by almost 33 per cent. This effect was expected--since the variable "Female" in this case also incorporates part of the effects of not being a head of family. The deletion of "Sex and Race" increases the negative coefficient of "Female" by 66 per cent, an indication that although nonwhite females earn more than nonwhite males ("Sex and Race" has positive coefficient), they also were discriminated against.

Intercorrelation also exists between the variable "Sex" (X_{12}) and several other variables, as was observed by deleting "Sex." The main effects are on other sex interaction variables, but also on the

topic-group "Age." It is interesting to note the different effects on "Age" in the various regressions reported. In regressions A-4, A-5 and A-7 the deletion of the variable "Sex" affects especially the sex interaction variables, while stressing the male influence in the "Age" topic-group. The estimated coefficients of younger people (18-24, 25-34, 35-44, 45-54) increases, while the coefficients of the older persons (55-64, 65+) decreases further. In regression A-6, on the other hand, since sex interaction variables are missing, the effect of deleting "Sex" on the topic-group "Age" is different. The incorporation of the female influence is obvious: 18-24 year old have a smaller negative coefficient, and the 65 and over year old group has a 20 per cent increase in its negative coefficient. Especially interesting is the considerable decline in the amplitude of the function: the prime ages (35-44, 45-54) have coefficients of 932 and 872, respectively, compared with coefficients of 1110 and 1155, respectively, in regression A-7 where interaction variables are included.

The coefficient for the variable "Head of Family" (X_{14}) declines substantially when the "Sex" variable is deleted, since it incorporates the effects of female heads of family.

The changes in the coefficients of the different occupational-groups reflects the distribution of women among the various occupations. The negative coefficient of "Farmers" declines, which indicates a lower rate of participation of women in this occupational-group, or a higher rate of relative productivity the "Farmers" occupations. A substantial decline in the coefficient of "private Household" occupations indicates the high proportion of women in those occupations.

The deletion of the variable "Sex" (X_{12}) decreases the coefficients of the topic-group "Sex and Education" except for variable X_{67} (Females having 4+ years of college) which increases, perhaps reflecting the relative higher earning of elderly women (See X_{78} females 65+ year old. A similar reduction in all the coefficients has been observed in the topic-group. "Sex and Age." The coefficients of the topic-group "Sex + Race + Education" have a much steeper function when "Sex" is deleted. The coefficients of variables designating nonwhite females with low levels of education (X_{119} - X_{121}) decline drastically while the coefficients of variables indicating nonwhite females with high levels of education increase substantially. This supports the indication that the effect of education on earnings of nonwhite women is different than the effect on nonwhite males, or on white females. Another indication to the difference in earnings of white and nonwhite females, is the change in the coefficient of the variable "Sex and Race" (X_{85}) when "Sex" is being deleted. The coefficient of the former almost doubles in an effort to maintain the previous relative advantage, compared to males, of nonwhite females over white females.

Sex and Age: The major reason for including this interaction topic-group in the estimation of earning-capacity was to examine if age has the same effect on male and female. The estimated coefficients in all the regressions indicate that the female-age earning cycle is different from the male one.

While males 18-24 year old have a negative coefficient, indicating that they earn less than the 14-17 year old group, the parallel female age-group has a positive coefficient, indicating that they earn more than the omitted age-group (14-17 year old), and even more than

the parallel male group. The coefficients of the age-group variables X_7 to X_{10} (25-34, 35-44, 45-54, 55-64 year old) are positive, with a peak at the 45-54 year old group (X_9), but the parallel female-age variables (X_{74} to X_{77}) have negative coefficients, with the larger negative coefficient being for the 35-44 year old group. The coefficient for the 65 and over age-group (X_{11}) is negative (-689 in regression A-4), but when interaction with sex is tested (X_{78}) it yields a positive coefficient (+592 in A-4). Combining the effects of the topic-groups "Age" and "Sex and Age," in the case of A-4 for example, results in the following coefficients for females: +136; +207; +542; +718; +495; +97, in the order of the respective age-groups. It is obvious therefore that age affects women's earnings much less than male's earnings.

The effects on "Sex and Age" of deleting the variable "Sex" were discussed earlier. The deletion of the topic-group "Age" affects the coefficients of "Sex and Age" only slightly. The deletion of X_{14}, "Head of Family," steepens the "Sex and Age" function corresponding to the steepening of the "Age" coefficients.

The deletion of the topic-group "Sex and Age" increases the coefficient for the variable "Head of Family," possibly because it incorporates the influence of a larger proportion of older females who are heads of family. The deletion of "Sex and Age" has the same effect on the topic-group "Age" as has the deletion of "Sex"--it steepens the age function. The coefficients of the topic-group "Sex and Education" (X_{63} - X_{67}) are also affected by the deletion of "Sex and Age." Females with lower educational attainments have an increased earnings coefficient, after the deletion while the coefficients for the higher levels of

educational attainments (X_{65} and X_{67}) decrease substantially. The reason might be that among the younger generations of women, a relatively larger proportion have attained higher levels of education.

Race: The results of the various regressions assert once again that in 1960 race discrimination existed in the United States. The correlation between the race variable (X_{13}) and the topic-group "Education" is negligible, which indicates that the lower earnings-opportunity of nonwhites in the United States of 1960 was not caused solely by lower educational attainments. The discrimination can also be seen through the effect of deleting the topic-groups "Industry," or "Occupation" on the coefficient of the race variable (X_{13}). Deletion of "Industry" increases the negative coefficient of "Nonwhite" by approximately 7 per cent, while the deletion of "Occupation" increases its negative coefficient by almost 23 per cent. This indicates that nonwhites tend to be employed in the lower earning occupations.

Another expected effect was the increase in the negative coefficient of "Nonwhite" when "Region" (namely: Other than South) was deleted. This reflects the relatively larger proportion of nonwhites in the South. The deletion of any of the race interaction topic-groups increases the negative coefficient of "Race" proper, which is obvious upon comparing the various regressions presented. The deletion of the topic-groups "Sex," or "Age" decreases the negative coefficient of "Nonwhite," manifesting the relative advantage of nonwhite females, and young nonwhites.

The deletion of the race variable "Nonwhite," decreases almost all the coefficients of the topic-group "Age," except for the coefficients of the age-groups 55-64 and 65+ year old, reflecting the relative higher earnings of older nonwhites. The topic-group "Education"

is also affected by the deletion of race proper. In regression A-4, the deletion of the topic-group "Race" (X_{13}) yields a significant and negative coefficients for the "Elementary" (X_{15}) and "1-3 Years of High School" (X_{16}) levels of education. The coefficient for "4 Years of High School" decreases by almost 25 per cent, while the coefficients for the college levels of education (X_{18} and X_{19}) increase by 21 and 45 per cent, respectively. The decline in the coefficients of the low levels of education compound with the increase in the coefficients of the higher levels may manifest the lower proportion of Nonwhites attaining, in 1960, higher levels of education.

The effect of deleting "Race" on "Race and Education" was not expected. Before the deletion, the coefficients of "Race and Education" indicate that attaining high school education, or 1-3 years in college do not increase Nonwhites' earnings (the coefficients of X_{69} to X_{71} were not significantly different from zero even at the .10 level). Further, it has been indicated that Nonwhites with elementary education (X_{68}) fare better than Whites having the smae level of education, and that Nonwhites with 4 and more years of college (X_{72}) fare relatively worse than Whites. After the deletion of "Race" the coefficients of the variables X_{68} and X_{72}, which were significantly different from zero before, became insignificant, while the coefficients of the "High School" through "1-3 Years of College" (X_{69} - X_{71}) became significant. Further, the observed trend of the significant coefficients (in A-4) was that education increases the relative earning capacity of Nonwhites. The conclusion, however, seems to be that the relations between Race and Education are much more complicated than expected and deserve further study.

Race and Age: Similar to the topic-group "Sex and Age," this topic-group indicates that the age-earning cycle of Nonwhites is different from Whites. The coefficients of the youngest Nonwhite age-group (X_{19} = 18-24 year old) and the oldest (X_{84} = 65+ year old) are positive, as opposed to the parallel negative coefficients in the "Age" topic-group. The coefficients of the intermediate Nonwhite age-groups (X_{80} to X_{83}) are negative, while the parallel coefficients in the "Age" topic-group are positive. The combined effects of "Age" and "Race and Age" on the earnings capacity of Nonwhites is reflected in the following coefficients (according to regression A-4) -56; +301; +798; +585; -461, in the respective age-groups order. The main differences are: the relative advantage of young and old Nonwhites; the relative disadvantage at the intermediate ages; and the reduced amplitude which reaches its peak earlier--at the 35-44 year old age-group. The decline in the amplitude is between 20 and 45 per cent.

As expected, the deletion of the topic-group "Nonwhite" (Race) reduces the coefficients of "Race and Age" to incorporate the general race discrimination. Deleting the topic-group "Sex" (X_{12}) decreases somewhat the coefficient of Nonwhites of 18-24 years of age, increases the coefficients of the variables designating Nonwhites of 25-34, 35-44, and 45-54 years of age, and leaves unchanged the coefficients of the remaining two age-groups. This might indicate the role that the Nonwhite females have in increasing the relative earnings of Nonwhite people of various ages. It seems that Nonwhite women of 25-54 years of age have higher earnings opportunities than Nonwhite males.

The deletion of the "Age" topic-group emphasizes once again the different effect age has on White and Nonwhite people. The relative

advantage of young and older Nonwhite over White people of similar age is very substantial. After deleting "Age" the coefficient for Nonwhites of the age 18-24 year old indicates that they can earn approximately 424 dollars more annually than Whites of the same age having similar characteristics. The advantage of older Nonwhite people is even greater --the difference is 971 dollars annually. However, Nonwhite people of the ages 25-64 are at comparable disadvantage ranging between 175 to 494 dollars annually. Similar effects were observed when the topic-group "Education and Age" was deleted.

The deletion of the topic-group "Race and Age" has an unexpected effect on the coefficients of the "Age" topic-group. The age-earnings function becomes much steeper and the peak increases considerably. It appears that the earning function compensates White people for the absence of the negative coefficients of the race-age variables. Other race interaction variables are affected only slightly by the deletion of the "Race and Age" topic-group, and in the expected direction.

Sex and Race: The relationships between this interaction top-group and the topic-groups "Sex" and "Race" were discussed earlier. It should be noted again that there exists a sex-race effect indicating that Nonwhite females have higher earnings opportunities than Nonwhite males. This advantage is highly correlated with other characteristics, such as educational attainment and industrial employment. In the regressions presented, one observes the decline in the "Sex + Race" coefficient from regression A-4 to A-7. But, while the decline from A-4 to A-5 is associated with the deletion of the topic-group "Sex + Race + Education," and is observed also in regression A-4 when the same topic-group is deleted, the decline from A-5 to A-7 is associated with

the deletion of the topic-group "Industry." However, the deletion of "Industry" when "Sex + Race + Education" is included (in A-4) does not affect the coefficient of "Sex and Race."

The deletion of "Sex and Race" completely changes the pattern of the "Sex + Race + Education" coefficients. Instead of indicating a growing importance of education for Nonwhite females the pattern becomes undecisive. The coefficients for the variables reflecting elementary education, 1-3 years of high school, and 4 years of high school (X_{119} - X_{121}), which were negative in a declining absolute order, change after the deletion of "Sex and Race," to be positive and similar in size. The coefficient for Nonwhite females with 4+ years of college (X_{123}) becomes negative, instead of it being positive before the deletion of "Sex and Race." A simple explanation is impossible because of the complexity of the relation between the three basic topic-groups involved: sex, race, and education. However, it appears that the major interactions are between sex and education rather than between race and education.

The effect of deleting "Sex and Race" on the coefficients for "Industry" is becoming obvious only in regression A-5, in which the major change is the increase in the coefficient for "Private Household Workers" indicating a high proportion of Nonwhite females in this industry. However, the coefficient for "Private Household" is negative, even after the deletion of "Sex and Race" which explains why the "Sex and Race" coefficient decreases when "Industry" is deleted.

<u>Relation to Head of Family</u>: The estimated coefficient for the variable "Head of Family" indicates that head of families have a higher opportunity to earn, apart from other characteristics associated

usually with head of family. The explanation might be motivations, length of time employed, etc. The coefficient increases from regression A-4 to A-6 reflecting intercorrelation with the variables being deleted.

As expected there exists a high correlation between this variable and "Sex," the deletion of which increases the coefficient for "Head of Family" substantially. The deletion of the topic-group "Age" also increases the coefficient of "Head of Family" indicating that a higher proportion of head of families are of the more productive ages. A further increase in the coefficient is observed when the topic-group "Sex and Age" is deleted. It is interesting to observe that the correlation between "Head of Family" and the interaction variable "Sex and Head of Family" is rather small. Deletion of the latter increases the former (in A-4) by only 2 per cent.

The deletion of the variable "Head of Family" supports the assumption, stated earlier, that heads of families are concentrated in the more productive ages. Accordingly the coefficients of the topic-group "Age" for the age-groups 18-24, 25-34 year old decrease after the deletion, while the other age-groups yield higher coefficients. Again as expected, the coefficient of "Female" declines substantially when the relation to the head of family is excluded. The coefficients of the topic-group "Education" were modulated by the deletion of "Head of Family," perhaps reflecting the effect of being a head of family on earnings.

Sex and Relation to Head of Family: As indicated earlier, the correlation between this topic-group and "Head of Family" was observed to be low. It is significant therefore to observe that although females

heads of families have lower estimated earnings than males heads of families, they still earn more than women who are not heads of families. This supports the conclusion that the effect of being a head of family on earnings is one of motivation, especially if necessity is viewed as part of motivation. It is also interesting to note that the net effect on earning of a female head of family does not change through the various regressions and ranges between 132 and 139 dollars annually.

The interactions between the discussed variables and other variables have the same pattern as those of the variable "Head of Family."

Education: The changes in the estimated coefficients for this topic-group in the various regressions indicates several patterns. Two major observations are immediately obvious. First, the coefficients of X_{15} and X_{16} (Elementary education, and 1-3 years of High School), which are insignificant in A-4 become significant in A-5 and the following regressions, which exclude "Occupation." Second, the coefficient of X_{19} (4+ years of College) is either negative (A-4), or insignificant (A-5, and A-7), and becomes positive only in A-6 (which excludes interaction variables).

However, the major factor affecting the coefficients for "Education" is not "Occupation," as might appear from examining the reported regressions, but "Age" and "Education and Age." The deletion of "Occupation," in A-4, renders significance to the coefficients for "Elementary" and "1-3 years of High School" variables (X_{15} and X_{16}) but decreases the level of significance of the coefficient for "4 years of High School" (X_{17}) and leaves the coefficient for "4 years of College" (X_{19}) still negative. The deletion of "Age," in A-4, renders the coefficients for variables X_{15} to X_{18} highly significant and the coefficient for X_{19}

insignificant. The deletion of "Education and Age", in regression A-4, yields coefficients which are the nearest to those presented in A-6. Apart from other implications the above stresses the importance of the interaction between "Education" and "Age" and casts doubts on the possibility of correcting for education, or age, by an additive approach. A summary of the discussed coefficients follows.

	A-4				A-5	A-7	A-6
		After Deletion of					
Variables	Undeleted	"Occupation"	"Age"	"Edu.+ Age"	Undeleted		
X_{15} = Elementary	0	-140	-437	-419	-254	-335	-975
X_{16} = H.S. 1-3	0	-135	-460	-300	-152	-185	-489
X_{17} = H.S. 4	198	108	-195	0	166	235	59
X_{18} = College 1-3	500	559	1,354	239	623	795	462
X_{19} = College 4+	-539	-257	0	1,024	0	0	2,258

The negative coefficients for the variables reflecting elementary education, 1-3 years of high schook, or 4 or more years of college, should not be interpreted as an indication that those levels of education do not improve earnings opportunities, but as a reflection on the higher proportion of part-time workers who still study. In this sense this topic-group and the topic-group "Education and Age" should be viewed together. In any case, it is obvious that at least a high-school education, or 1-3 years of college education greatly increases earnings opportunities. For the purpose of this study it does not matter if education increases the inherent productivity of labor or is used as a tool for selection, as long as the earnings of labor in the United States is affected by it.

The coefficients of "Education" are slightly reduced by the deletion of "Sex" (X_{12}). The deletion of "Race" affects the coefficients of "Education" as expected: The coefficients for the "Elementary" through "H.S. 4" levels of education decrease, while the coefficients for "College" levels increase. Deleting "Industry" or "Occupation" have the same effect that of deleting "Race," while the deletion of "Age" steepened the function even further.

The deletion of the topic-group "Education" has its major effect on the topic-group "Education and Age." The deletion increases somewhat the coefficients of the topic-groups "Age," "Education and Sex," and "Education and Race."

The effects on the coefficients of "Education and Age" are: first, the number of insignificant coefficients is reduced greatly; second, the coefficients associated with elementary education and 1-3 years in high school are decreased and so also is the coefficient associated with 4 and more years of college. The coefficients associated with 4 years of high school and 1-3 years of college increase as a result of the deletion of "Education."

Education and Age: As mentioned in the earlier discussion, this topic-group and the topic-group "Education" should be viewed together. The coefficients of this topic-group are believed to reflect several influences, of which the main ones are: part-time worker, because of continued study; the number of years in college, over 4, that a person might have completed; the experience, or length of time, a person enjoyed at the attained level of education, etc. In the case of the young age group 18-24 year old, it is obvious that a high proportion of those who completed 1-3 years of high school and more were still studying in

1960 and therefore had negative coefficients. Of those who completed only the elementary education, a higher proportion were working full-time, and have higher earnings than those who had no formal education at all. Among the 18-24 year old age-group and above those who had only elementary education either were in school in 1960, or have lower earnings than those who enter the labor force even earlier. The elementary education seems to affect this group's earnings only at a very old age (X_{53} and X_{58} = 55-64, and 65+ year old). The conclusion seems to be that for earnings purposes low levels of education may be worse than no education, because of the reduced experience. The same is true with the high-school levels of education: at lower age one may assume that a person is still studying, but at the higher age-groups it seems that the negative coefficient, or the insignificant ones, indicate the loss of experience, seniority, or perhaps the quality of education. The breakthrough, comes with the completion of 1-3 years of college, the coefficient for which becomes positive, and substantially larger, once "Education" is deleted. Deleting "Education" yields the following coefficients for "1-3 years of College": 46, for the 25-34 year old age group; 414 for those of 35-44 years of age; 392, for the 45-54 year old age-group; 495, for 55-64 year old persons; and 0, for people of 65+ years of age. Those who completed 4 or more years of college have a similar pattern: the coefficients for the age groups 25-34 year old and up are positive, with the peak at 45-54. The decline with increased age in the coefficients for similar educational levels may reflect lower motivation, lower quality of education, or other characteristics correlated with age that reduce the effect of education (health, for example).

The most important observation for this study is the obvious fact that similar levels of education have different effects on earnings at different ages.

Education and Sex: The estimated coefficients of this topic-group indicate that the expectation that education may motivate women to work more, or earn annually more, was wrong. Higher educated women may receive higher rates for their work, but on the average they are motivated to work less, and earn less, than males of the same educational level. Another possibility might be that sex discimination is encountered more strongly the higher the educational level of the females.

The coefficients of "Education and Sex" are highly correlated with the topic-group "Sex & Race & Education," since the deletion of the latter renders significance to "Education and Sex" coefficients which were insignificant before. However, the pattern of the coefficients is not changed by the deletion. The previously described pattern appears even stronger when the topic-group "Sex and Race" is deleted, reflecting the negative effect of education on race and the positive effect of a younger age on Nonwhite females. Similar effects were observed when "Sex and Age" or "Race and Age" were deleted.

The most profound effect of deleting "Education and Sex" is on the coefficients for the topic-group "Sex & Race & Education." The coefficients for the lower levels of education decrease, but those for the higher levels increase. This may reflect the specific effect that education has on Nonwhite females, which is opposite to the effect on White females. The deletion of "Education and Sex" also affects the coefficients for the topic-group "Sex and Age." It decreases the

coefficients for younger female and increases the coefficient for older women, which might reflect the relatively lower level of education in 1960 of older women.

Education and Race: This topic-group was included to test the specific effects of education on the earnings of Nonwhite persons. It was expected that education might decrease the degree of discrimination. The results observed in this study do not confirm such expectations. On the contrary, the observed coefficients indicate that the degree of discrimination increases with education, or in other words, the differences in earnings between White and Nonwhite people increase the more educated people are. One should not confuse this with the phenomenon that higher educated Nonwhites earn more than lower educated Nonwhites. The "Education and Race" topic-group measures the gap between the races, which increases with higher educational attainments. The only level of education in which Nonwhite people fare better than Whites is the lowest one (X_{68} = Nonwhite with elementary education), presumably because a higher proportion of White youngsters are still studying, or because Nonwhites' seniority and experience caused by early entrance to full-time work, give them an advantage at this level. However, when the variable "Race" (X_{13}) is deleted the coefficients of "Education and Race" present a confused picture. Those coefficients associated with lower levels of education are still negative or insignificant, but in one regression (A-4) they decline in order, in another (A-5), they increase in order and in the last one (A-7) they decline and increase. The coefficient associated with 1-3 years of college (X_{71}) becomes positive and varies in size. The coefficient associated with 4 and more years of college (X) becomes either insignificant

(A-4, A-5), or positive but smaller than X_{71} (A-7). One might conclude therefore that although there are indications that education is not closing the gap between the races, further clarifications are needed.

The deletion of the topic-group "Age" increases those coefficients for "Education and Race," which are associated with elementary education (X_{68}) and with 4 or more years of college (X_{72}). This possibly reflects the effects of age, which is correlated with education, on Nonwhites earnings (see the discussion of "Race and Age.") The deletion of the topic-group "Occupation," in A-4, affects the coefficients for "Education and Race." It increases the coefficient associated with Nonwhite having elementary education, but changes only very slightly the coefficient for higher education levels. Again, it might be interpreted as an indication that education is not helping, at least, to close the earnings gap between the races. The deletion of "Industry" shows similar patterns--it only increases the coefficient for Nonwhites with low levels of education.

The deletion of the topic-group "Education and Race" decreases the coefficient for the 35-44 year olds (X_8), in the topic-group "Age," as does any deletion of race variable. The coefficient for "Race" (X_{13}) increases as a result of the deletion of "Education and Race," reflecting the relative advantage of education in general. The coefficient for the "Elementary Education" variable, in topic-group "Education," becomes significant and negative when "Education and Race" is deleted, and also the coefficients associated with college education decline. It is suggested that the decrease of the former indicates the disadvantage of White people with low educational attainments relative to Nonwhite persons with similar attainments. The decline of the latter

reflects supposedly, the comparable disadvantage of Nonwhites having college education.

Sex & Race & Education: Earlier discussions mentioned that education has a different effect on Nonwhite males than on Nonwhite females, which this topic-group manifests explicitly. While the effect of education on Nonwhite people in general indicated an increase in the gap between the races, the coefficients of this topic-group indicate that Nonwhite women with higher educational attainments fare relatively better than White women of similar levels of education. In A-4 the coefficients for the topic-group "Sex + Race + Education" increase from -171; for X_{119}(Nonwhite females with elementary education), to +383, for X_{123} (Nonwhite female with 4+ years of college). Apart from the interest in the phenomenon itself, its implications for the measurement of comparable labor should be realized. Not only has education a different effect on Nonwhite people in general, relative to Whites, but it affects Nonwhite females differently than Nonwhite males. It becomes obvious that a simple correction for aggregate characteristics is bound to introduce biases.

The deletion of the variable "Sex" (X_{12}) steepens the "Sex & Race & Education" function: the coefficients for lower levels of education decline further, while the coefficients for higher levels of education increase. The deletion of the topic-group "Education and Sex" has a somewhat weaker effect in the same direction. The effect of deleting the topic-groups "Sex and Race" was discussed earlier.

The deletion of the topic-group "Sex & Race & Education" affects the various coefficients as follows: (1) the coefficient for the sex variable (X_{12}) declines substantially (2) the deletion emphasises further

the relative disadvantage of females having high educational attainments ("Education and Sex,") (3) it supports also the observed effect of education on race; (4) the coefficient of X_{85} ("Sex and Race") declines to reflect the lower earnings of low educational attainment.

Type of Place and Education: It was expected that this topic-group would test the differentials in earnings due to the quality of education, related to the various residence areas, school sizes, etc. Although the topic-group (as a group) had a significant effect when incorporated in regression A-4 (at the .05 level of significance), only 2 of the 15 variables included in this topic-group have significant coefficients. It was decided therefore to drop this topic-group from further regressions. However, the significant effect of the group as a whole indicates the possibility that some other classification of the single variables included in this topic-group, or an interaction between "Education" and another variable associated with residence areas may result in significant coefficients.

Associate's Education: The expectation that the level of earnings is associated positively with the educational attainments of the associate person in the family was borne out. However, no further indication of the line of causation could be interpreted from the observations of this study. It remains, therefore, unclear if this topic-group is a causative or indicative one, and therefore this topic-group was dropped from the regressions following A-4.

Worker Class: A very high correlation between this topic-group and the topic-groups "Occupation" and "Industry" was detected. In regression A-4 the insignificant coefficient for the variable "Salaried" turns significant and negative when "Occupation" is deleted. Therefore,

both coefficients (X_{31} and X_{32}) are significant, but the first negative in regression A-5. In insignificant coefficient for "Salaried" is apparently the result of this variable's high correlation with several occupational-groups, which employ mostly salaried persons (Multicollinearity). The negative coefficient for "Salaried" becomes positive once the topic-group "Industry" is deleted, even if "Occupation" is retained. Why the inclusion of "Industry" causes the coefficient for "Salaried" to become negative needs further examination. Although this topic-group deserves further study, the difference between the coefficients for "Salaried" and "Self-employed" can be viewed, especially after the deletion of "Industry," as the returns to management and self-owned capital.

Occupation: This topic-group was discussed in detail in the previous chapter. Since it was found that the variables incorporated in the present estimation of the Earnings-Capacity function bear only slight relation to the occupation in which one is employed, and since the literative did not indicate any causative relation between one's labor capacity and his occupation, it was decided that this topic-group is an indicative one (rather than causative) and therefore excluded from the predictive function.

Industry: This topic-group was incorporated to measure net industrial differentials in earnings and to give some knowledge of the possible opportunity-costs a migrant may have, if the industrial "mix" of the probable place of inmigration is known. Another interesting observation for the purpose of this study, is the realization that the "pure" industrial differentials in earnings between agriculture and other industries which in the past absorbed most farm migrants is smaller than expected.

Summary

In summarizing the main features of the earning-capacity functions estimated, several general characteristics should be emphasized. First, the proportion of the variance in "Total Earnings" explained by the independent variables is higher, by mroe than 38 per cent, than the proportions explained in previous studies. Second, no single topic-group was found to have dominance, but rather a multitude of factors determine one's earnings. Third, the multitude of human characteristics which determine earnings interact with each other greatly. A crude measure of the interaction incorporated in this study is the increase in $\bar{R}^2$ attributable to interaction variables. The $\bar{R}^2$ of A-6, excluding all interaction variables and also "Industry," is .3836. The parallel $\bar{R}^2$ in A-7, which differs only by inclusion of interaction variables, is .4286, or an increase of almost 12 per cent.

Importance is attached to the existence of interaction between factors determining earnings-capacity for two reasons. First, it emphasizes the biases introduced by simplified methods of measuring comparable labor. Second, it points out that United States farm-labor is not a homogeneous entity and therefore cannot be analyzed as such. The proper analysis seems to be that one which deals separately with each relatively homogeneous farm-group.

The most interesting specific findings are those related to interaction variables. It appears very clear that similar factors affect differently the earnings of males and females, Whites and Non-whites, young and old people, etc.

The effect of age on the earnings of females indicates that although they have lower earnings, females retain their earnings-capacity

longer. Young females (18-24 year old) and elderly females (65+ year old) have higher earnings compared with males of the same age. On the other hand, education decreases the earnings-capacity of females in general, while increasing the earnings-capacity of males in general. However, the earnings of Nonwhite females are affected positively by education.

The empirical results confirm that "pure" race discrimination existed in the United States in 1960. In addition they indicate that, contrary to the belief of many, education does not help in closing the earnings gap between the races, rather it appears that the degree of discrimination increases as the educational attainments of Nonwhites increase.[1] Nonwhite females, however, appear to be affected differently. Education of Nonwhite females sometimes compensates for race discrimination (compare, in A-4, the coefficients for X_{66} and X_{67} with those for X_{122} and X_{123}).

Moreover, although the positive coefficient associated with Nonwhite females cannot compensate for both race and sex discimination, its magnitude is sufficient to more than compensate the negative effect of "Race," or to reduce the negative effect of "Sex" by 80 per cent (in A-4 it reduces the negative effect from -456 to -90).

Age also affects the earnings of Nonwhites differently than Whites' earnings. Young Nonwhites (14-17 year old) and the older ones (65+ year old) have earning advantages over Whites of the same age.

Education was found to have different effect at various age levels. It could not be determined whether this reflects longer experience, or lower quality of education, etc. It was found that early entrance to

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[1] See also, Herman P. Miller, <u>Income Distribution in the United States</u>, A 1960 Census Monograph, U.S. Dept. of Commerce, Bureau of the Census (Washington: U.S. Government Printing Office: 1966), pp. 163-65.

the labor force can compensate only for low levels of educational attainments. Seniority in labor force cannot, however, compensate for not having college education. Those who have the lowest earnings potentials are persons 35-54 years of age with elementary, or high school education. They are worse off than people without formal education, and relatively worse off than younger or older persons with the same level of education.

There were several indications that migration to Rural-nonfarm residence areas, or to small SMSAs (less than 100,000 inhabitants) will not enhance farm people's earnings. However, the emphasis in past migration towards large SMSAs (over 1,000,000 people) appears, in 1960, to be misguided, unless these are compensating socioeconomic factors which were not included in this study. Depending on further examination it seems that migrants would benefit from migrating to the intermediate-sized SMSAs (between 100,000 to 1,000,000 people). Another result related to SMSAs is the low correlation detected between the effect on earnings of the various sizes of SMSAs and "Occupation" or "Industry."

An attempt to employ the estimated Earning-Capacity function in an examination of the difference between possible opportunity-costs and actual earnings (income) of specific rural-farm people, is reported in the following pages. This examination could be only partially fulfilled since the only place that the necessary information is reported for individuals is in the 1/1000 sample of the Census of United States Population and Housing: 1960. Because of technical as well as time limitation it was impossible to return to this source, and therefore the present attempt is based on data reported in the 25 per cent sample of the

United States Census of Population: 1960.[1] This source reports only averages of aggregates, which prevents proper measurement of interaction effects. Therefore, the attempt reported here (Table VII-2) is crude and should be viewed with caution.[2]

It should be emphasized again that Income as reported by the Bureau of the Census does not include income in kind, or intangibles. Further, the estimated function could not incorporate properly the effect of experience, or the length of time one is employed in this specific occupation, or industry. Thus, the coefficients for people subject to discrimination such as: Nonwhites, Females, and Older persons, are very likely overestimated. The Earning-Capacity function by its nature reflects an average earnings-capacity assuming a perfect elastic demand for labor, and is therefore not capable of reflecting marginal demand for labor. This again tends to bias the earning capacity of marginal labor. The effect of the various residence areas on the quality of education was also not incorporated which overestimates rural-farm capacities.

The regression utilized as the Earnings-Capacity function was A-7. The characteristics incorporated in the test were: all the age-groups; sex; race; median years of school completed by each age-group; two assumed areas of residence to which farm-migrants are likely to migrate (Rural-Nonfarm and Urban); and three possible sizes of SMSAs to which farm migrants might migrate (less than 100,000 people, between 100,000 -

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[1] U.S., Bureau of the Census, U.S. Census of Population: 1960, Detailed Characteristics, op. cit.

[2] A more detailed test is being attempted in a forthcoming Ph.D. thesis by J. Nixon, Dept. of Agri. Econ., M.S.U.

1,000,000 people, and more than 1,000,000 people). The possibility that the migration would be to or from the South region of the United States could not be incorporated since the source of data did not report income by regions. Farm migrants were assumed to have salaried occupations once they migrated, and for the age-groups 25-34 to 65+ the possibility of being or not being, head of family was considered. The younger age-group was assumed not to have heads of families. Table VII-2 presents only the extremes, the lowest estimates being for people who reside after their migration in "rural-nonfarm" areas which are contained in SMSAs of less than 100,000 people, and who are not head of a family. The highest figures are for people migrating to "urban" areas inside SMSAs of between 100,000 and 1,000,000 people, and who are head of family.

Keeping in mind the limitations of the comparison, one may draw several conclusions from Table VII-2. As far as White males and females are concerned the only strong indication of malallocation is at the age-group 14-19 years of age.[1] However, several questions arise: Should 14-19 year old persons be regarded as individuals standing on their own, or as part of their families? How is the inferior education, as far as urban occupations are concerned, affecting this group opportunities? How elastic is the nonfarm demand for 14-19 year old youngsters? For Whites older than 14-19 years of age the table indicates that in several cases the potential earnings in 1959 may have been higher than the actual ones. However, if one considers that in a recent study it was established

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[1] A similar conclusion, although by a different approach, was reached by Chennareddy Venkaseddy in his study "Present Values of Expected Future Income Streams and their Relevance to Mobility of Farm Workers to the Nonfarm Sector in the U.S., 1917-62," op. cit.

Table VII-2. ESTIMATED POTENTIAL EARNINGS OF SPECIFIC RURAL-FARM PEOPLE

		White						NonWhite					
		Low			High			Low			High		
Male	Age	Estimated Earnings Capacity,$[a]	Actual Income 1959,$[b]	Estimated minus Actual,$	Estimated Earnings Capacity,$[a]	Actual Income 1959,$[b]	Estimated minus Actual,$	Estimated Earnings Capacity,$[a]	Actual Income 1959,$[b]	Estimated minus Actual,$	Estimated Earnings Capacity,$[a]	Actual Income 1959,$[b]	Estimated minus Actual,$
	14-19[c]	1,670	652	1,018	2,312	652	1,660	1,173	566	607	1,815	566	1,249
	20-24[c]	1,857	1,996	- 139	2,499	1,996	503	1,460	788	672	2,102	788	1,314
	25-34	2,552	3,081	- 529	3,194	3,081	113	1,395	979	416	2,037	979	1,058
	35-44	2,169	3,405	-1,236	2,811	3,405	- 594	1,369	1,005	364	2,011	1,005	1,006
	45-54	1,883	2,931	-1,048	2,524	2,931	- 407	2,290	917	1,373	2,931	917	2,014
	55-64	2,082	2,328	- 246	2,723	2,328	395	2,020	810	1,210	2,661	810	1,851
	65+	393	1,495	-1,102	1,034	1,495	- 461	917	721	196	1,558	721	837
Female													
	14-19[c]	1,003	647	356	1,644	647	997	871	536	335	1,513	536	977
	20-24[c]	1,419	1,467	- 48	1,752	1,467	285	1,194	575	619	1,526	575	951
	25-34	1,893	1,251	642	2,225	1,251	974	1,046	600	446	1,378	600	778
	35-44	999	1,344	- 345	1,331	1,344	- 13	695	597	98	1,027	597	430
	45-54	971	1,401	- 430	1,303	1,401	- 98	1,440	593	847	1,773	593	1,180
	55-64	1,099	894	205	1,432	894	538	1,271	584	687	1,603	584	1,019
	65+	638	642	- 4	970	642	328	974	541	433	1,306	541	765

[a] According to regression A-7 (excluding Region). For educational attainment see: U.S. Census of Population: 1960, Final Report Pc (1) - 1D, op. cit., p. 1-404, Table 173.

[b] *Ibid.*, p. 1-580, Table 219.

[c] Since the source mentioned above does not report income by the tested 14-17, and 18-24 year old age-groups, the coefficients of those age-groups were applied to the reported 14-19, and 20-24 year old age-groups respectively.

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that in 1962 more than 63 per cent of farms in a low-income area consumed directly in their households, farm products the value of which was estimated to be more than 500 dollars,[1] the reported difference disappears almost completely.

The figures for Nonwhites indicate malallocation in all age groups but especially for the age-groups 45-54 and 55-64 year old. However, it was emphasized earlier that the estimates of earnings-capacity for labor subject to discrimination are less reliable, which the unexplained increase in the indicated malallocation of people 45-64 year old tends to confirm. There are also indications that the practice of consuming own-produced goods is more prevalent among Nonwhites.[2]

In general, Table VII-2 presents a partial explanation for the patterns of past farm outmigration, of which the bulk were Nonwhites and Young persons of 25 and less years of age. Unless factors unincorporated in this study (persumably sociological ones) explain why Nonwhites migrate predominantly to large SMSAs, this destination could be regarded as an indication of malallocation in the migration process. Proper information may help to divert more migrants toward the intermediate SMSAs.

Since in 1960, 90 per cent of the rural-farm population in the United States were White people, it appears that the major hypothesis of this thesis is supported by the figures of Table VII-2. Namely, that a substantial part of the farm labor force would not have benefited from off-farm migration and therefore should be regarded as fixed.

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[1] Nelson L. LeRoy and William W. Reeder, Ex-Farm Operators in a Low-Income Area, Dept. of Rural Sociology, Cornell University Agri. Exp. Stat., Bul. 67-2 (November, 1965), pp. 36-38.

[2] Pius Weisgerber, "Characteristics of Low Income Rural Families Related to Expenditure and Consumption Patterns," op. cit., pp. 41-43.

CHAPTER VIII

Summary and Conclusions

Summary

The primary objective of this study was to examine the validity of statements, such as:

> If resources were sufficiently mobile, an hour of labor would earn as much in agriculture as it would in other economic sectors not enjoying monopoly profits.[1]

In condensed terms, the objective was to examine if farm labor of the United States in 1960 was either malallocated or fixed. The main rationale for the examination is the realization that fixity should be treated by different agricultural policies than those appropriate for the case of malallocation.

The analysis was performed given several terms of reference. A "positive," rather than a "normative," approach was taken in analyzing the various issues. Different value systems can therefore be incorporated at will. Since the economic system of the United States has been believed to be a complex one, it was decided that analyzing it in a static framework would result in useless conclusions. Thus, the analysis attempted to incorporate as many dynamic measures as possible. It was further decided that as "surplus resources" would be defined only those resources (or specific resource units) which were malallocated in 1960,

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[1] E. O. Heady, E. O. Haroldsen, L. V. Mayer, and L. G. Tweeten, _Roots of the Farm Problem_ (Ames: Iowa State University Press, 1965), p. 11.

meaning that their actual returns in 1960 were lower than their then opportunity-costs.

The first subject area examined was the relationships between the present United States farm problem and the causes put forth to explain it. It was intended to discover if those explanations support the hypothesis that farm labor in the United States is malallocated. Many agricultural economists believe that the general farm problem in the United States centers around four conditions: (1) the supply of farm products increase at rates which are too high relative to the rates by which the demand for farm products increased; (2) the farm sector experiences a high rate of technological change, which substitutes for labor, increases uncertainty, and causes labor in agriculture to be malallocated; (3) the farm sector ofthe United States relatively to other sectors, is highly competitive, which makes for increased uncertainty, forces the adoption of technical innovations, and reduces the ability of the sector to adjust to new circumstances; and (4) the farm sector suffers from a high degree of resource fixity.

A close examination indicated, however, that the mentioned beliefs are far from being proven and in several cases are still untested. Moreover, the fourth condition precludes the possibility of malallocation. The only plausible explanation was offered by Hathaway, who stated that even though any one of the mentioned conditions, by itself is insufficient to cause the present farm problem, a specific combination of all of them might cause it. Unfortunately, however, an empirical test of this hypothesis has never been reported.

The second area to be examined were the specific features believed to characterize farm labor in the United States. Many agricultural

economists believe that these characteristics induce labor malallocation and therefore support the hypothesis of farm labor malallocation. The specific characteristics, assumed to attest that farm labor in the United States is in surplus were, following the exposition of T. W. Schultz: (1) the relative importance of the labor resource; (2) technological changes are predominantly "labor-saving"; and (3) labor is transferable. Again, a detailed examination of the above, indicated that in theory as well as in reality, each of the above is constrained by several necessary conditions, which either do not exist or have not been conclusively shown to exist. In short, there is no conclusive evidence indicating that the farm-labor currently engaged in agriculture has the specific characteristics, in the right setting, to induce it to be malallocated. On the contrary, there are several indications asserting the economical alertness of farm people, and implying strongly that the adjustment mechanism of farm-labor is at least as efficient as that of other sectors. It was also pointed out that most past studies regarding resource allocation in United States agriculture, assumed that the nonfarm sector has a perfectly elastic demand for farm labor. To examine this assumption the increase in past farm migration needed to establish farm-nonfarm income parity was estimated. An estimate of the growth of United States economy needed to enable the absorption of the increase in off-farm migration was also calculated. In conclusion it appeared doubtful that the economy of the United States could have grown at the rate necessary to absorb the increase in off farm migration required to insure income parity.

All the indications point to the tentative conclusion that the farm-labor problem is mainly a problem of fixed resources, and not of

malallocation. The estimation of the Earning-Capacity function was intended as a step toward testing this last hypothesis. The basic conclusions which were drawn from the empirical results, apart from the estimated coefficients themselves, are: (1) Earnings are affected by a multitude of factors, without any single factor exerting dominance; (2) The relationships between the various factors and characteristics which determine earnings are complex, intercorrelated, and affected strongly by interaction. As a consequence, the use of simplified methods to measure "comparable labor" will very likely produce biased results; (3) United States farm labor is not homogeneous and therefore should not be analyzed, or treated, as such. The analysis, as well as policies, should be geared to specific rural-farm populations, or specific farmers, and not to the farm labor force as a whole. This conclusion is supported by the empirical results presented in Chapter VII. The empirical results indicate that various factors which determine the earnings-capacity affect various parts of the population differently. Age has a different effect on the earnings of females than on males, and also a different effect on the earnings of Whites than on Nonwhites. Education affects the earnings of males differently than females, and affects the earnings of Nonwhites females still differently than the earnings of White females. Age, Sex, Education, and Race interact greatly, which precludes the possibility of having reliable simple methods of estimating opportunity-costs, or "comparable returns."

The fourth issue to be examined was the application of the estimated Earning-Capacity function to a specific rural-farm population. A crude application was attempted in Chapter VII, which appeared to support

the contention that a large part of United States farm labor was fixed in 1960. Those that might have benefited from migration were predominantly the young (14-19 year old) and the Nonwhites. It was further indicated that Nonwhites should migrate to the intermediate size SMSAs, and not the large ones, which they seem to prefer.

Further Study

The present study indicates strongly that further study of the subject is needed and will be fruitful. A short list of topics for analysis follows. An examination similar to that which "Occupation" was exposed to is suggested for the topic-group "Industry." Questions that need to be answered include: What determines one"s industry of employment? What is the industrial distribution among regions, SMSAs, type of place, etc.? How are occupational-groups distributed among industries?, and Is there an interaction between "Occupation," "Industry," and some variable associated with region, or residence areas.

It appears that the determination of which interactions exist between "Race," "Education," and "Age' is far from completed. Other interactions with "Sex" were also felt to be worth investigation. It is believed that utilization of a different variable as an indicator of residence areas in an interaction with "Education" might make it possible to discriminate between the various qualities of education in different areas.

The information contained in the data used was only partially utilized, which suggests the possibility of additional results once different variables, or different classifications are used.

Policies

Assuming that the main goals of United States agricultural policy makers were and are to bring United States agriculture to a position in which it would provide farmers with socially accepted incomes, without governmental intervention, and to maintain an accepted minimum income of farmers throughout the process, it appears (see Table I-1) that the policies persued till now have not achieved those goals. The reasons for the weak performance were very vividly presented and analyzed by T. W. Schultz. Accepting the hypothesis that a substantial portion of the farm-labor is fixed and that a substantial part is receiving comparable returns it becomes clearer why past policies, which emphasised price supports and land idling, were unsuccessful.

If the hypothesis forwarded in this study is accepted, then one immediate policy action regarding the young agricultural generation becomes imperative. It is necessary to improve considerably the rural educational system. With present conditions in many rural areas, the educational system is condemning the younger generation to poverty.

Two different approaches are possible in dealing with the older farm generation. They are: (1) to maintain the income of fixed farm people, and <u>only</u> that of fixed labor, at a socially accepted level though the same institutions which United States society devised for similar cases in other sectors. (2) To retain the fixed farm labor so that it would fit the demands of modern industry. From a "positive" standpoint one could calculate which approach will cost the society less,

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[1] Theodore W. Schultz, "Production and Welfare Objectives for American Agriculture," *J. Farm Econ.*, XXVIII, No. 1 (1946) especially p. 451.

given the life span of the older farm generation, however, there is doubt if in a democratic society the prospect of condemning masses of people to earlier "retirement" is conceivable. It seems therefore that the plausible policies will be those which will encourage farm people to acquire a wide range of skills other than farming.

The findings of this study do not support the suggestions of several agricultural economists and several farmers' organizations that government should cease its intervention in agriculture and leave the adjustment to the price market mechanism. The present study indicates that to induce a larger off-farm migration prices of farm products would have to be reduced substantially in order to depress farm earnings below the potential off-farm earnings of most present farmers. Ironically, such outmigration would not raise the income of the migrants, or of the remaining fixed resources in agriculture.

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APPENDIX

Earnings-Capacity Functions

(Four Regressions)

102 021
THS
Regression A-5

102 021
THS
Regression A-4