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A two-stage estimate of underemployment of the male and female labor force, by county, Tennessee, 1960 and 1970

Khairulah Dawlaty

To the Graduate Council:

I am submitting herewith a dissertation written by Khairulah Dawlaty entitled "A two-stage estimate of underemployment of the male and female labor force, by county, Tennessee, 1960 and 1970." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Agricultural Economics.

James G. Snell, Major Professor

We have read this dissertation and recommend its acceptance:

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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We have read this dissertation and recommend its acceptance:

Charles L. Cleland

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A TWO-STAGE ESTIMATE OF UNDEREMPLOYMENT OF THE MALE AND FEMALE LABOR FORCE, BY COUNTY, TENNESSEE, 1960 AND 1970

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee

Khairulah Dawlaty

August 1975

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ABSTRACT

The State of Tennessee has generally lagged behind the national standard of economic growth and prosperity. However, the gap has narrowed during the decade of the 50's and 60's. The labor force has been a dominant factor behind the state economic growth during this period. In spite of this fact, studies on the subject of quantitative measurement of underemployment of labor force at the county level of the state, particularly on a periodic basis, are rare in the available literature.

The main concern of this study has been an attempt to define, and isolate underemployment as a specific dimension of manpower study, quantifying it in terms of man labor work units unutilized and specifying the number of factors affecting this aspect of labor force utilization in the State of Tennessee in two time period 1960 and 1970. More specifically, the objective has been a two-stage estimation of the state male and female labor force underemployment by county in the above two time periods. The data used in this study were obtained entirely from the secondary sources.

In the first stage, underemployment of the state male and female labor force by county were estimated mathematically for the year 1970. This was based on Williams and Glasgow's technique used by U.S.D.A. in estimating underemployment of the male and female labor force by county for the entire United States for the year 1960.

In the second stage, a regression model was applied where the mathematical estimate of underemployment for the year 1960 and 1970 were used as the dependent variable and an alternative set of variables were selected as the estimating or independent variables.

The mathematical estimate showed that female labor force underemployment has increased in all 95 counties of the state from the year 1960 to 1970 compared to the increase in 35 counties for male labor force. This was due to the fact that female labor force income earning capacity attributed to the factors such as age-color mix, educational status, labor force participation status and employment status has increased in more counties of the state than the increase for male labor force income earning capacity.

The outcome of the second stage estimate confirms the result of the first stage which was an increase in underemployment rate for female labor force from 1960 to 1970. This was reflected in the changes in size and magnitude of the coefficients of the first group of independent variables. However, in general the statistical model for male labor force performed very respectably in terms of R^2, and standard error of estimate and overall level of significance.

The statistical test for any structural change between the pairs of the regression equations of the second-stage estimate model shows that there was no structural difference between the year 1960 and 1970 least square estimate of the male labor force, while the structure of the least square estimate of underemployment for the female labor force has changed during this period. The test also shows that there was no structural difference between the male and female labor force underemployment estimate in 1960, while the structure of the least square estimate of underemployment was different between male and female labor force in 1970.

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CHAPTER I

INTRODUCTION

I. STATEMENT OF THE PROBLEM

The state of Tennessee, as part of the South of the United States, has always lagged behind the national standard of economic growth and prosperity.* However, the gap has narrowed in recent years.

Per capita income in Tennessee was 67 percent of that of the United States in 1950. It increased to 75 percent in 1967. One of the major sources of the state economic growth during this period, according to Bieler (46), has been the increase in employment and improvement of the quality of the labor force. In the United States the increase in civilian labor force employment was 80 percent of the increase in population during the 1950-1967 period. This increase in Tennessee was 200 percent of the increase in the state population during the same period. The impact of the growth of technology on the state economic growth has been one quarter of that for the nation during this period, and the transfer of labor from agriculture to more

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*However, some of the historical data on per capita wealth of the South and that of U.S., interpreted by Martin (45), reveals that before the Civil War the per capita wealth of the South was higher than that of the U.S. due to counting slaves as part of the wealth. After the Civil War, the slaves became liberated and were not counted as wealth, but became part of the "free population." This historical event reversed the situation. Since then, the per capita income of the South has always kept lagging behind that of the U.S.

productive sectors is the third factor responsible for the state economic growth during the above mentioned time (46).

In spite of the fact that the increase in labor force employment and efficient utilization have been the two major factors bringing about economic growth in Tennessee since 1950, studies and research on the subject of underemployment in Tennessee with emphasis on the quantitative aspect of underemployment are rare in available literature. The USDA publication on estimates of underemployment by county for all of the United States for the year 1960 is apparently the only basic empirical work available (35). At the national level this lack of research effort on the subject of labor force underemployment can be justified by the fact that labor is not as much a dominant factor in the United States economic growth as a whole as it is for a less developed region like the state of Tennessee.

Underemployment of the labor force is a source for possible economic growth and a cause of poverty (48). In a capital dominated economy with many highly developed sectors, the existence of underemployment could be a potential source of economic growth and increase in income, provided that labor mobility is not restricted by any factor (47). On the other hand, in the case of a labor dominated economy where one sector is the major source of employment or if other sectors do exist, interregional, intersectoral or interindustrial mobility of the labor force is restricted by several socioeconomic, political and cultural factors; underemployment prevails both as a cause of poverty and a potential source of economic growth.

In less developed regions where it is generally the major resource available, full utilization of the labor force has received a great deal of attention from planners, economists and policymakers for being a major factor that can perform miracles in economic development. A Ford Foundation study by Edwards (44) has called underemployed labor force a "sleeping giant" that could be a major element of modernization and development if given an "injection of capital."

Based on the dominancy of the role of labor on the economy of the state of Tennessee (46), underemployment of the labor force can emerge as a problem related to human poverty and possible economic growth. Therefore, a periodic quantitative knowledge with a particular stress upon the factors affecting the underemployment of the labor force at the county level which is not available at the present time is an essential factor for sound economic planning and policymaking particularly if accompanied by information on the mobility and quality of the "underemployed." Such a study will provide the basic background for understanding the changes in the structure of factors that effect underemployment of labor force through the course of economic development in time.

Knowledge as to which sector of the economy utilizes labor relatively more efficiently and with less underemployment is not at hand. The role of such type of information is important for economic planning and resource allocation at the state and county level.

Structural change in the intersectoral distribution of the productivity of manpower over time is an integral part of the process of economic development. Knowledge of such a change will provide guidelines for investment planning and allocation of labor and capital. Available literature reviewed does not show any work being done in this area particularly at the county level.

II. AN ILLUSTRATIVE REFLECTION OF THE CONCEPT

A study which deals with empirical analysis of manpower employment, unemployment or underemployment in any particular country, region or locality is basically a study of the whole population of that area with all its socioeconomic and technological dimensions.

The concern of this study was rather specific. It dealt with underemployment of the labor force only. It attempted to define and isolate underemployment as a specific dimension of manpower study, quantifying it in terms of man-labor work units unutilized, and then specifying some of the factors affecting this particular aspect of labor force utilization and the magnitude of the effect of each factor in two time periods, 1960 and 1970, for all counties of the state of Tennessee.

Focusing on the time dimension aspect of underemployment is one of the major tasks of the current research. The time dimension is actually the estimating factor affecting underemployment of the labor force in all counties of Tennessee over time. Through a statistical analysis of the two time periods 1960 and 1970* an estimate of underemployment, knowledge on the composition of those underemployed and the structural changes during the course of economic development over time was obtained.

The schematic illustration in Figure 1 presents a way of derivating the concept of underemployment in an equation form from the whole population. Each division and subdivision, until underemployment "U" is derived is affected by many other socioeconomic and technological factors that are not presented in this scheme. The omission of these factors is mainly to keep the illustration simple and to avoid confusion. As an example, we can see that the "labor force" and "not in the labor force" divisions of the "working age" population depend upon factors such as minimum working age, education, removing objections to certain kinds of work, incentive to earn money, emancipation of women, improved labor mobility and so on. The same is true with other divisions and subdivision.

This gives an idea that there is a broad and multidimensional factors base that effects underemployment. However, the number of factors that can be empirically measured may be much more limited and the availability of data may vary among various countries and even regions or localities.

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*The underemployment for 1960 is already estimated through a mathematical technique for all counties of the U.S. by USDA.

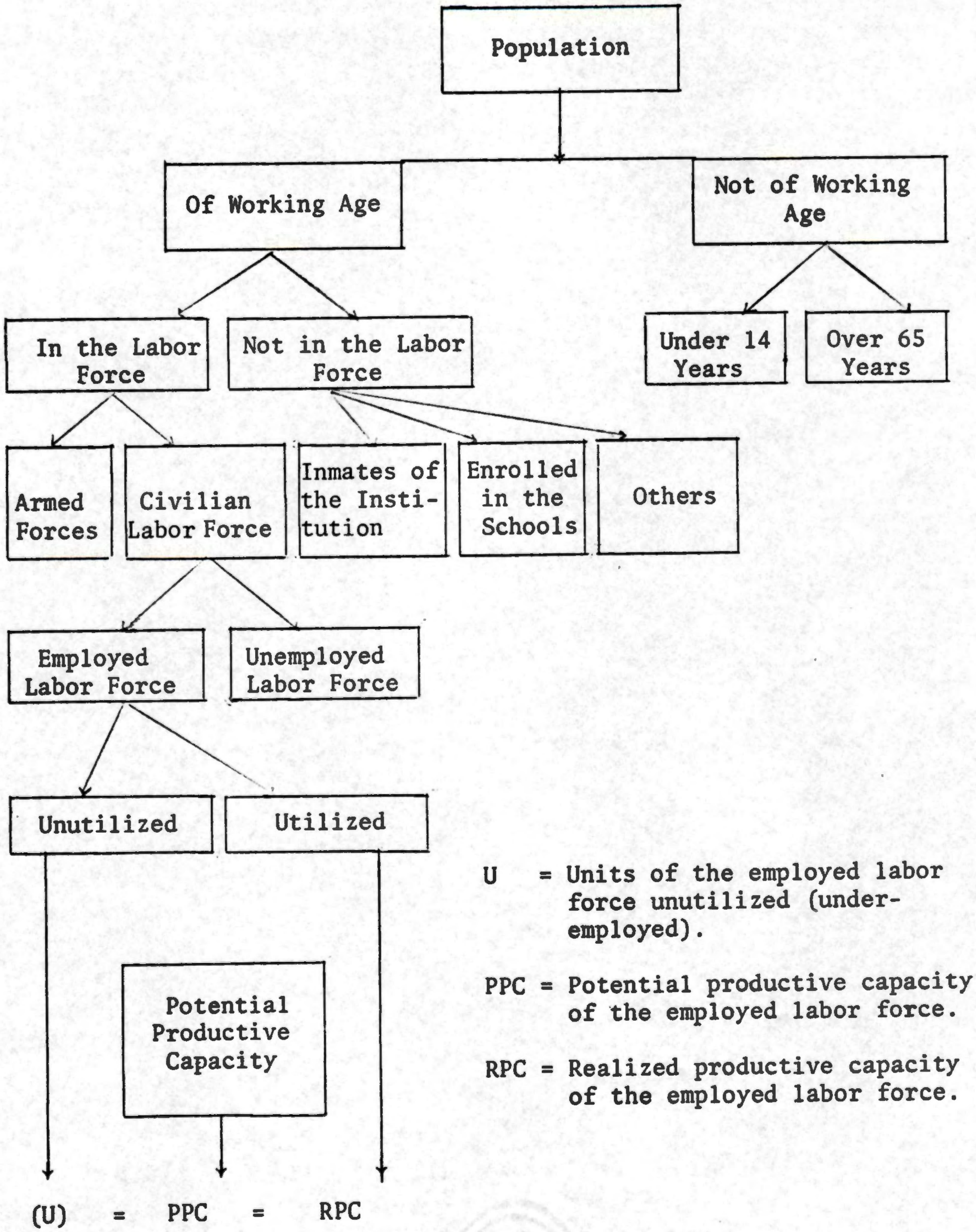

Figure 1. A Schematic Diagram of the Population Reflecting an Illustrative Derivation of the Concept of Underemployment.

III. DEFINITION OF UNDEREMPLOYMENT

A General Theoretical Definition

Underemployment is an economic concept. Very generally speaking, it deals with the potential productive capacity of resources employed in a particular process of production, and the extent that this capacity is actually utilized in that process. In more specific terms, underemployment is a resources utilization measure; it is a measure of that portion of the potential productive capacity of a given resource employed in a process of production which remains redundant, with the redundancy usually being nonvisible. This is unlike its counterpart concepts of employment and unemployment which are the measures of resource market supply and demand and are referring to that magnitude of a resource supply which is visibly hired or not hired in a particular market, respectively. Briefly speaking, underemployment is a form of disguised or chronic unemployment of a particular resource already employed.

The assumption upon which this definition is based is that each one of the resources employed in a process of production have (1) a potential productive capacity (PPC) that is not always necessarily fully utilized in the process of production; and (2) a capacity which is reflected in the realized (actual) output of that specific process of production which is called here realized productive capacity (RPC).

This assumption reduces the theoretical definition into the following simple notational terms:

$$\text{underemployment (U)} = (PPC_i) - (RPC_i)$$

When $(PPC_i) = (RPC_i)$, we have a situation of employment of resource (i) with no underemployment. When $(PPC_i) > (RPC_i)$, we have a situation of employment of resource (i) with underemployment.

One interesting implication of this theoretical assumption is that the concept of full employment, particularly that of manpower, which is known as "a labor market measure and . . . a highly publicized barometer of economic conditions . . ." (43) and to which the economic policymaker reacts very often, does not necessarily imply a full employment with no underemployment. It only indicates that anyone who wanted a job had a job; it doesn't exclude the possibility that the jobs may not utilize all of their potential productivity, and thus may not provide them with the potential income (output) that they could receive (produce) had they been able to use all of their potential productivity.

The Definition in Terms of Specific Variables

According to the basic assumption of the general definition and its implication with respect to the concept of full employment of manpower as a resource, some measure of manpower income (output) must be used as a proxy or indicator of the magnitude of the manpower utilization.

If it is assumed that productive capacity of manpower employed in a region is represented by the <u>per capita income</u> of the population of that region, then underemployment (U) is simply defined to be the magnitude of the difference between the potential per capita income

$\left(\frac{Y^*}{P}\right)$ and the realized per capita income $\left(\frac{Y}{P}\right)$ of the population of that region.

$$U = \left(\frac{Y^*}{P}\right) - \left(\frac{Y}{P}\right) \tag{1}$$

Understanding of the dimensions of per capita income $\left(\frac{Y}{P}\right)$ will guide us to understand the dimensions of manpower utilization and the meaning of potential per capita income. This will lead to a definition of underemployment, which is more explicit in terms of some of the empirically measurable variables which affect manpower utilization. Streeten (48) summarizes the dimensions of per capita income in the following identity:

$$\left(\frac{Y}{P}\right) = \left(\frac{Y}{H}\right) \cdot \left(\frac{H}{L}\right) \cdot \left(\frac{L}{W}\right) \cdot \left(\frac{W}{P}\right) \tag{2}$$

where:

Y = total income or output of an economy ($)

P = population

H = total "time units" that labor force worked

L = total labor force

W = people of working age

Each one of the ratios represents one aspect of manpower utilization.

$\left(\frac{Y}{H}\right)$ = labor productivity per unit of time worked

$\left(\frac{H}{L}\right)$ = time worked per unit of labor force

$\left(\frac{L}{W}\right)$ = labor force participation

$\left(\frac{W}{P}\right)$ = people of working age per unit of population or a demographic ratio

Each depends upon several other factors and there are some interrelationships among some of the ratios as well (48). Maximum per capita income $\left(\frac{Y}{P}\right)$ can only be reached when each one of the ratios in the right-hand side of identity (2) is maximized. For an economy with a given population and a given level of capital and technology, this level of income represents the potential per capita income $\left(\frac{Y^*}{P}\right)$. If any one or all of the ratios on the right side of identity (2) is not at the maximum level, we get a level of realized or actual per capita income $\left(\frac{Y}{P}\right)$. With the knowledge of the dimensions of per capita income, we can restate the definition of underemployment (U) given in equation (1) in terms of the four ratios in the right side of the identity (2).

$$U = \left[\left(\frac{Y^*}{H}\right) \cdot \left(\frac{H^*}{L}\right) \cdot \left(\frac{L^*}{W}\right) \cdot \left(\frac{W^*}{P}\right)\right] - \left[\left(\frac{Y}{H}\right) \cdot \left(\frac{H}{L}\right) \cdot \left(\frac{L}{W}\right) \cdot \left(\frac{W}{P}\right)\right] \qquad (3)$$

The (*) represents the potential (maximum) level of the corresponding ratios in equation (3), and here underemployment is expressed in terms of the components of per capita income. For an economy as a whole, each one of the component ratios of the per capita income $\left(\frac{Y}{P}\right)$ is the summation of the corresponding ratios for each sector of that particular economy, multiplied by a weight related to that sector (48).

$$\left(\frac{Y}{H}\right) = \left[h_1 \frac{Y_1}{H_1} + h_2 \frac{Y_2}{H_2} \ldots\right] \qquad (3a)$$

h_1 = share in the labor time worked of the ith sector

1,2 = refers to sectors

$$\left(\frac{H}{L}\right) = \left[l_1 \frac{H_1}{L_1} + l_2 \frac{H_2}{L_2} \ldots\right] \qquad (3b)$$

l_i = share of the ith sector in total labor force

$$\left(\frac{L}{W}\right) = \left[w_1 \frac{L_1}{W_1} + w_2 \frac{L_2}{W_2} \ldots\right] \qquad (3c)$$

w_i = share of the ith sector in total people of working age

$$\left(\frac{W}{P}\right) = \left[P_1 \frac{W_1}{P_1} + P_2 \frac{W_2}{W_2} \ldots\right] \qquad (3d)$$

Each one of the ratios in the left side of (3a), (3b), (3c), and (3d) can be maximized, *ceteris paribus*, either by shifting the weights to the sectors where the ratios are high or by increasing the ratios in the sectors where the weights are high. When the right sides are at optimum level, the ratios at the left sides are at their maximum.

The sectoral breakdown of the labor productivity, working time rate, labor force participation and the demographic ratio in (3a), (3b), (3c), and (3d) will allow us to redefine underemployment stated in equation (3) in terms of more specific variables related to each sector of an economy. In equation (4), (*) indicates the optimum level of the corresponding variables.

$$U = \left[\left(\Sigma h_i^* \frac{Y_i^*}{H_i}\right) \cdot \left(\Sigma l_i^* \frac{H_i^*}{L_i}\right) \cdot \left(\Sigma w_i^* \frac{L_i^*}{W_i}\right) \cdot \left(\Sigma p_i^* \frac{W_i^*}{P_i}\right)\right] - \left[\left(\Sigma h_i \frac{Y_i}{H_i}\right) \cdot \left(\Sigma l_i \frac{H_i}{L_i}\right) \cdot \left(\Sigma w_i \frac{L_i}{W_i}\right) \cdot \left(\Sigma p_i \frac{W_i}{P_i}\right)\right] \tag{4}$$

In general form, underemployment (U) at the economy level becomes the function of the following variables related to all sectors of the economy:

$$U = f\left(h_i,\ l_i,\ w_i,\ p_i\ \frac{Y_i}{H_i},\ \frac{H_i}{L_i},\ \frac{L_i}{W_i},\ \frac{W_i}{P_i}\right)^* \tag{5}$$

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*The last four variables each depend upon several other factors at the sector level [see reference (48)]:

$\left(\frac{Y}{H}\right)$ — Depends on hours worked rate, equipment, fuel, raw materials . . . education, health, intensity of application, motivation, incentive and so on.

$\left(\frac{H}{L}\right)$ — Depends on such organizational and institutional factors as standard working time, overtime, multiple shifts and waste of time due to several sociocultural factors. It also depends on natural factors such as weather and harvesting time. Rural to urban shift of labor, transport and community facilities are the other set of factors affecting this ratio.

$\left(\frac{L}{W}\right)$ — Affected by mininum working age, education and removing objection to certain kind of work, incentive to earn money, emancipation of women, improved mobility.

$\left(\frac{W}{P}\right)$ — Depends on measures of population control, mortality and migration.

h_i = the intersectoral distribution of labor time worked

l_i = the intersectoral distribution of labor force

w_i = the intersectoral distribution of people of working age

P_i = the intersectoral distribution of population

$\frac{Y_i}{H_i}$ = the intersectoral distribution of labor output/unit of time worked

$\frac{H_i}{L_i}$ = the intersectoral distribution of "working time rate"

$\frac{L_i}{W_i}$ = the intersectoral distribution of labor force participation

$\frac{W_i}{P_i}$ = the intersectoral distribution of a demographic ratio which reflects the population age structure (people of working age over population)

IV. OBJECTIVES

Underemployment of the labor force serves as a useful and meaningful economic indicator particularly when it is empirically measured. The overall objective of this project was twofold: first, to estimate empirically estimation of underemployment of the labor force in the state of Tennessee by counties for the year 1970, applying the mathematical technique used by USDA in estimating underemployment of the labor force by counties for the entire United States for the year 1960; and the second was to take the 1960 and 1970 mathematical estimate as given and analyze the effect of an alternative set of variables on underemployment by using a statistical model. This second stage estimation attempted to explain underemployment in terms of a set of disaggregated variables at the various socioeconomic sector levels of the counties.

The objectives in more specific terms were as follows:

1. To compute a first stage estimate of underemployment of the labor force by counties for the state of Tennessee for the year 1970. This was based on a follow-up on Thomas T. Williams and Robert B. Glasgow's mathematical technique used by USDA in estimating the underemployment of the United States labor force by counties for the year 1960 (34, 46).
2. To compute a second stage estimate of underemployment of the labor force the state of Tennessee obtained in objective 1. This was done, using a statistical model and an alternative set of variables for both periods, 1960 and 1970 (see Chapter III, page 57 for justification).
3. To determine if there were significant structural changes in the factors affecting the labor force underemployment from 1960 to 1970.

CHAPTER II

A REVIEW OF LITERATURE

Underemployment or "disguised unemployment" is one of the more challenging and controversial doctrines of development economics. The nucleus arguments on this subject started with empirical studies on labor force utilization in many of the less developed countries during the decade of 1930-40. Since then the concept of underemployment has been considered an important indicator of various aspects of economic health, particularly in the less developed countries, and it has gained worldwide research efforts and wide scale scholastic scrutiny. Some of the widely scattered literature on this subject suggests that the concept of underemployment has gained improvements through an evolutionary process.* A review of the main stages of this evolution with a rather close look at each segment is an essential portion of the layout of the current study. The review serves two basic methodological purposes. First, it will avoid the repetition of any of the past contributions in the area that may have achieved objectives similar to those of this study. Second, it will give us awareness of the existence of any possible areas of gap and shortcomings that could be filled or shed some light upon within the procedural framework of the present study.

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*References (4, 5, 8, 39).

All the literature cited is presented in historical order under eight separate categories, each underlying a specific aspect of the evolution of the concept of underemployment during a particular period of time. The categories are:

1. The prewar and postwar empirical studies (1930s and 1940s).
2. The period of major theoretical expansion and model building (1951-55).
3. Major criticism and attacks upon the concept (1955-57).
4. Mellor cultural dimension of the concept of underemployment (1956).
5. Leibenstein Malthusian version of disguised unemployment (1957).
6. The recent main empirical studies (1957-64).
7. "Refinement" of the theory and development of methodological approach to measure underemployment (1961-68).
8. "Reexamination" and redefintion of the concept of disguised unemployment (1966-74).

I. THE PREWAR AND IMMEDIATE POSTWAR EMPIRICAL STUDIES (1930S AND 1940S)

This is the period of "initial development" of the concept of underemployment. Empirical surveys and collection of statistical data related to the problem of labor force underutilization in various countries of south and southeastern Europe and Asia are the main features of the activities during this period.

Buck (1, 5), a pioneer in the area of labor force studies, conducted a survey of over 16,000 farms in China during the years 1929-33. He revealed that only 35 percent of the men between 15-60 years of age had full-time jobs.

In 1936, Joan Robinson (2, 4) coined the term "disguised unemployment" for the first time. She used this term in relation to a cyclical decline in aggregate demand when workers after being thrown out of their regular jobs as a consequence of the decline in effective demand accept temporary inferior occupations, where they have low but not necessarily zero marginal productivity.

In 1939, Warriner (3, 5) revealed that before the Second World War, "in Eastern Europe as a whole, one-quarter to one-third of the farm population was surplus" (p. 68).

In 1943, Rosenstein-Rodan (6) wrote that out of 100-110 million population of eastern and southeastern Europe, 25 million were totally or partially disguised unemployed. He pointed out that this waste of labor was considerably greater in poor agrarian than in rich industrialized countries.

In 1945 Mandelbaum (5, 7) estimated that from 20 to 27 percent of rural workers in Greece, Yugoslavia, Poland, Hungary, Romania and Bulgaria were redundant.

After the war, labor force utilization, particularly in the less developed countries, received a great deal of attention. Full employment and higher income became the main objectives in the course of economic planning for almost all of the less developed countries (8, p. 4).

In 1951, a group of experts, including W. Arther Lewis, T. W. Schultz and D. R. Cradgil cited in their widely quoted report to the United Nations (9), the above mentioned studies and concluded that the existence of surplus labor in many regions of India, Pakistan and eastern part of the Philippines and Indonesia cannot be less than the prewar average of of the Eastern Europe region.

Up to this point, all the experts agree that surplus labor, which means a certain amount of labor force with zero marginal productivity, exists in the rural population of the less developed countries. This implies ceteris paribus that if these labor forces with zero marginal productivity are removed from the agricultural (rural) sector, the output of that sector will not decrease.

II. THE PERIOD OF THEORY AND MODEL BUILDING (1951-55)

In 1951 Navarrete and Navarrete (10) relaxed the ceteris paribus assumption that was held through the decades of the 1930s and the 1940s. They included the supply of means of production in their definition of underemployment. According to them, with a given level of capital and complementary means of production, expansion of employment of labor is possible only up to the point where the total product curve reaches at its maximum. Beyond this point marginal productivity of labor will become zero and further employment is only nominal. This is the situation when labor forces are underemployed. "A positive policy to combat underemployment in the less developed economies requires a stream of investment expenditure." This expenditure will shift the total product curve to a higher level thus the maximum point of the new total product curve corresponds to a higher level of employment of the labor force. Therefore, the labor force who were nominally employed before, will be fully employed with no underemployment after the capital investment and availability of complementary resource. They distinguished between (1) cyclical underemployment, which occurs due to the fall in demand, (2) structural underemployment arising due to lack of production capital, and (3) underemployment of expansion, which arises during the periods of economic expansion due to the failure of capital and complementary equipment to match the rate of increase of the supply of labor. The last type of underemployment gets worse by deficit financing of development programs which results in inflation and intensification of the cityward migration of the labor force.

In 1953, Nurks (11) introduced a theory of economic development. His theory was based upon the assumption that underemployment exists in a large portion of Asia. He quoted many secondary sources, including Warriner (17), who claimed that from 40-50 percent of Egyptian labor forces are underemployed. Based on this assumption, he optimistically proposed that economic development can take place in the less developed countries if the surplus labor (assuming zero marginal productivity in agriculture) is shifted from the agricultural sector to higher productive activities. His optimism was that after the removal of these labor forces better organization of the farm operation takes place and it will not permit the farm output to decline. His view was criticized for the optimistic adjustment that will take place within the agricultural sector after the removal of surplus labor from the farm by an Egyptian economist Koestner (12) in 1953. Nurks' theory of capital accumulation and economic development was also criticized by Junke (13) in 1967 who called it "all too easy way" for economic development. He brought India as an example that according to Nurks' optimistic view could develop into one of the most industrial nations of the world. According to Junke (13), it is false to believe that untrained labor forces in a country like India could be a hidden source of saving available for economic development. This could be true only if the labor force is trained and there is a shortage of labor.

In 1954 Lewis' (14) widely quoted article, "Economic Development with Unlimited Supply of Labor," opened a new branch of modern literature on theories of development for backward economies. Lewis (14) postulates that there exists an unlimited supply of disguised unemployed labor in the "subsistence" sector of the backward economies and that this increases with the increase in population. The marginal productivity of these labor forces is zero or close to zero. This unlimited supply of labor is available to be used in the "capitalist" sector at the subsistence wage level which is equal to the average product per man in agriculture plus a margin. Hiring of the underemployed labor from the subsistence sector with a constant wage would result in capital formation and technological progress in the "capitalist" sector as the latter would plow its profit back into investment in the "capitalist" sector. This process would go on until the rate of capital formation gets ahead of the rate of population growth where the labor supply curve would turn upward from its previous horizontal form. This means an increase of wage in the "capitalist" sector. This problem can be checked with export of capital or import of workers from outside of Lewis' two sector economy.

Lewis' model was criticized by Ranis and Fei (15) in 1961 mainly that he failed to analyze the growth of the subsistence sector, which according to them, would necessarily accompany industrial sector expansion.*

In 1955, Eckaus (16) presented the factor proportion and technological restraint hypothesis of underemployment. According to this hypothesis, there exists a technological restraint on the less developed countries which causes underemployment of the labor force. Even a highly labor intensive agriculture requires some mininum capital per unit of labor. If this minimum doesn't exist, additional units of labor simply cannot be productive (labor will have zero marginal productivity). Eckaus (16) recommends two ways to prevent

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*The detail of Ranis and Fei's model will come in the latter part of this chapter.

zero marginal productivity of labor: (1) introduce new technique to substitute labor for capital in the production process; and (2) increase the quantity of capital which needs labor as a counterpart.

III. THE PERIOD OF HEAVY CRITICISM ON THE CONCEPT (1955-57)

During the years 1955-57, the concept of underemployment came under heavy criticism of many authors and some of the authors reversed their previously held positions.

Warriner (71) in 1955 reversed her position in ("Land and Poverty in the Middle East") (17) where she had shown that about 50 percent of Egyptian rural population was underemployed. She noted that the amount of labor required for capital maintenance was omitted in that study (p. 26); thus her new position was that there was no underemployment in Egypt.

Schultz in 1955 and 1956 (18) became one of the strongest opponents of the concept of disguised unemployment. However, in 1951 he, as a member of United Nations experts (9), had supported the idea that disguised unemployment exists in many of the highly populated Asian countries. To support his new position that the concept of disguised unemployment is false, particularly under the ceteris paribus situation, Schultz cited examples in Latin American countries where labor reduction had resulted in reduction of agricultural output.

In 1957, Verner (9) became another strong opponent of the concept of "disguised unemployment." His criticism was specifically directed to Eckaus (16) factor proportion hypothesis which relates disguised unemployment in agriculture to the limited substitutability of factors of production. He stated:

> I find it impossible to conceive a farm of any kind on which other factors of production being held constant in quantity and even in form as well. It would not be possible by known methods to obtain some addition to the crop by using some additional labor in more careful selection and planting of seeds, more intensive weeding, cultivating, thinning and mulching, more painstaking harvesting, gleaning and cleaning of the crop. (p. 347).

In an unpublished dissertation in 1957, Kenadjian (20) concluded against the existence of underemployment. After reviewing a wide range of studies on underemployment, he called the previous empirical estimates and conclusions supporting the existence of underemployment gross exaggerations. He stated that the estimates as high as 25-30 percent of labor force underemployed in any sector of an economy, even of highly populated countries, appears to be without any foundation (p. 259).

Haberler joined the critics of underemployment in 1957 (21) and 1958 (22); his reasoning was based on earlier positions advanced by Schultz (18) and Viner (19).

IV. MELLOR'S CULTURAL DIMENSION OF DISGUISED UNEMPLOYMENT (1956)

While "disguised unemployed" as an economic concept was under heavy criticism, an empirical study by Mellor and Stevens (23) was published in 1956. This study was based upon the labor income record of 104 rice farms in Thailand. The farm records were obtained by personal interview. Mellor and Stevens added a cultural dimension to the concept of underemployment by making an assumption that consumption (demand) in underdeveloped countries are traditionally bound to a certain minimum level and that the people in these countries have no motivation to increase it*; therefore, underemployment (labor force with zero marginal productivity) exists in those countries because of lack of demand. This demand deficiency hypothesis is similar to one proposed by Joan Robinson (2).

Mellor and Stevens performed a linear regression analysis between total farm product as a dependent variable and man-equivalent work units as independent variable. From this they concluded: since the (b) coefficient was not significant from zero, therefore, there exists underemployed (zero marginal productivity) labor force on those farms.

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*Chayaneve (1888-1936), a Russian Agriculture Economist is actually the founder of this idea, where he proposes in "The Theory of Peasant Economy" (68), that consumption or the family's subsistence is the motive determining peasant productive activity. The output of peasants will remain at the point of Equilibrium between the amount of satisfaction from additional unit of output and the additional amount of work to produce that unit of output.

Oshima (24) in 1963 attacked Mellor and Stevens' study by warning that "it is hazardous to regard this study as conclusive for either theoretical or policy use. The spread of data in the scattered diagram relating rice yield to labor input for each of the 104 farms suggest to me not a linear regression line as it does to the authors." Oshima (24) called Mellor and Stevens' assumption that the rice production function for each of the 104 farms is the same a "dubious" assumption. He also didn't agree with the exclusion of the children under 15 years old from the labor force and the same with 15 years old and above for being included in labor force (p. 450).

V. LEIBENSTEIN'S SUPPLY OF "LABOR EFFORT" AS RELATED TO NUTRITION (1957)

In 1957 when the academic debate on the controversial concept of disguised unemployment was at its peak, Leibenstein presented a completely new theory of disguised unemployment. He was the first one to explicitly introduce the relationship (1) between wage (income) and nutrition and (2) between nutrition (improved health) and labor effort or "labor work unit." His theory is based on the assumption that in the short run when the conventional labor supply curve is vertical, there exists an upward sloping supply curve of "labor work unit" or labor effort which is a function of wage. Up to a certain wage level it is profitable for the employers to pay higher wages; it is because higher wages permits better nutrition, and this consequently will result in an increase of "labor work unit" performed. He cited much empirical evidence to support the relation between nutrition and labor effort or "work unit." It is noted that the supply curve of "labor work unit" after certain point will tend to become vertical as higher wages are paid. According to the basic assumption of his theory, under the situations of extremely low wages, in highly populated less developed countries, there may exist a situation of labor deficit because less work is done by poorly paid and poorly fed workers. On the other hand, the work done per man increases so rapidly as wages increase that at a certain wage point a labor surplus is created. According to Leibenstein, in less developed countries underemployment of the labor force in agriculture does not exist at very low wage level; however, it is created when wages rise sufficiently.

In a competitive labor market two opposite forces effect the optimum wage level where the net revenue of the employers is at maximum, and where there is no underemployment. One of these forces is the profit motivated employers who want to pay higher wages up to a certain point in order to increase output and maximize their net revenue. The opposite force is that of the market which means that higher wages attract more workers and (because of competition) this pushes the wages back down to the opposite direction of what the employers are trying to do.

For landlords, in order to maximize their net revenue, Leibenstein proposes a compromise wage just below the optimum and some kind of institutional arrangement where the labor force can be hired under conditions of "no competition" by the landlord.

VI. THE RECENT EMPIRICAL STUDIES (1957-64)

In 1957 Rosenstein-Rodan (26) conducted an empirical study in southern Italy in order to measure underemployment. He assumed the static concept* of disguised unemployment and used the "efficiency norm"** approach in estimating underemployment. Further, criteria and assumption used are as follows (5):

1. Only small holdings were included.
2. Active population was assumed to be between age 14-65 years, and coefficient of labor efficiency for men, women and children was used for each type of cultivation.
3. Labor hours required for each type of cultivation and labor hours available were computed and compared, and average workdays per year were assumed to be 270 days.

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*Refers to a situation where a certain amount of population from agriculture which can be removed without any change in the method of cultivation and without leading to any reduction in output (zero marginal productivity of labor).

**According to Kao, Anschel and Eicher (5) there are three variants of this method: (1) the difference between the amount of labor time required to produce a given output and the amount of labor time available; (2) the difference between the density of population adequate for a given type of cultivation and the actual density of population; and (3) the difference between the number of acres required (under a given type of cultivation) to provide one person with the "standard income" in contrast to the number of acres available (see reference 5, p. 2).

4. Surplus workers were assumed to be involuntarily unemployed.

5. A distinction was made between:

   a. Removable disguised underemployment which is the same as disguised unemployment.

   b. Fractional disguised underemployment which is the labor hours not used throughout the year which do not add up to an entire labor unit. (Workers of this category are not removable from agriculture.)

   c. Seasonal underemployment due to climatic factors.

Rosenstein-Rodan concluded from their empirical study that 10 percent of the active labor force in agricultural sector of southern Italy was surplus (p. 4).

The result of Rosenstein-Rodan's study was criticized by Kanadjian (20) as an <u>overestimate</u> of underemployed labor force in Italy simply because Rosenstein-Rodan counted workers who worked 50 days or less as underemployed. If this floor was set lower than 50 days, the estimate of underemployment would have been much lower (p. 250).

Interestingly, Rosenstein-Rodan was criticized by Dovering (27) for <u>underestimating</u> underemployment by estbalishing a very high labor efficiency norm which results in concealing underemployment.

In 1958, Nurks (28) qualified his previous optimistic position in "Problems of Capital Formation in Underdeveloped Countries" where he wrote that surplus labor exists in the agricultural sector of the less developed countries and that after its removal for activities and productive employment in nonagricultural sectors, production in agricultural sector doesn't decline because of organizational changes that take place in agricultural sector by those who remain there. In his 1958 (28) paper, his new position was that such organizational changes in agriculture "are major undertakings and cannot be lightly taken for granted" (p. 262).

After Rosenstein-Rodan's (26) empirical study in southern Italy, Mujumdar (29) published the result of another important empirical study on underemployment in 1961. This study was covering selected villages in Bombay, Karnatak region of India. The study was focused on "disguised" and seasonal unemployment.

The data which was on the village population, occupation, land use, number of livestock, labor movement, work schedule, and standard cultivating holdings in each village were collected through interview technique. The author used the standard cultivated holding* instead of marginal productivity of labor as the main criteria in determining magnitude of disguised unemployment. He doesn't explain how he determined this standard cultivating holding.

The way this standard holding becomes a tool to estimate unemployment is that full employment of all holdings of standard size

*Defined as: "the area of land which is sufficient to absorb in a given conditions of technique and type of farming the labor of an average farm family working with a pair of bullocks" (pp. 83-84).

or above is considered ideal, while less than standard holdings size comes under the category of disguised unemployment (p. 202). He found that in that region 71 percent of farmers were underemployed.

Kao, Anschel, and Eicher (5) disagree with Mujumdar's methodology on the following points:

1. His standard holding is an arbitrary unit, and it assumes bullock being used in producing all crops, thus doesn't allow alternative productive technique, nor does it recognize that bullocks are labor replacing and thus uneconomical.
2. No special attempt is made to quantify the labor input; he assumes that all farms are using labor intensive technique available.
3. His theoretical definition of underemployment is not related to his empirical findings. Given the size of the labor force in a sector, he defines underemployment as a situation in which the withdrawal of certain quantity of labor force to another sector, given a measure of reorganization in the first sector, will not reduce the total output.

Mujumdar's empirical definition classifies any worker on a farm of less than standard holding as underemployed. He ignores farm's productivity or the productivity of the group. Therefore, his conclusion that 70 percent of the agricultural population could be removed is "dubious" (pp. 137-138).

In 1962 Pepelasis and Yotopoulos (31) published their microlevel study where they have measured the volume of removable and seasonal surplus labor in Greek agriculture for the period 1953-60. Removable surplus was defined as that amount of labor which could be removed for at least one year (quantities of other factors the same) without reduction in output (p. 86).

They used secondary data to estimate surplus labor, and it was done by comparing the estimates of labor availability and labor requirement. Labor available was calculated from the total agricultural population ages 15 to 69 years old as measured by census. This estimate was converted into man productive units based on a conversion coefficient measuring the workdays of an adult male farm worker. Man productive units were converted into man productive days available during the period 1953-60.

Separate estimates of labor requirement were computed for farming, husbandry, forestry, fishing and agricultural transport. Then labor requirement was computed by products through using "labor intensity coefficient" that is a labor land ratio and/or capital output ratio. The authors found that "chronic surplus labor in Greek agriculture is virtually nonexistent." It existed only in two years of the study period, 1953 and 1954, to a degree of 3.5 and 2.3 percent, respectively. The other years of the period (1953-6) showed seasonal shortage of labor (p. 136). The authors commented on feasibility of removing surplus labor; stated that a 2 percent surplus labor doesn't imply that we can remove two workers without reducing the output; it is because this 2 percent consists of a small fraction of labor spread among a number of families (nondivisibility) therefore we cannot determine how much labor is feasible to be removed.

In 1964, Schultz (30) brought up a historical incident, namely the epidemic influenza of (1918-19) in India where the nation's agricultural population was reduced about 8 percent as a criteria of testing his hypothesis that disguised unemployment doesn't exist. He showed that as a consequence of population decline, acreage cropped declined 3.8 percent, and this an indication that underemployed labor force didn't exist in India's agriculture during that period of time.

Schultz's empirical test was criticized by Wellisz (4) in the following manner:

> Even if the deaths from influenza were randomly distributed, some farms were bound to have had a large portion of their labor force wiped out while others were left untouched, so that a decline in output was bound to occur prior to restoration of the optimal distribution of workmen. Since the influenza is transmitted by personal contact, it is probable that some farms and some areas suffered greater loss than a random distribution would suggest. Unless we could find out what happened to the output of the farm which were only slightly effected . . . we cannot even begin to surmise whether at the margin the productivity per work was zero or positive. (p. 47)

VII. REFINEMENT OF THE THEORY AND METHODOLOGICAL APPROACHES TO MEASURE UNDEREMPLOYMENT (1961-68)

In 1961 Ranis and Fei's (15) model of economic development brought the concept of underemployment under a process of refinement within the framework of the theory of economic development. They started with Lewis' (14) theory of capital formation and economic development and moved toward a theory of balanced economic growth. Their work emerged as a new spot of attraction in the literature of economic development.

Their work starts with criticizing Lewis (14) for ignoring to analyze the growth of the subsistence sector which according to them would necessarily accompany industrial sector expansion. Lewis assumes the subsistence sector as reserve of labor for industrial sector. The main conclusions from Ranis and Fei's work are:

1. Conditions of unlimited supply of labor (Lewis' assumption) will follow increasingly limited supply of labor. Thus development follows through three phases:
    a. When marginal productivity of agricultural labor force is equal to zero.
    b. When it is greater than zero but less than one.
    c. When it rises above subsistence wage.

They showed that the term of trade will turn against the "capitalist" sector in stages (b) and (c) (rise of food prices) and thus will cause the wages to rise in the capitalist sector. In order to avoid unfavorable terms of trade for "capitalist" sector, the profit from this sector should be allocated between agricultural and "capitalist" sector. This is a view of the theory of balance growth based on the use of the surplus labor existing in the subsistence sector of the less developed countries as presented by Lewis (14).

Jorgenson in 1961 (39) and 1970 (40) proposed an economic development theory of dual economy. In this theory marginal productivity of labor in agriculture is always positive (neoclassical assumption).* Jorgenson assumed that technological improvement in agriculture increases output in the agricultural sector. This causes mortality to reach its minimum (a point of critical value of agricultural output). At this point demand for consumption of industrial goods tends to increase and once agricultural output reaches above the critical level, part of the labor force may be released from the agricultural sector to produce industrial goods. This release of labor is due to increase in population and increase in demand for industrial goods in the agricultural sector not due to zero marginal productivity of labor in the agricultural sector.

In 1963, Georgescu (32) refined the definition of underemployment by presenting an alternative explanation to the zero marginal productivity of labor in less developed countries. According to him, neither capitalism nor socialism is an efficient form of organizing agriculture in less developed countries. Under capitalism, labor is not used beyond the point where marginal product is equal to wage and this leaves a portion of the labor force idle; thus agricultural output will not be maximized. In underdeveloped countries peasants are

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*According to the classical assumption proposed by Lewis, marginal productivity in subsistence sector is equal to zero or close to zero. Ranis and Fei modified it and stated that it starts from zero, then equals to subsistence wage and finally gets higher than subsistence wage.

maximizing total family product; hence marginal production is becoming zero when total family production is maximized.

Wellisz (4) in his 1968 paper has taken an important step toward redefining underemployment in the light of various interpretations and academic inputs on the issue. Concerned about the lack of clarity underlying the basic premises of the concept of underemployment, he distinguishes three versions of the concept and states that arguments applying to one version do not necessarily apply to the other:

1. Keynesian version of underemployment—This version of the concept was developed by Joan Robinson (2) in connection with her analysis of depression in industrial countries. However, this problem may occur in those less developed countries where the major portion of their income comes from export to the industrial nations. This type of underemployment results from deficiency of aggregate demand and is characterized by low but not necessarily zero marginal productivity of labor.

2. Structural version of underemployment—This version of the concept is caused by misallocation of manpower between agriculture and nonagricultural activities. The term underemployment in the structural sense was first used by Rosenstein-Rodan (6) and later with more precise meaning by Nurks (11). The basic assumption of the version is that marginal productivity of labor is equal to zero.

3. "Malthusian" version of underemployment—Under this type of underemployment the average product per person falls below the physical level of subsistence. This type of underemployment arises where a

"share alike"* ethic exists in the agricultural sector. In the cities this type of underemployment prevails when the profit maximizing entrepreneurs are forced to hire a greater than optimum number of workers. This version is explained by Leibenstein (25) and Mellor (23). Wellisz (4) recommends that in order to reduce "Keynesian" and "structural" disguised underemployment, a policy of increasing public work should be followed as it will increase effective demand and create capital, the two basic elements deficiencies of which are the basic cause of the two types of underemployment, respectively.

Malthusian version calls for an increase in food supply or a decrease in population. The larger the portion of population transferred from agriculture to industry the smaller the amount of food becomes available, which reduces the total effective labor units. It should be noted that "Malthus' version" ignores the application of technology in agriculture.

In 1964 Rudolf Bicanic (33) from the University of Zabreb, Yugoslavia, presented two general methodological approaches to measure overpopulation (surplus population) in agriculture: the consumption approach and the production approach. At the end of his paper, he outlines the factors that affect the immobility of surplus population from agriculture. The summary of each section of his paper is presented here:

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*A situation where every member of the farm family work force perform a certain part of the farm work, but they share the output equally due to the fact that they live together. Under this situation as population increases, average share decreases.

1. The consumption approach. From the consumption point of view surplus population (V), is the difference between the number of population an area can support at certain standard of personal consumption (A_o), and the actual number of population (A).

$$V = A - A_o$$

$$g = \frac{A}{A_o} \qquad (g = \text{population pressure})$$

Standard population (A_o) is derived by dividing the available aggregate consumption fund (F) by standard consumption per head (f_o).

$$A_o = \frac{F}{f_o}$$

$$g = \frac{A}{F} \cdot f_o$$

Thus surplus agricultural population is expressed as:

$$V = A - A_o = A - \frac{F}{f_o}$$

If actual population (A) increases or if aggregate consumption fund (F) decreases, agricultural surplus population (V) increases.

2. The production approach. From the production point of view, surplus agricultural population (V_e), is equal to the number of people economically active (A_e) minus the standard number of producers required for agricultural production (A_{e_o}).

$$V_e = A_e - A_{e_o}$$

$$g_e = \frac{A_e}{A_{e_o}} \qquad (g_e = \text{population pressure})$$

The economical active population (A_e) and the standard agricultural population (A_{e_o}) is computed as follows:

$$A_{e_o} = \frac{Z}{Z_o}$$

$$A_e = \frac{Z}{z}$$

where: Z = aggregate volume of production

z = actual agricultural productivity of the active population

z_o = standard productivity of the active agricultural population

Agricultural surplus popuation from the production standpoint (V_e) can be written as:

$$V_e = A_e - \frac{Z}{z_o}$$

Agricultural surplus population (V_e) increases when the economically active population (A_e) _ceteris paribus_ increases, or if the standard productivity of the active population (z_o) increases _ceteris paribus_ and the same if (Z) decreases. He incorporated capital (K) as an element of labor productivity. Thus _agricultural productivity of_ active population (z) and standard agricultural productivity of active population (z_o) is defined to be the product of capital productivity $\left(\frac{Z}{K}\right)$ and capital intensity $\left(\frac{K}{A_e}\right)$.

$$z = \frac{Z}{K} \cdot \frac{K}{A_e}$$

$$z_o = \frac{Z}{K} \cdot \frac{K}{A_{e_o}}$$

At the end of his paper, Bicanic (33) defined surplus population in agriculture as those people with zero marginal productivity that could be removed. But the basic point that he explores in this section of his paper is to isolate and specify the factors that keep this surplus removable population from moving out of the agricultural sector.

He divides all the factors that cause surplus population to exist in certain places into two broad categories: (1) the attractive factors and (2) the explosive factor. Then each is subdivided each into two groups according to whether they operate within or outside the observed area.

1. The attractive indigenous (pull in) factors—Factor from within the area that attracts people from outside to move into that area. An example could be an increase in the area of cultivable land, a decrease in population, higher wages and income and favorable prices in the observed area.

2. <u>The attractive exogenous (pull out) factors</u>—Situation where the population from the observed area is pulled out due to factors outside the area. An example would be low prices of land or better land outside the observed area.

3. <u>Explosive indigenous (push out) factors</u>—Under this kind of situation, forces are developed within the observed area that pushes the population to move to another area. An example would be an increase in agricultural population or a decrease in the volume of production in the observed area. Among the factors of this category are also natural and climatic conditions such as flood and erosion or technological progress such as mechanization which reduces demand for the labor force within the observed area.

4. <u>Explosive exogenous (push in) factors</u>—Here people are impelled in an area or compelled not to abandon agricultural occupation. Examples would be induced or compulsory agrarian land settlement, compulsory transfer of workers, heavy investment in indivisible fixed capital, heavy indebtedness, etc.

In 1968, Williams and Glasgow (34) developed a mathematical technique to estimate underemployment for rural labor force of seven southern states of the United States. In their paper, they noted that for most of the underdeveloped countries, underemployment is a more significant problem indicator than unemployment. But the fact that underemployment is also an important indicator of regional economic health and economic activities of sectors in the highly developed countries, is less appreciated.

Their study covered 92 small economic areas in the southern United States; their objectives were:

1. To develop a technique for measuring underemployment in those areas from available secondary data.
2. To isolate and account for socioeconomic conditions to which underemployment appears to be functionally related.
3. To examine policy implication of their findings.

The concept of involuntary underemployment was defined as:

> The man equivalent years of economically unutilized manpower among employed civilians that exist in a specific group as a result of failure to utilize manpower of the group as effectively as labor of comparable income earning capacities and economically relevant values and tastes is utilized in U.S. economy as a whole.

The basic approach of their technique is that they estimate a manpower utilization index by expressing the region's actual median income as a percent of the U.S. median income adjusted for the factors that affect median income in the region as well as in the nation. When this labor force utilization index is subtracted from one hundred, it gives an estimate of the percent of the labor force that is unutilized; the latter is multiplied by the number of employed civilian labor force in the related region in order to obtain man-years of unutilized employed members of the civilian labor force. (For full details of this technique, see methodology pages 51-57.) Williams and Glasgow's (34) technique was applied by USDA in 1969 to estimate underemployment of the labor force for all U.S. counties for the year 1960 (35).

VIII. REEXAMINATION OF THE CONCEPT (1966-74)

One of the main aspects of underemployment, namely the existence of the zero marginal productivity of the labor force as a prerequisite for the existence of underemployment, came under close scrutiny and examination of the analysts during this period.

In 1966, Sen (36) in his article, "Peasant and Dualism with or without Surplus Labor," with an analytical framework and a list of assumptions showed that zero marginal productivity of labor is neither a necessary nor a sufficient condition for the existence of surplus labor. It is possible that surplus labor will exist with positive marginal productivity.

Wellisz (4) in 1968 noted that under the condition of the "share alike rule," where the out-migration of the labor force doesn't break all connections with the rural family,* zero marginal productivity concept doesn't apply because rural residents of the family, share the income of their member who has migrated to the urban areas and the urban residents get their share of the farm income.

Myrdal (37) (1968) totally disagreed with all of these "distinguished" writers who accept the static concept of underemployment which implies zero and even negative marginal productivity of labor to exist as a prerequistie for "disguised unemployed" labor force. Myrdal's position on this issue is quoted from Asian Drama (37), Vol. 3:

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*Conventionally, it is assumed by "disguised unemployment" theorists that out-migration from the farm does break family connections and the out-migrant gives up claim to the share of the farm income (4).

> When underemployment is measured, the only accomplishment is to have ascertained the amount of actual idleness. In order to do this, a norm has to be introduced, defining full employment. This norm represents the outsider's view of how much people ought to work, not the view of the people concerned. In spite of the arbitrariness of this norm applied in the measurement of idleness, the exercise, by itself, is clearly of considerable interest. But the further manipulations that assume static conditions of capital input, technique, and institutional framework; the attainment of full employment when a part of the labor force, corresponding to the amount of idleness ascertained, is removed; and unchanged production—all in terms of a static comparison implying that the vast change of removal is instantaneous and will not disturb any of the above assumptions—do not introduce any new elements of knowledge but rather a number of abstract notions that, when spelled out, are shown to be totally inapplicable to reality and therefore invalid.

In 1970 Desai and Mazumdar (38) made a study using secondary data on 99 farms related to 10 villages in West Bengal. They concluded that those farms employing hired labor showed positive marginal productivity in nine out of 12 cases, while farms that were operated with no hired labor had eight out of 12 cases with lower or zero marginal productivity. Desai and Mazumdar suggested that investigation of marginal productivity should be at a "disaggregate microlevel" and that labor should be measured in terms of hours of work performed, not the number of men.

Myint (41) has emphasized "the crucial distinction between surplus labor hours and surplus men" by noting that in the subsistence sector work load is spread over all members of the family capable of work; this means that on the average each may work a few hours per day. Therefore, the transfer of labor to the modern sector cannot be costless to those remaining in agriculture; even the marginal productivity of their effort may approach zero. He explains further that unless reorganization in the subsistence sector takes place following the withdrawal of the labor force to maintain production in the same level, zero marginal productivity doesn't necessarily indicate underemployment.

In a very recent paper (May, 1974), Garfinkel and Havemen have developed a technique to obtain a standard indicator of family economic status as an alternative to annual money income (AMI) upon which the United States official Social Security Administration (SSA) definition of poverty is based, and the income transfer depends upon it. The authors' alternative indicator is the "earning capacity" of families which "reflects the ability of a family—given its current endowment of human and physical capital—to generate a net flow, if the family uses that endowment at capacity."

In their study, Garfinkel and Havemen estimated the family "earning capacity" for 50,000 U.S. families in "a weighted national sample of families." In measuring the earning capacity of human capital they estimated separate earning functions for men and for women and used them to imput the full-time earnings on the basis of each individual's demographic characteristics. "The independent variables included were standard measures of human capital." They were age, years of schooling, race, marital status, location, weeks worked, and part-time/full-time employment status. To the adjusted earning capacity they added the capacity return on physical assets and finally obtaining the "net earning capacity" of a family by subtracting the expenses involved in using human capital. The empirical measure of net earning capacity is defined as:

$$NEC = EC_h \left(\frac{50 - W^h_{su}}{50} \right) + EC_w \left(\frac{50 - W^w_{su}}{5} \right) + Y_1 - CC$$

where:

EC_h = family heads imputed annual earning capacity at 50-52 weeks full-time work

EC_w = wives' imputed annual earning capacity at 50-52 weeks full-time work

W_{su} = weeks sick or unemployed

Y_1 = income from interest, dividends, rent, alimony and miscellaneous other resources (not including government transfer)

CC = minimally acceptable annual child care cost for a certain age child

The Garfinkle and Havemen paper doesn't deal with computation or estimation of such things as underemployment per se. The main objective followed in the paper is the estimation of net earning capacity of the families. However, once net earning capacity is obtained through simple manipulation, the net earning capacity can be used to derive the family index of earning capacity utilization (IECU) by computing the ratio of actual net earning (ANE) to the net earning capacity (NEC) and multiplying it by one hundred.

$$(IECU) = \frac{ANE}{NEC} \times 100$$

If the outcome is one hundred, it means that the ability of a family, given its current endowment of human and nonhuman capital to generate net income flow, is fully utilized (employed). If (IECU) is less than one hundred, underutilization (underemployment) of the net earning capacity (NEC) exists and in the cases where (IECU) is greater than one hundred it means that income earning performance of the family is above norm.

Another recent article by Levitan and Taggart (43) implicit reference has been made to the existence of the phenomenon of underemployment as a problem in the U.S. that reduces the labor market measures of employment and unemployment to a completely inadequate economic indicator. The inadequate status of unemployment as a labor market indicator is reflected in the fact that being on the job for a significant portion of the labor force doesn't mean that they earn adequate income, income that they could earn had they not been "subemployed." The authors are referring to the past efforts of the government in preparing a "subemployment" index of the U.S. labor force, and then proposing the need for an index (social economic indicator) which they called employment and earning inadequacy that would reflect the labor force employment and income status together.

CHAPTER III

METHODOLOGY

The procedural framework within which the objectives of the current study were achieved, embody the following components:

1. The major assumptions.
2. The sources of data.
3. A mathematical technique used to obtain the first-stage underemployment estimate of labor force by county in Tennessee for the year 1970.*
4. A statistical method and an alternative set of variables to derive the second-stage estimate of underemployment for the years 1960 and 1970 by county in Tennessee, and the justification and rationale for the second-stage estimation.
5. A statistical test for any structural changes in the alternative set of variables used in the second-stage estimate of underemployment.

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*For mathematical technique used in the first-stage estimate of underemployment in 1960, see References (34) and (35).

I. ASSUMPTIONS

A. Median income* was a proxy variable measuring output per unit of employed civilian labor force in the U.S. and the county.

B. Employed labor force of a county has a realized median income, and a potential median income.

C. The county potential median income is the national realized median income, adjusted for the four factors affecting labor productivity (output). Therefore, the county potential median income is an imputed relative potential median income, not an absolute potential median income (output).

D. There is no limitation from the demand side for the labor force output.

E. Regional wages (county or state) per unit of time are compensated or adjusted by the regional variation in cost of living.

F. When speaking of underemployment of labor force within a county, it is assumed that alternative sources of employment for labor force does exist, which can result in raising the existing county median income.

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*In the definition of underemployment given in Chapter I, per capita income (Y/P) was assumed to be the proxy of output/unit of employed civilian labor force.

II. SOURCES OF DATA

The data used in this study were obtained entirely from secondary sources. The data fell into two broad categories depending upon the level of the region they represent: (1) those at the U.S. level and (2) those at the county level of the state of Tennessee.

Data at the U.S. Level

1. Percent distribution of the U.S. population 14 years old and over by age-color mix, male and female for the year 1970 and the U.S. median income by age-color mix for the same year and the same population.
   Source: Constructed from Table 245, Reference 50.
2. Percent distribution of the U.S. population, 25 years old and over, by years of school completed, for male and female, for the year 1970 and the U.S. median income by years of school completed, for the same year and the same population.
   Source: Table 199, Reference 50, and Reference 59.
3. Percent distribution of the U.S. population 14 years old and over, with income, by labor force participation, for both sexes for the year 1970 and the U.S. median income by labor force participation for the same population and the same year.
   Source: Constructed from Table 248, Reference 50.
4. Percent distribution of U.S. population 14 years old and over with income, by employment status for male and female, for the year 1970 and the U.S. median income for the same

population by employment status, for the same year.

Source: Constructed from Tables 248 and 215, Reference 50.

5. U.S. median income for the year 1970, for male and female population, respectively.

   Source: Table 245, Reference 50.

Data at Tennessee County Level

1. Percent distribution of the counties populations 14 years old and over by age-color mix, for male and female, for the year 1970.

   Source: Constructed from Tables 51 and 35, Reference 51.

2. Percent distribution of the counties populations 25 years old and over, by years of school completed, for male and female, for the year 1970.

   Source: Constructed from Table 120, Reference 52.

3. Percent distribution of the counties populations 14 years old and over with income by labor force participation, for male and female for the year 1970.

   Source: Constructed from Tables 121, 122, Reference 53.

4. Percent distribution of the counties populations 14 years old and over by employment status, for male and female, for the year 1970.

   Source: Constructed from Tables 121, 122, Reference 53.

5. Median income by county in Tennessee for male and female, for the year 1970. Reference 53.

6. Percent distribution of the counties employed labor forces among industries, for male and for female 14 years old and over, for the years 1960 and 1970.

   Source: Constructed from Table 123, Reference 52 and Table 85, Reference 54.

7. Percent rural urban distribution of population, for male and female, for the year 1960 and 1970.

   Source: Constructed from Tables 27, 91, Reference 54, Tables 134, and 135 of Reference 52 and Table 35 of Reference 51.

8. Percent unemployment by county, for male and female labor force 14 years old and over, for the year 1960 and 1970.

   Source: Table 121, Reference 52, and Table 83, Reference 54.

9. Percent employed labor force used public transportation by county, for the years 1960 and 1970.

   Source: Table (2) Item 49, Reference 60 and Table (2) Item 48, Reference 61.

10. Percent of housing unit with no automobile by county for the years 1960 and 1970.

    Source: Constructed from Table 62, Reference 55 and Table 30, Reference 56.

11. Dependency ratio by county, for the years 1960 and 1970.

    Source: Constructed from Table 27, Reference 54 and Table 35, Reference 51.

12. Death rate per 1000 population from diseases and sicknesses by county, for the years 1960 and 1970.

    Source: Constructed from Table X, P(47-70), Reference 57, Table VII, P(39-58), Reference 58.

13. Industrial diversification; number of type of industries hiring 2 percent or more of the employed labor force by county for the years 1960 and 1970.

    Source: Constructed from Table 123, Reference 52, and Table 85, Reference 54.

14. Underemployment; "man-years economical unutilized" by county, for the year 1960, and the related factors displayed in Appendix Tables A-I and A-II.

    Source: Reference 35, Appendix.

III. A FIRST-STAGE ESTIMATE OF UNDEREMPLOYMENT FOR THE YEAR 1970

The use of a mathematical technique gave an underemployment estimate that was consistent with the estimate of underemployment of the year 1960 which was published by USDA (35).

Counties were the units of observation. For the state of Tennessee there were 95 observations in one point of time (1970) in the form of a cross-sectional data.

The basic approach of the mathematical technique was consistent in general terms with the theoretical definition of underemployment discussed in Chapter I, where underemployment (U) was defined to be the difference between the potential productive capacity and realized productive capacity of any particular resource employed in a process of production (employed civilian labor force). In Chapter I, per capita income (Y/P) was used as a proxy of labor productivity, while here, per capita median income was selected to serve that purpose.

Theoretically underemployment is an absolute concept as reflected in the definition derived in Chapter I. However, the measurement problem precludes handling underemployment as an absolute concept. Hence, the measurement of underemployment is in relative terms, i.e., county realized median income compared to the U.S. realized median income adjusted for the factors affecting labor productivity.

Fundamentally, the mathematical technique was the derivation of a labor force utilization index for each county, which when subtracted from 100, gives the percent unutilized or underemployed labor force. The labor force utilization index is a ratio of a county realized median income and the U.S. realized median income, adjusted for labor force characteristics that have impacts on labor productivity (median income) in the county and in the U.S.

Man-years of labor economically unutilized was the quantitative measure of underemployment and was computed by multiplying percent unutilized (underemployed) labor force to the employed male or female civilian labor force of each county.

The factors (labor force characteristics) for which realized national median income was adjusted for were: (1) age-color mix distribution, (2) level of education, (3) labor force participation and (4) employment status. The adjustment factor for any of the labor force characteristics is a ratio described as follows:

$$\text{The income adjustment factor for a certain labor force characteristic} = \frac{\sum \left[\begin{array}{l}\text{percent in the ith}\\ \text{level of that labor}\\ \text{force characteristic}\\ \text{for the county}\end{array}\right]\left[\begin{array}{l}\text{U.S. median}\\ \text{income for}\\ \text{the ith group}\\ \text{of that}\\ \text{characteristic}\end{array}\right]}{\sum \left(\begin{array}{l}\text{percent in the ith}\\ \text{level of that labor}\\ \text{force characteristic}\\ \text{for the U.S.}\end{array}\right)\left(\begin{array}{l}\text{U.S. median}\\ \text{income for the}\\ \text{ith group}\\ \text{of that}\\ \text{characteristic}\end{array}\right)}$$

In order to compute the county potential median income (CPMI) with respect to each one of the labor force characteristics, one adjustment factor for each one of the four characteristics or factors that effect the productivity of the labor force was constructed. The individual adjustment factors were then multiplied together which gives a combined adjustment factor that adjusts for the variations in the factors that effect labor force productivity (median income). The descriptive underemployment estimation technique developed by Williams and Glasgow (34) can be simplified and is presented in the following notational form:

$$U = \left[100 - \frac{y}{Y\left[\left(\frac{\Sigma A_i Y_{ai}}{\Sigma \bar{A}_i Y_{ai}}\right)\left(\frac{\Sigma E_i Y_{ei}}{\Sigma \bar{E}_i Y_{ei}}\right)\left(\frac{\Sigma L_i Y_{li}}{\Sigma \bar{L}_i Y_{li}}\right)\left(\frac{\Sigma M_i Y_{mi}}{\Sigma \bar{M}_i Y_{mi}}\right)\right]} \times 100\right] \times (C)$$

U = "man-years" economically unutilized

y = the realized (actual) median income of the county (CRMI) in dollars

Y = the realized (actual) median income of United States (NRMI) in dollars

A_i = percent population age 14 and over (male or female) in ith age-color group in the county

$\overline{A}_i$ = percent population age 14 and over (male or female) in ith age-color group in United States

Y_{ai} = United States median income for the ith age-color group ages 14 or over

$\left(\frac{\Sigma A_i Y_{ai}}{\Sigma \overline{A}_i Y_{ai}}\right)$ = the income adjustment factor for distribution of population age 14 and over by age-color mix

E_i = percent population age 25 and over (male or female) in the ith level of education in the county

$\overline{E}_i$ = percent population age 25 and over (male or female) in the ith level of education in United States

Y_{ei} = United States median income for the individual age 25 and over with ith level of education

$\left(\frac{\Sigma E_i Y_{ei}}{\Sigma \overline{E}_i Y_{ei}}\right)$ = the income adjustment factor for the distribution of population age 25 and over by the level of education

L_i = percent of population ages 14 and over with income (male or female) in the ith labor force status in the county

$\overline{L}_i$ = percent of population ages 14 and over with income (male or female) in the ith labor force status in United States

Y_{1i} = United States median income ($) for individuals ages 14 and over in the ith labor force status

$\left(\frac{\Sigma L_i Y_{1i}}{\Sigma \overline{L}_i Y_{1i}}\right)$ = the income adjustment factor for distribution of population ages 14 and over by the labor force status (labor force participation)

M_i = percent distribution of population age 14 and over in the labor force (male or female) who belong to the ith employment status in the county

$\overline{M}_i$ = percent distribution of population age 14 and over in the labor force (male or female) who belong to the ith employment status in the United States

Y_{mi} = United States median income ($) for individuals in the ith employment status

$\left(\frac{\Sigma M_i Y_{mi}}{\Sigma \overline{M}_i Y_{mi}}\right)$ = the income adjustment factor for employment status or working time rate

C = number of employed civilians (male or female) in the county

The products of all of the individual adjustment factors appearing in the denominator of the right-hand side of the estimating model (page 54), gives us the coefficient for the combined adjustment factor. By multiplying this factor with the national realized median income (NRMI), we get an adjusted national median income (a norm), which is assumed to be the county potential median income (CPMI) of the employed labor force.

Using the letters (d_1), (d_2), (d_3) and (d_4) for the adjustment factor of age-color mix, level of education, labor force participation, and employment status, respectively, then the combined adjustment factor will be:

$$D = d_1 \cdot d_2 \cdot d_3 \cdot d_4$$

by which the mathematical model for the estimate of underemployment by county can be expressed in a rather simpler form:

$$U = \left[100 - \left(\frac{y}{Y \cdot (D)} \times 100\right)\right] \times C$$

The ratio within the small bracket is an estimate of the "labor force utilization index" (35), where the (CRMI) is expressed as a percentage of the adjusted national realized median income (Y.D.). A "labor force utilization index" of less than (100) means that the county employed labor force is underemployed relative to the U.S.; a "labor force utilization index" of more than (100) means that the county employed labor force is utilized above the "norm."

IV. A SECOND-STAGE ESTIMATE OF UNDEREMPLOYMENT FOR THE YEARS 1960 AND 1970

Justification

First of all, it should be mentioned that if one accepts the mathematical estimate, where median income is selected as the proxy of the employed labor force output (both at the county and the U.S. level), there is no question, or any technical argument against it within the procedural framework of this study. However, the mathematical procedure and consequentially the estimate of underemployment obtained through the use of it are criticized in this study for the existence of the following shortcomings: (a) Median income which is the basic tool of quantification of manpower utilization in the mathematical model is in the real world generated by a much broader set of variables related to the manpower utilization in the county and the U.S., rather than the four factors used in the mathematical estimation. (b) The four factors used in the mathematical model that affect median income (labor force productivity) are highly aggregated and relate themself with the macrolevel of a particular region's economy, rather than the microaspect of it. Therefore, the impact of a broader base of relevant variables at the roots of the existence of the phenomenon of manpower underemployment may remain unrevealed.

The second-stage estimation of underemployment in Tennessee by county, through a statistical model, using a selected broader set of variables, allows the specification of more variables that affect underemployment thus making the statistical estimate more useful for planning and policymaking at the county level, and permitting underemployment to be used as an economic indicator with a broader implication and interpretation.

The Statistical Model

There are four equations in the model. Equations (1) and (2) are for male labor force for the years 1960 and 1970, respectively;

equations (3) and (4) are for female labor force for the same respective years. The equations are as follows:

1. $PU_m^{60} = a_m^{60} + b_1X_{1m}^{60} + b_2X_{2m}^{60} + b_3X_{3m}^{60} + b_4X_{4m}^{60} + b_5X_{5m}^{60} + b_6X_{6m}^{60} + b_7X_{7m}^{60} + b_8X_{8m}^{60}$

$b_9X_{9m}^{60} + b_{10}X_{10c}^{60} + b_{11}X_{11c}^{60} + b_{12}X_{12c}^{60} + b_{13}X_{13c}^{60} + b_{14}X_{14c}^{60} + b_{15}X_{15c}^{60}$

2. $PU_m^{70} = a_m^{70} + b_1X_{1m}^{70} + b_2X_{2m}^{70} + b_3X_{3m}^{70} + b_4X_{4m}^{70} + b_5X_{5m}^{70} + b_6X_{6m}^{70} + b_7X_{7m}^{70} + b_8X_{8m}^{70}$

$b_9X_{9m}^{70} + b_{10}X_{10c}^{70} + b_{11}X_{11c}^{70} + b_{12}X_{12c}^{70} + b_{13}X_{13c}^{70} + b_{14}X_{14c}^{70} + b_{15}X_{15c}^{70}$

3. $PU_f^{60} = a_f^{60} + b_1X_{1f}^{60} + b_2X_{2f}^{60} + b_3X_{3f}^{60} + b_4X_{4f}^{60} + b_5X_{5f}^{60} + b_6X_{6f}^{60} + b_7X_{7f}^{60} + b_8X_{8f}^{60}$

$b_9X_{9f}^{60} + b_{10}X_{10c}^{60} + b_{11}X_{11c}^{60} + b_{12}X_{12c}^{60} + b_{13}X_{13c}^{60} + b_{14}X_{14c}^{60} + b_{15}X_{15c}^{60}$

4. $PU_f^{70} = a_f^{70} + b_1X_{1f}^{70} + b_2X_{2f}^{70} + b_3X_{3f}^{70} + b_4X_{4}^{70} + b_5X_{5f}^{70} + b_6X_{6f}^{70} + b_7X_{7f}^{70} + b_8X_{8f}^{70}$

$b_9X_{9f}^{70} + b_{10}X_{10c}^{70} + b_{11}X_{11c}^{70} + b_{12}X_{12c}^{70} + b_{13}X_{13c}^{70} + b_{14}X_{14c}^{70} + b_{15}X_{15c}^{70}$

Where:

PU = percent of employed civilian labor force underemployed (unutilized) as derived by the mathematical model

f = female

m = male

60 = the year 1960

70 = the year 1970

a = constant

Xi = the independent variables

c = common variables for male and female labor force for the corresponding years.

The independent variables are described in Table 3.1.

The Rationale for Variable Selection

The independent variables were selected on the assumption that they were relevant estimators of underemployment of labor force as quantified through a mathematical procedure.

Each group of variables is discussed in following:

Group I: It includes five variables (X_1, X_2, X_3, . . . X_5), representing the distribution of labor force among the industrial sectors of any particular county.

The relevancy of these variables was due to the fact that the productivity of the labor force employed in each sector is the product of two components, $(\frac{\text{output}}{\text{capital}}) \cdot (\frac{\text{capital}}{\text{labor force}})$ (48)(page 385). This means that (ceteris paribus) output (median income) in a county depends upon the optimality of the employed labor force distribution among the industrial sectors. In a given county a very large (small) percentage of the labor force may be employed in an industrial sector, where $(\frac{\text{output}}{\text{capital}})$ may be relatively high (low), while $(\frac{\text{capital}}{\text{labor}})$ may be extremely low (high), or both components of labor productivity may be relatively low (high).

TABLE 3.1

THE INDEPENDENT VARIABLES SELECTED FOR THE SECOND-STAGE ESTIMATION OF UNDEREMPLOYMENT OF LABOR FORCE BY SEX, FOR ALL COUNTIES OF TENNESSEE 1960 AND 1970

Groups of Independent Variables	Symbol	Description of Variable
		Separate Variables for Male and Female
I. Industrial distribution of labor force	X_1	- Percent of employed labor force 14 years and over in agriculture, fishery and forestry in each county
	X	- Percent of employed labor force 14 years old and over employed in mining and construction in each county*
	X_2	- Percent of employed labor force 14 years old and over employed in manufacturing
	X_3	- Percent of employed labor force 14 years old and over employed in transportation, communication, utilities and sanitary services
	X_4	- Percent of employed labor force 14 years old and over employed in wholesale and retail trade in each county
	X_5	- Percent of employed labor force 14 years old and over in services in each county
II. Rural-urban distribution of population	X_6	- Percent of the county total population being male or female and living in rural farm. (Rural farm population mix)

TABLE 3.1 (continued)

Groups of Independent Variables	Symbol	Description of Variable
	X_7	- Percent of the county total population being male or female and living in rural nonfarm. (Rural nonfarm population mix)
	X_8	- Percent of the county total population being male or female and living in urban areas. (Urban population mix)
III. Unemployment	X_9	- Percent of the county civilian labor force unemployed
	Common Variables Between Male and Female	
IV. Transport and commuting facilities	X_{10}	- Percent of county employed labor force using public transportation
	X_{11}	- Percent of occupied housing units with no automobiles
V. Dependency ratio	X	- Total dependency ratio $\frac{\text{total dependent population*}}{\text{population of working age}}$
	X_{12}	- Young dependency ratio $= \frac{\text{dependent population 13 years and under}}{\text{population of working age}}$
	X_{13}	- Old dependency ratio $= \frac{\text{dependent population 65 years and over}}{\text{population of working age}}$
VI. Health status	X_{14}	- Death rate per (1,000) population from diseases and sickness $= \frac{\text{(total death rate) - death due to nondiseases and nonsickness}}{\text{enumerated population}}$

TABLE 3.1 (continued)

Groups of Independent Variables	Symbol	Description of Variable
VII. Industrial variation	X_{15}	- number of types of industries hiring 2 percent or more of the employed labor force

*Variables without a subscript number are deleted from each of the four estimating equations in the model, in order to avoid singularity.

This situation of labor force allocation, consequently affects labor force underemployment through the county median income. Also, the effect of distribution of labor productivity among the industrial sectors $(\frac{Y_i}{H_i})$, on underemployment of labor force, is mathematically shown in functional form on page 12, equation (5), Chapter I.

Group II: Variables in this group (X_6, X_7, X_8) were selected in order to determine the effect of rural urban distribution of population in a particular county on the labor force underemployment of that county.

It is assumed that the functional relationship of labor force participation $(\frac{L_i}{W_i})$ and labor working time ratio $(\frac{H_i}{L_i})$, with underemployment (U), is reflected through these variables. (See page 12, relation (5), Chapter I.) Both of these ratios may vary in urban, rural farm and rural nonfarm areas of any county. Thus, the percentage distribution of the population of a county by urban, rural farm and nonfarm will have an impact on underemployment (U) through the above two ratios.

The second reason for the selection of variables in this group was based on Tweeten's (62) explanation of farm labor force allocation within the context of the fixed resource theory. He revises the classical theory of efficient allocation of a resource which is the point where marginal product is equal to the <u>market price</u> of that resource. In the case of farm labor force instead he proposes, "not one price but four prices"* as being relevant. "The price that induces out movement of labor from agriculture" may be below the reservation price (the lowest), where farm labor may want to stay with low return in the farm instead of leaving friends and relatives. This form of inefficient use of a county labor force will effect median income and is a form of underemployment.

Group III: This group includes only one variable, namely the percent of the county civilian labor force unemployed (X_9). The rationale for its selection as an independent variable was based on three theories:

First, there is the "Additional Workers Theory." As Hauser (63) explains it, according to this theory the loss of employment by breadwinner results not only in the breadwinner seeking employment but also in other members of the family joining the search for work. Therefore the loss of one job adds more individuals to the unemployed and increases the total labor force.

The current study uses (X_9) as an independent variable in order to compare this theory with Joan Robinson's (2),

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*(1) The acquisition price, (2) the opportunity cost, (3) the transfer cost and (4) the reservation price.

where she proposes that under the situation of unemployment, workers will accept jobs below their level of potential productivite capacity. Thus unemployment of the labor force will create underemployment rather than creating farther unemployment.

Second, there is "the discouraged workers theory" explained by Wachter (64). Here it is said that under situation of unemployment, the unemployed workers stop seeking a job. This is just the opposite of the first theory, as it proposes the labor force participation $(\frac{L_i}{W_i})$, decreases, rather than increase (as it does in the case of additional workers theory).

The sign and the level of significance of the coefficient of (X_9), will enable us to compare the first and the second proposals with that of Joan Robinson's.

Third, there is the opportunity cost proposal by Haveman and Krutilla (65). They argue that the underemployed labor force has high opportunity cost, when the economy is at full employment of labor force. As the rate of unemployment of the labor force increases, the opportunity cost of the labor force declines and the probability of drawing labor from the unemployed pool increases, this means that, as unemployment increases, underemployment becomes less and less important as an economic phenomenon, and in terms of opportunity cost it declines.

Group IV: Variables included were (X_{10}) and (X_{11}) indicators of transportation and commuting facilities. They can have an impact on underemployment through working time rate ($\frac{H_i}{L_i}$) of the employed labor force on the county (see page 12, Chapter I, functional relation 5 and the related footnote). Given the distance between the location of work, and the place where the worker lives, and all of the workers other qualities, the status* of the transportation and commuting facilities will determine if a worker could accept a job, or could be accepted, where they have a standard fixed working time, availability of multiple shifts, overtime and similar other conditions.

It is possible, that due to the poor quality and quantity of transportation and commuting facilities, workers are forced to find employment below their potential productive capacities, thus affecting the county median income and the estimate of underemployment. Percent of employed labor force using public transportation (X_{10}) and percent of occupied housing units with no automobiles (X_{11}) were chosen, because of lack of availability of alternative indicators by county for transportation and commuting facilities.

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*Refers to the quality and quantity of all means of transportation and commuting facilities which connect the county's labor force to the location of job where they are employed or could be employed.

Group V: These variables are selected to find the impact of demographic factors such as young dependency ratio X_{12} and old dependency ratio X_{13} on labor force underemployment. The relation between underemployment (U), and the demographic ratio of people of working age over total population $(\frac{W_i}{P_i})$, are shown in general functional relation (5), page 12, Chapter I.

The total dependency ratio is subdivided into its components, the young dependency ratio (X_{12}) and the old dependency ratio (X_{13}). This was to find if there may be any difference between the impact of (X_{12}) and (X_{13}) upon the underemployment of male and female labor force.

The old dependency ratio (X_{13}), according to Davis (66), may be only a demographic scale of the aged population of a county. In advanced industrial societies where sufficient health and medical care is available, the health and vigor of aged population may be prolonged in "chronological scale." Thus they may not be costly to the society and may not generate underemployment for those whom they depend upon (the working age population). They may be productive and a plus factor to the median income of a county.

Group VI: Under an assumption that death rate per 1000 population due to sickness and diseases reflects the health status of a given county's labor force, (X_{14}) was chosen as an indicator of health status. Health status (as a variable) affects labor force underemployment through its impact on labor productivity $(\frac{Y_i}{H_i})$, according to Streeten (48). Davis' (66) explanation that supports the relation of labor health and labor productivity is summarized in one statement: "A healthy man of 65, is likely to have more capacity for work than a sick man of 40."

Group VII: The main purpose of selecting industrial variation (X_{15}) as an estimating variable is to find the impact of alternative employment opportunities on the labor force utilization and underemployment in any particular county. Brown (67) in his book The Economics of Labor states "the rise of industrialism tends to reduce alternatives open to a worker who does not think a particular offer good enough." This reduction in alternatives is caused by an increase in the size of a firm relative to the size of the labor force in any particular region.

The Uniqueness of the Interpretation of the Coefficients of the Variables in Group I

The magnitude and the sign of the regression coefficient of the first five variables (X_1, X_2, X_3, X_4, and X_5) will provide a tool through which we can find the relative efficiency of the labor force in various sectors in terms of net change in (PU).

$$\text{Net change in (PU)} = \begin{bmatrix} \Delta \text{ in (PU) due to} \\ \text{employment of a unit} \\ \text{of labor in the ith} \\ \text{sector which was} \\ \text{withdrawn from the} \\ \text{jth sector} \end{bmatrix} \pm \begin{bmatrix} \Delta \text{ in (PU) due to} \\ \text{withdrawing of} \\ \text{that unit of} \\ \text{labor from the} \\ \text{jth sector} \end{bmatrix}$$

The basic assumption in computing the net change in (PU) is that a unit of labor transferred from one sector to another has at least the same level of productivity as the labor force already has in that sector where that unit of labor gets transferred. This implies that due to labor transfer, we expect the net productivity to increase which means a reduction in (PU). The relatively more efficient sector is the one where (PU) is reduced more when labor comes into that sector, than the moving in of labor in any other sector.

However, it should be mentioned as a part of this assumption that as units of labor are transferred from the relatively less efficient to the relatively more efficient sector, the productivity of labor in those related sectors converges closer and closer to an equilibrium, so that further transfer doesn't decrease percent underemployment (PU); instead it may increase it.

With this interpretation of the coefficients, it is also necessary to assume that there is no labor transfer cost among the various industrial sectors of the economy.*

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*It is well recognized that no transfer is costless.

V. THE STATISTICAL TEST

A second-stage estimation of underemployment through a linear regression model was carried out for the two stratifications of labor force (male and female) and in two different time periods (1960 and 1970).

The pairs of linear least-square regression coefficient to be tested for structural changes are each presented in condensed* notational form. A statement of the hypotheses follows each pair of equations to specify the objectives of the test in more formal terms.

<u>The First Pair:</u> $PU_m^{60} = X_m^{60} B_{vm}^{60} + U_m^{60}$

**

$PU_m^{70} = X_m^{70} B_{vm}^{70} + U_m^{70}$

H_o: $B_{vm}^{60} = B_{vm}^{70}$ The structure of underemployment estimates for male labor force (m) in Tennessee has not changed from 1960 to 1970.

H_A: $B_{vm}^{60} \neq B_{vm}^{70}$ The structure of male labor force (m) underemployment estimates in Tennessee have changed from 1960 to 1970.

$$* \quad PU = \begin{bmatrix} Pu_1 \\ Pu_2 \\ \vdots \\ Pu_{95} \end{bmatrix} \quad X = \begin{bmatrix} 1 & X_{21} & \cdots X_{151} \\ 1 & X_{22} & \cdots X_{152} \\ \vdots & \vdots & \vdots \\ 95 & X_{295} & \cdots X_{1595} \end{bmatrix} \quad B_v = \begin{bmatrix} B_1 \\ B_2 \\ \vdots \\ B_{15} \end{bmatrix} \quad U = \begin{bmatrix} U_1 \\ U_2 \\ \vdots \\ U_{95} \end{bmatrix}$$

**The superscripts refer to the years and the subscripts refer to male and female.

<u>The Second Pair:</u> $PU_f^{60} = X_f^{60} B_{vf}^{60} + U_f^{60}$

$PU_f^{70} = x_f^{70} B_{vf}^{70} + U_f^{70}$

$H_o: B_{vf}^{60} = B_{vf}^{70}$ The structure of underemployment estimates for female labor force (f) in Tennessee have not changed from 1960 to 1970.

$H_A: B_{vf}^{60} \neq B_{vf}^{70}$ The structure of female labor force (f) underemployment estimates in Tennessee have changed from 1960 to 1970.

<u>The Third Pair:</u> $PU_m^{70} = X_m^{70} B_{vm}^{70} + U_m^{70}$

$PU_f^{70} = X_f^{70} B_{vf}^{70} + U_m^{70}$

$H_o: B_{vm}^{70} = B_{vf}^{70}$ There are no structural differences between the estimates of underemployment for male (m) and female (f) labor force in Tennessee during the year 1970.

$H_A: B_{vm}^{70} \neq B_{vf}^{70}$ There are structural differences between the estimates of underemployment for male and female labor force in Tennessee during the year 1970.

<u>The Fourth Pair:</u> $PU_m^{60} = X_m^{60} B_{vm}^{60} + U_m^{60}$

$PU_f^{60} = X_f^{60} B_{vf}^{60} + U_f^{60}$

$H_o: B_{vm}^{60} = B_{vf}^{60}$ There are no structural differences between the estimates of underemployment for male and female labor force in Tennessee during the year 1960.

H_A: $B_{vm}^{60} \neq B_{vf}^{60}$ There are structural differences between the estimates of underemployment for male and female labor force in Tennessee during the year 1960.

To test the hypotheses connected with their related least-square estimates of underemployment, an "F" ratio (49) is computed for each pair of the estimates.

$$F_c = \frac{\left(\frac{Q_3}{K}\right)}{\frac{Q_2}{(m + n - 2K)}}$$

Where: K = 15

m = 95

n = 95

c = computed

Q_1 = sum of the squared residual computed from the $(\underset{V}{B})$ coefficient obtained by pooling of the observations (m + n) in each pair of estimates

Q_2 = sum of the squared residual of each member of a pair computed separately and then added together

$Q_3 = Q_1 - Q_2$

For each one of the four cases if:

$\left[F_c > F_{.05,\ 15,\ 160}\right]$, the null hypothesis is rejected.

$\left[F_c \leq F_{.05,\ 15,\ 160}\right]$, the null hypothesis is not rejected.

CHAPTER IV

A FIRST-STAGE ESTIMATION OF LABOR FORCE UNDEREMPLOYMENT IN ALL COUNTIES OF TENNESSEE FOR THE YEAR 1970 AND THE COMPARISON OF SOME ASPECTS OF IT WITH THE ESTIMATE OF THE YEAR 1960

I. MATHEMATICAL ESTIMATION

This section presents the results of the mathematical estimation of underemployment of the labor force for each county of Tennessee. The technique applied to obtain these estimates was explained in the first section of the methodology. The estimation of underemployment deals with male and female labor force for the year 1970; however, a comparison of certain aspects of the 1960 results (35) and that of 1970 is also presented in the latter part of the chapter.

The basic elements of this estimation was the construction of four income adjustment factors. The income adjustment factors were aggregate numbers, representing labor productivity with respect to a particular characteristic* of labor force in any county relative to the productivity of the U.S. labor force with respect to that characteristic.** The technique of construction of the four income

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*See Section III, Methdology, Chapter III, for further detail.

**This implies that these adjustment factors are indices of a county's labor force productivity with respect to certain labor force characteristics.

adjustment factors and the underemployment estimate of the labor force for the year 1970 was illustrated utilizing Anderson County as an example. However, the income adjustment factors for all counties of the state are shown in Appendix Tables A-I to A-IV for male and female labor force, respectively.

The income "adjustment factor" for age-color mix of the male and female labor force, 14 years old and over for Anderson County is constructed in Tables 4.1 and 4.2.* In column (1) of the respective tables the U.S. age-color mix, percent distribution of the labor force and in column (2), the Anderson County age-color mix percent distribution of the labor force are presented. These age-color mix distributions are weighted by U.S. median income listed in column (3) of the respective tables and the results are listed in columns (4) and (5), respectively. In Table 4.1, which is related to male labor force, the sum of column (4), which is 6,347.44, and that of column (5), which is 6,331.19, are reflecting the sum of the U.S. and the Anderson County age-color mix median income, respectively, which are adjusted by the percent distribution of their respective labor force age-color mix characteristics.

In Table 4.1, by dividing the sum of column (5), into the sum of column (4), a ratio (.997) is obtained that reflects an income

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*For the description of the Symbols used in Tables 4.1 through 4.8 see Chapter III, pages 54-56.

TABLE 4.1

THE CONSTRUCTION OF THE INCOME ADJUSTMENT FACTOR FOR AGE-COLOR MIX OF MALES 14 YEARS AND OVER FOR ANDERSON COUNTY, 1970

Age by Color	Percent Distribution of Males 14 Years and Over		U.S. Median Income		
	U.S. $(\bar{A}_i)$	Anderson County (A_i)	\$ (Y_{ai})	\$ $(\bar{A}_i Y_{ai})$	\$ $(A_i Y_{ai})$
	(1)	(2)	(3)	(4)	(5)
White					
14-19	8.50	16.20	912.00	77.52	147.74
20-24	9.70	7.60	3,725.00	361.32	283.10
25-29	8.70	9.30	7,671.00	667.38	713.40
30-34	7.40	7.80	8,863.00	655.86	691.31
35-44	15.00	15.20	9,514.00	1,427.10	1,446.13
45-54	15.10	17.80	9,022.00	1,362.32	1,605.92
55-64	11.80	13.60	7,609.00	897.86	1,034.82
65-74	7.30	6.10	3,365.00	245.64	205.26
75 and over	4.00	3.00	2,226.00	89.04	66.78
Nonwhite					
14-19	1.30	0.60	857.00	11.14	5.14
20-24	1.50	0.50	3,344.00	50.16	16.72
25-29	1.40	0.30	5,669.00	79.37	17.01
30-34	1.20	0.20	6,172.00	74.06	12.34
35-44	2.40	0.60	6,247.00	149.93	37.48
45-54	2.00	0.40	5,725.00	114.50	22.90
55-64	1.40	0.50	4,334.00	60.68	21.67

TABLE 4.1 (continued)

Age by Color	Percent Distribution of Males 14 Years and Over: U.S. ($\bar{A}_i$)	Anderson County (A_i)	U.S. Median Income \$ (Y_{ai})	\$ ($\bar{A}_i Y_{ai}$)	\$ ($A_i Y_{ai}$)
65-74	0.90	0.10	1,931.00	17.38	1.93
75 and over	0.40	0.10	1,548.00	6.19	1.55
	100.0	100.		$\Sigma\bar{A}_i Y_{ai}$ = 6,347.44	$\Sigma A_i Y_{Ai}$ = 6,331.19

The index or adjustment factor for age-color mix, male population age 14 years and over =

$$\frac{\Sigma A_i Y_{ai}}{\Sigma \bar{A}_i Y_{ai}} = \frac{6,331.19}{6,347.44} = .997$$

TABLE 4.2

THE CONSTRUCTION OF THE INCOME ADJUSTMENT FACTOR FOR AGE-COLOR MIX OF FEMALES 14 YEARS AND OVER FOR ANDERSON COUNTY, 1970

Age by Color	Percent Distribution of Females 14 Years and Over		U.S. Median Income		
	U.S. ($\bar{A}_i$)	Anderson County (A_i)	\$ (Y_{ai})	\$ ($\bar{A}_i Y_{ai}$)	\$ ($A_i Y_{ai}$)
	(1)	(2)	(3)	(4)	(5)
White					
14-19	8.20	14.20	807.00	66.17	114.59
20-24	11.00	8.90	2,765.00	304.15	246.08
25-29	7.00	8.80	3,492.00	244.44	307.30
30-34	5.50	7.50	3,150.00	173.25	236.25
35-44	12.20	16.10	3,134.00	382.35	504.57
45-54	13.40	17.40	3,771.00	505.31	656.15
55-64	9.80	13.20	3,204.00	313.99	422.93
65-74	10.90	6.60	1,566.00	170.69	103.36
75 and over	7.60	3.70	1,362.00	103.51	50.39
Nonwhite					
14-19	1.40	0.70	796.00	11.14	5.57
20-24	2.00	0.40	1,334.00	26.68	5.34
25-29	1.60	0.50	3,091.00	49.46	15.45
30-34	1.40	0.20	3,120.00	43.68	6.24
35-44	2.60	0.60	3,052.00	79.35	18.31
45-54	2.10	0.60	2,594.00	54.47	15.56
55-64	1.50	0.40	1,701.00	25.51	6.80

TABLE 4.2 (continued)

Age by Color	Percent Distribution of Females 14 Years and Over: U.S. ($\bar{A}_i$)	Percent Distribution of Females 14 Years and Over: Anderson County (A_i)	U.S. Median Income \$ (Y_{ai})	\$ ($\bar{A}_i Y_{ai}$)	\$ ($A_i Y_{ai}$)
65-74	1.20	0.10	1,160.00	13.92	1.16
75 and over	0.60	0.10	1,003.00	6.02	1.00
	100.0	100.0		$\Sigma\bar{A}_i Y_{ai}$ = 2,574.11	$\Sigma A_i Y_{ai}$ = 2,717.07

The index or adjustment factor for age-color mix, female population age 14 years and over =

$$\frac{\Sigma A_i Y_{ai}}{\Sigma \bar{A}_i Y_{ai}} = \frac{2,717.07}{2,574.11} = 1.056$$

adjustment factor for age-color mix characteristics of the male labor force for Anderson County. The ratio means that, if each age-color mix group of labor force in Anderson County were given the same median income as the corresponding group earns in U.S., the Anderson County aggregate median income for all age-color mix groups will be 99.7 percent of the corresponding groups aggregate median income in U.S.

The reason that any county aggregate median income with respect to age-color mix characteristic is less than that of the U.S., even individual groups of age-color mix in U.S. and the County were assumed earning the same median income, is due to the fact that the male labor force percent distribution among the age-color mix groups in the county and the U.S. with respect to "income" earning power is not the same. In this case, the county age-color mix percent distribution of the male labor force may be high in a group (or groups depending upon the county) where the U.S. median income is extremely or relatively low, or the opposite of the above case may exist and give the same result, which is an age-color mix adjustment factor less than 100 percent. The age-color mix adjustment factors for male labor force of the remaining counties of the State are displayed in column (1), Appendix Table A-I.

Table 4.2, pages 78-79, illustrates the construction of income adjustment factor for age-color mix characteristic of the Anderson

County female labor force 14 years old and over, which was 1.056. The fact that it is different from 100 percent reflects that the county percent distribution of the female labor force among the age-color mix groups, with respect to "income" earning power, is not similar to that of the U.S.

Here, the county age-color mix percent distribution of the female labor force may be high (low) in an age-color mix group (or groups) depending upon the county, where the U.S. median income is substantially (or maybe relatively) high (low). However, a county (Anderson) may have a single age-color mix group (Table 4.2, pages 78-79) with considerably high percentage of labor force where the U.S. median income may be extremely low. In this case, the low income earning capacity of a single large group is compensated by relatively high income earning capacities of other groups in the distribution. Thus, the county age-color mix adjustment factor may still remain above 100 percent. The female labor force age-color mix adjustment factors for the remaining 94 counties of the state are shown in column (1), Appendix Table A-III .

Tables 4.3 and 4.4, respectively, present the construction of income adjustment factors for the level of education of the 1970 Anderson County male and female labor force, 25 years old and over. The level of education income adjustment factor was .893 for male and .905 for female (Tables 4.3 and 4.4, respectively). [The same adjustment factors for other counties are presented in column (2) of Appendix Tables A-I and A-III, respectively.]

TABLE 4.3

CONSTRUCTION OF THE INCOME ADJUSTMENT FOR THE LEVEL OF EDUCATION ATTAINED BY MALES 25 YEARS AND OVER, ANDERSON COUNTY, 1970

Years of School Completed	Percent Distribution of Males 25 Years and Over: U.S. ($\bar{E}_i$)	Anderson County (E_i)	U.S. Median Income \$ (Y_{ei})	\$ ($\bar{E}_i Y_{ei}$)	\$ ($E_i Y_{ei}$)
	(1)	(2)	(3)	(4)	(5)
Less than 8 years	16.50	24.19	3,429.00	565.78	829.60
8	12.90	14.97	5,345.00	689.50	799.99
9-11	18.60	14.96	7,079.00	1,316.69	1,058.98
12	27.70	31.66	8,434.00	2,336.22	2,670.36
13-15	10.70	11.89	9,394.00	1,005.16	1,116.62
16 and over	13.50	2.33	12,255.00	1,654.42	285.72
	100.0	100.0		$\Sigma\bar{E}_i Y_{ei}$ = 7,567.78	$\Sigma E_i Y_{ei}$ = 6,761.27

Adjustment factor or index for level of education for males 25 years and over, 1970 =

$$\frac{\Sigma E_i Y_{ei}}{\Sigma \bar{E}_i Y_{ei}} = \frac{6,761.27}{7,567.78} = .893$$

TABLE 4.4

CONSTRUCTION OF THE INCOME ADJUSTMENT FOR THE LEVEL OF EDUCATION ATTAINED BY FEMALES 25 YEARS AND OVER, ANDERSON COUNTY, 1970

Years of School Completed	Percent Distribution of Females 25 Years and Over: U.S. ($\bar{E}_i$)	Percent Distribution of Females 25 Years and Over: Anderson County (E_i)	U.S. Median Income $ (Y_{ei})	$ ($\bar{E}_i Y_{ei}$)	$ ($E_i Y_{ei}$)
	(1)	(2)	(3)	(4)	(5)
Less than 8 years	14.50	19.99	1,277.00	185.16	255.23
8	12.60	13.77	1,645.00	207.27	226.54
9-11	20.10	16.68	2,338.00	469.94	389.98
12	34.00	35.22	3,240.00	1,101.60	1,141.28
13-15	10.60	13.22	3,509.00	371.95	464.06
16 and over	8.10	1.11	5,817.00	471.18	64.71
	100.0	100.0		$\Sigma\bar{E}_i Y_{ei}$ = 2,807.10	$\Sigma E_i Y_{ei}$ = 2,541.80

Adjustment factor or index for level of education for females 25 years and over, 1970 =

$$\frac{\Sigma E_i Y_{ei}}{\Sigma \bar{E}_i Y_{ei}} = \frac{2,541.80}{2,807.10} = .905$$

The income adjustment factors for labor force participation for the 1970 Anderson County male and female labor force are presented in Tables 4.5 and 4.6, respectively. The labor force participation income adjustment factor 1.145 for males 14 years old and over and 1.338 for females 14 years and over. [See column (3) of Appendix Tables A-I and A-III for similar income adjustment factors related to male and female labor force, respectively, for other counties.]

Finally, the construction of the income adjustment factors for employment status for the 1970 Anderson County male and female labor force is presented in Tables 4.7 and 4.8, respectively. The employment status income adjustment factors are 1.015 and .984 for male and female labor force, 14 years and over for the year 1970. [For this adjustment factor of other counties, see column (4) of Appendix Tables A-I and A-III, respectively.]

The combined income adjustment factor for male labor force is the product of the income adjustment factors for age-color mix (Table 4.1, pages 76-77), level of education (Table 4.3, page 82), labor force participation status (Table 4.5), and employment status (Table 4.7), respectively.

$$[(.9977)\cdot(.893)\cdot(1.145)\cdot(1.015)] = 1.036$$

The combined income adjustment factor for female labor force in Anderson County for the year 1970 would be:

$$[(1.056)\cdot(.905)\cdot(1.339)\cdot(.984)] = 1.259$$

TABLE 4.5

THE CONSTRUCTION OF THE INCOME ADJUSTMENT FACTOR FOR LABOR FORCE PARTICIPATION STATUS FOR MALES 14 YEARS AND OVER RECEIVING INCOME, ANDERSON COUNTY, 1970

Labor Force Status	Percent Distribution of Males 14 Years and Over with Income: U.S. ($\bar{L}_i$)	Percent Distribution of Males 14 Years and Over with Income: Anderson County (L_i)	U.S. Median Income \$ (Y_{1i})	\$ ($\bar{L}_i Y_{1i}$)	\$ ($L_i Y_{1i}$)
	(1)	(2)	(3)	(4)	(5)
In the labor force	80.00	96.26	7,578.00	6,062.40	7,294.24
Not in the labor force	20.00	3.74	1,830.00	366.00	68.52
	100.0	100.0		$\Sigma\bar{L}_i Y_{1i}$ = 6,428.40	$\Sigma L_i Y_{1i}$ = 7,362.77

The index or adjustment factor for labor force participation for males 14 years and over =

$$\frac{\Sigma L_i Y_{1i}}{\Sigma \bar{L}_i Y_{1i}} = \frac{7,362.77}{6,428.40} = 1.145$$

TABLE 4.6

THE CONSTRUCTION OF THE INCOME ADJUSTMENT FACTOR FOR LABOR FORCE PARTICIPATION STATUS FOR FEMALES 14 YEARS AND OVER RECEIVING INCOME, ANDERSON COUNTY, 1970

Labor Force Status	Percent Distribution of Females 14 Years and Over with Income		U.S. Median Income		
	U.S. ($\bar{L}_i$)	Anderson County (L_i)	\$ (Y_{1i})	\$ ($\bar{L}_i Y_{1i}$)	\$ ($L_i Y_{1i}$)
	(1)	(2)	(3)	(4)	(5)
In the labor force	58.00	93.18	3,725.00	2,160.50	3,470.95
Not in the labor force	42.00	6.82	1,171.00	491.82	79.86
	100.0	100.0		$\Sigma \bar{L}_i Y_{1i}$ = 2,652.32	$\Sigma L_i Y_{1i}$ = 3,550.81

Adjustment factors or index for labor force participation status for females 14 years and over =

$$\frac{\Sigma L_i Y_{1i}}{\Sigma \bar{L}_i Y_{1i}} = \frac{3,550.81}{2,652.32} = 1.338$$

TABLE 4.7

CONSTRUCTION OF THE INCOME ADJUSTMENT FACTOR FOR EMPLOYMENT STATUS OF MALE LABOR FORCE 14 YEARS AND OVER, ANDERSON COUNTY, 1970

Employment Status	Percent Distribution of Males 14 Years and Over with Income: U.S. ($\bar{M}_i$)	Anderson County (M_i)	U.S. Median Income \$ (Y_{mi})	\$ ($\bar{M}_i Y_{mi}$)	\$ ($M_i Y_{mi}$)
	(1)	(2)	(3)	(4)	(5)
Civilian labor force					
Employed	92.80	95.62	7,820.00	7,256.96	7,477.84
Unemployed	3.50	4.31	3,973.00	139.05	171.23
Armed forces	3.70	0.07	3,771.00	139.53	2.47
	100.0	100.0		$\Sigma\bar{M}_i Y_{mi}$ = 7,535.54	$\Sigma M_i Y_{mi}$ = 7,651.54

The adjustment factor or index for employment status of male labor force 14 years and over =

$$\frac{\Sigma M_i Y_{mi}}{\Sigma \bar{M}_i Y_{mi}} = \frac{7,651.54}{7,535.54} = 1.015$$

TABLE 4.8

CONSTRUCTION OF THE INCOME ADJUSTMENT FACTORS FOR EMPLOYMENT STATUS OF FEMALE LABOR FORCE 14 YEARS AND OVER, ANDERSON COUNTY, 1970

Employment Status	Percent Distribution of Females 14 Years and Over with Income: U.S. ($\bar{M}_i$)	Percent Distribution of Females 14 Years and Over with Income: Anderson County (M_i)	U.S. Median Income \$ (Y_{mi})	\$ ($\bar{M}_i Y_{mi}$)	\$ ($M_i Y_{mi}$)
	(1)	(2)	(3)	(4)	
Civilian labor force					
Employed	95.7	92.43	3,804.00	3,640.43	3,515.87
Unemployed	4.3	7.57	2,010.00	86.43	152.25
Armed forces					
	100.0	100.0		$\Sigma\bar{M}_i Y_{mi}$ = 3,726.86	$\Sigma M_i Y_{mi}$ = 3,668.11

Adjustment factor or index for employment status of female labor force 14 years and over =

$$\frac{\Sigma M_i Y_{mi}}{\Sigma \bar{M}_i Y_{mi}} = \frac{3,668.11}{3,726.86} = .984$$

[See column (5) of the Appendix Tables A-I and A-III, respectively, for the combined income adjustment factors, constructed for other counties.]

By multiplying the combined income adjustment factors of male and female labor force of the county to the 1970 U.S. median income, which was \$6,444 and \$2,328 for male and female, respectively, a new median income was obtained, which was Anderson County's "required" or "warranted" earning capacity of income of labor force for each sex. The required or warranted median income of Anderson County for male and female labor force, respectively, for the year 1970 was:

$$[(1.036)\cdot(6,444)] = \$6,678$$

$$[(1.259)\cdot(2,328)] = \$2,932$$

[See column (6), Appendix Tables A-II and A-IV, respectively, for the male and female labor force required median income of other counties.]

The labor force utilization index was obtained for male and for female labor force. This was done by expressing Anderson County's actual (realized) median income for 1970 which was \$5,618 and \$63 for male and for female labor force, respectively [see the actual median income of other counties at column (7) of Appendix Tables A-II and A-IV, respectively] as a percentage of the respective sex, required or warranted median income.

$$\text{Male labor force utilization index} = \frac{5,618}{6,678} = .841$$

$$\text{Female labor force utilization index} = \frac{63}{2,932} = .021$$

[See column (8), Appendix Tables A-II and A-IV, respectively, for male and female labor force utilization indices of other counties.] Subtracting the above figures from 100 (after multiplying it by 100) will give us the underutilization index (percent underemplyment) of the labor force which are 15.9 percent and 97.9 percent for male and female labor force, respectively, for our specific county. [For underutilization indexes (percent underemployment) of other counties for male and female labor force, see column (9), Appendix Tables A-II and A-IV, respectively.]

Now by multiplying 15.9 which is the percent of male civilian labor force unutilized or underemployed (PU) to the 1970 male civilian labor force employed in Anderson County (14,599 men), we get the number of man units of the male civilian labor force unutilized which is the quantitative measure of underemployment of male civilian labor force in Anderson County. The same procedure applies to the estimate of underemployment of the female labor force. For our specific county, the underemployment estimate for the year 1970 is 2,318 man years for the male labor force and 7,021 man years for the female labor force. [These figures for other counties are listed in column (11) of Appendix Tables A-II and A-IV for male and female labor force, respectively.]

The lengthy mathematical steps that yield the estimate of underemployment can be expressed in a condensed aggregate model form, as has been presented in the form of notation on page 54, Chapter III. Let [$U_{m_{70}}$] and [$U_{f_{70}}$] represent unutilized man years for Anderson

County for male and female labor force, respectively, for the year 1970, then they can be expressed as:

$$\left(U_{m_{70}}\right) = \left[100 - \left(\frac{5,618}{6,444[(.997)\cdot(.893)\cdot(1.145)\cdot(1.015)]} \times 100\right)\right]$$

$$\times\ 14,599 = 2,318$$

$$\left(U_{f_{70}}\right) = \left[100 - \left(\frac{63}{2,328[(1.056)\cdot(.905)\cdot(1.339)\cdot(.984)]} \times 100\right)\right]$$

$$\times\ 7,175 = 7,021$$

II. A COMPARISON OF THE 1960 AND 1970 ESTIMATE

One of the advantages of the periodic estimate of underployment of labor force in all counties of Tennessee is to provide the basic knowledge of the changes that have occurred in the structure of the underlying factors affecting underemployment during the period under study. This consequently gives an understanding of the changes in the estimate of underemployment itself. The mathematical estimation of underemployment for 1970, presented in the first section of this chapter, provided the needed empirical data to compare the factors and the estimates in two periods (1960 and 1970).

Appendix Tables A-I to A-IV give a comparative view of the 1960 and 1970 underemployment estimate for male and female labor force, respectively. From these tables the changes in the four adjustment factors, labor force utilization index, and percent underemployment are discussed briefly in the remaining portion of this section.

Changes in the Age-Color Mix Income Adjustment Factor

For male labor force, the adjustment factor has declined* in 91 counties of the state with only minor increase in the remaining 4 counties from the year 1960 to 1970. During the same period, the female labor force income adjustment factor has increased in 35 counties and declined in 58 counties [see Table 4.9 and column (1) of Appendix Tables A-I and A-III].

This decline in 91 counties for male, in this particular adjustment factor, is an indication of a structural change in age-color mix distribution of the male labor force 14 years old and over in 1970, relative to the same distribution in 1960.

The structural change means that (Table 4.1, page 76) age-color mix percent of the county male labor force may have (A) substantially increased compared to the U.S. age-color mix group, where the U.S. median income is extremely low; (B) decreased in those age-color mix groups relative to that of the U.S. where the U.S. median income is extremely high; (C) moderately decreased in more than one age-color mix where the related U.S. group median income is moderately higher.**

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*In a county, a negative change in any particular adjustment factor from the year 1960 to 1970, means a loss in income earning power of a certain productive characteristic or attribute of the employed civilian labor force of that county. A positive change implies the opposite case of the above statement.

**A decline in this adjustment factor for female labor force in 58 counties from 1960 to 1970 will carry the same interpretation (A, B, and C).

TABLE 4.9

SOME STATISTICS ON THE CHANGES IN THE ADJUSTMENT FACTOR, ECONOMIC UTILIZATION INDEX, AND PERCENT UNDEREMPLOYMENT OF THE EMPLOYED CIVILIAN LABOR FORCE IN TENNESSEE, FROM THE YEAR 1960 TO 1970

Adjustment Factors, Economic Utilization Index, and Percent Underemployment	Statistics for the Changes	
	Male	Female
Age-Color Mix Adjustment Factor		
Number of counties where it declined from the year 1960 to 1970	91	58
Number of counties where it increased	4	35
Number of counties where it did not change	0	2
TOTAL	95	95
Mean of the changes for all counties	-4.5	-.2
Range of the changes for all counties	13.7	16.8
Standard deviation of the changes for all counties	2.4	2.5
Educational Status Adjustment Factor		
Number of counties where it declined from 1960 to 1970	93	83
Number of counties where it increased	2	11
Number of counties where it did not change	0	1
TOTAL	95	95
Mean of the changes for all counties	-3.3	-2.7
Range of the changes for all counties	17.3	14.9
Standard deviation of the changes for all counties	2.6	2.5

TABLE 4.9 (continued)

Adjustment Factors, Economic Utilization Index, and Percent Underemployment	Statistics for the Changes	
	Male	Female
Labor Force Participation Status Adjustment Factor		
Number of counties where it declined from 1960 to 1970	0	1
Number of counties where it increased	95	94
Number of counties where it did not change	0	0
TOTAL	95	95
Mean of the changes for all counties	16.1	41.8
Range of the changes for all counties	16.2	44.0
Standard deviation of the changes for all counties	3.4	7.6
Employment Status, Adjustment Factor		
Number of counties where it declined from 1960 to 1970	43	64
Number of counties where it increased	49	26
Number of counties where it did not change	3	5
TOTAL	95	95
Mean of the changes for all counties	.1	-.4
Range of the changes for all counties	15.8	10.5
Standard deviation of the changes for all counties	1.9	1.8

TABLE 4.9 (continued)

Adjustment Factors, Economic Utilization Index, and Percent Underemployment	Statistics for the Changes Male	Female
Combined Adjustment Factors		
Number of counties where it declined from 1960 to 1970	17	0
Number of counties where it increased	78	95
Number of counties where it did not change	0	0
TOTAL	95	95
Mean of the changes for all counties	5.1	26.8
Range of the changes for all counties	30.1	30.7
Standard deviation of the changes for all counties	5.1	6.5
Labor Force Utilization Index		
Number of counties where it declined from 1960 to 1970	35	95
Number of counties where it increased	59	0
Number of counties where it did not change	1	0
TOTAL	95	95
Mean of the changes for all counties	2.2	-58.4
Range of the changes for all counties	41.0	69.0
Standard deviation of the changes for all counties	8.5	14.2

TABLE 4.9 (continued)

Adjustment Factors, Economic Utilization Index, and Percent Underemployment	Statistics for the Changes	
	Male	Female
Percent Underemployment		
Number of counties where it declined from 1960 to 1970	59	0
Number of counties where it increased	35	95
Number of counties where it did not change	1	0
TOTAL	95	95
Mean of the changes for all counties	-2.2	58.4
Range of the changes for all counties	41.0	69.0
Standard deviation of the changes for all counties	8.6	14.2

The generally statewide decline in age-color mix adjustment factor for male, and in 58 counties for female, has a further specific interepretation in terms of the age-color mix aspect:

1. Under Situation (A): Teenage male labor force, 14-19 years old with extremely low U.S. median income have substantially increased in those counties, from the year 1960 to 1970.

2. Under Situation (B): Male labor force, 30-54 years old generally with high U.S. median income, have decreased in those counties from the year 1960 to 1970.

3. Under Situation (C): Labor force between ages of 20-29 or 55-65 years old, with a moderate U.S. median income, have decreased in those counties, from year 1960 to 1970.

The average for the changes in this adjustment factor, from 1960-1970, for all counties and for both sexes of the labor force, with the range and standard deviation of the changes and some other related findings are illustrated in Table 4.9.

Change in the Educational Income Adjustment Factor

For male labor force, this adjustment factor has declined in 93 counties, and for female labor force in 83 counties from the year 1960 to the year 1970 [see Table 4.9 and column (2) of the Appendix Tables A-I and A-III].

The change (an increase or decrease)in this adjustment factor from 1960 to 1970, in any particular county is a reflection of a change in the percent distribution of the county labor force 25 years old and over, who completed various years of school. This change will be relative to the same distribution of the related sex of the U.S. labor force.

A decline from 1960-1970 in this adjustment factor, for both sexes of labor force, in a very large number of counties can be attributed to either one or both of the following:

a. A relative or substantial increase in the percent of those labor force distribution groups in a county who completed the years of school, where the U.S. median income is relatively or substantially low for the same group of the U.S. labor force.

b. A relative or substantial decrease in the percent of those labor force distribution groups who completed a certain number of years of school where the same distribution group in the U.S. has relative or extremely high median income.

For some of the basic statistics of the changes in this adjustment factor, related to all counties and both sexes of labor force, refer to Table 4.9, pages 93-96.

Change in the Labor Force Participation Status Income Adjustment Factor

Male labor force, 14 years old and over with income, has achieved considerable gain in this adjustment factor from the year 1960 to the year 1970 in all counties of the state. For the same category, female labor force, this income adjustment factor has increased in 94 counties and decreased in only one county (see Col. 3 of Appendix Tables A-I and A-III). For the statistics of the changes in this adjustment factor during the decade 1960-1970, see Table 4.9.

Labor Force Participation income adjustment factor reflects the percent distribution of the population 14 years old and over, with income, in the labor force group. The high increase in this adjustment factor for male and female labor force in all counties of the state (see Table 4.9), indicate that percent of the population 14 years old and over with income, who are in the labor force of the county, and for whom the U.S. median income is very high, has increased relative to the increase of the same population in the U.S. labor force, from 1960 to 1970. This increase in the labor force participation income adjustment factor of all counties of Tennessee could also be due to a large decline in the percentage of those who are not in the labor force of the county, where the U.S. median income is low. It is also logical to say that both effects might have generated this high change in labor force participation adjustment factors in all counties of the state, for both stratification of labor force.

Changes in the Employment Status Income Adjustment Factor

This adjustment factor has declined in 43 counties for male and in 64 counties for female labor forces from year 1960 to 1970. The number of counties where this factor has increased for male is 49, which is almost twice the number of counties where this adjustment factor has increased for female labor force [see Table 4.9, pages 93-96, and also refer to column (4) of the Appendix Tables A-I and A-III].

The fact that it has increased in more counties for the male than for the female labor force from the year 1960 to 1970 reflects a difference in the changes in employment status during this period for male labor force and for female labor force in those counties compared to the changes in the U.S. employment status. This implies that, in those 49 counties during this period, a higher percentage of the male civilian labor force (relative to the U.S.) may have entered the employed male civilian labor force group where the U.S. median income is higher for this particular group or the percent of male civilian force unemployed (which has a low U.S. median income) may have gone down in the related counties. It is also possible that both types of changes may have taken place in any one of the counties where the employment adjustment factor for male or for female labor force has increased (see Tables 4.7, page 87, and 4.8, page 88, as an example for the above interpretation).

The relationship between the number of counties where this adjustment factor has increased for male and female, which is two to one, respectively, indicate that in the state as a whole, male labor force has gained income earning capacity due to employment status, while female labor force (in spite of a gain in 26 counties) has shown a net loss with this respect. Table 4.9, pages 93-96, shows the average of the changes in all counties in this adjustment factor which is extremely low (.09), but positive for male, while it is -.35 for female.

Changes in the Combined Adjustment Factor or Index

The size of this adjustment factor is determined by the size of the four adjustment factors that have already been discussed (Chapter IV, pages 81, 84, and 89). This factor has declined in 17 counties for male from 1960 to 1970, but it has increased in a relatively large magnitude in all counties of the state for the female labor force (see Table 4.9, pages 93-96).

It is understood that this factor adjusts the U.S. median income for the combined effect of the four income earning power factors each with respect to one characteristic of the labor force.* Thus, a relative increase in the combined adjustment factor from 1960 to 1970 in a county, means that the income earning capacity with respect to all factors had increased. This would result in a decline in the labor force utilization index of a particular sex of labor in that county and consequently in a high rate of underemployment.

The fact that for female labor force this adjustment factor has increased in all counties of the state from 1960 to 1970 and that this increase is relatively large (see Table 4.9, pages 93-96) indicates that the underemployment rate for female labor force in Tennessee has increased in all counties during the decade of 1960's (see Table 4.10).

For male labor force a positive change has taken place in 78 counties of the state, but the magnitude of the change was relatively small as reflected in the mean and standard deviation of the change [Table 4.9 and also see column (5) of Appendix Tables A-I and A-III for a general look in the changes in this factor in all counties, for male and female labor force, respectively].

Changes in Labor Force Utilization Index

This index is the county's actual median income expressed as percentage of that county "required" or "warranted" median income.

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*Age-color mix, level of education, labor for participation status, and employment status.

TABLE 4.10

PERCENT DISTRIBUTION OF THE EMPLOYED CIVILIAN LABOR FORCE WHO ARE UNDEREMPLOYED IN TENNESSEE, BY COUNTY, REGION, AND SEX FOR THE YEARS 1960 AND 1970

Percent of the Employed Civilian Labor Force Underemployed	West Tennessee		Middle Tennessee		East Tennessee		TOTAL	
	No. of Cos.	%	No. of Cos.	%	No. of Cos.	%	No. of Cos.	%
(Male 1960)								
Above 60	2	9.52	8	19.50	2	6.06	12	12.63
50-59.9	9	42.85	4	9.75	3	9.09	16	16.68
40-49.9	4	19.05	13	31.71	12	36.36	29	30.52
30-39.9	4	19.05	9	21.95	4	12.12	17	17.89
20-29.9	1	4.76	6	14.63	5	15.15	12	12.63
10-19.9	0	0.00	1	2.44	4	12.12	6	6.31
0- 9.9	1	4.76	0	0.00	3	9.09	3	3.16
TOTAL	21	100.00	41	100.00	33	100.00	95	100.00
(Male 1970)								
Above 60	0	0.00	2	4.87	3	9.09	5	5.26
50-59.9	5	23.81	6	14.63	3	9.09	14	14.73
40-49.9	7	33.33	13	31.70	7	21.21	27	28.42
30-39.9	7	33.33	11	26.82	12	36.36	30	31.57
20-29.9	1	4.76	6	14.63	5	15.15	12	12.63
10-19.9	1	4.76	3	7.31	3	9.09	7	7.36
0- 9.9	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	21	100.00	41	100.00	33	100.00	95	100.00
(Female 1960)								
Above 60	0	0.00	0	0.00	0	0.00	0	0.00
50-59.9	0	0.00	0	0.00	0	0.00	0	0.00
40-49.9	0	0.00	0	0.00	0	0.00	0	0.00
30-39.9	10	47.52	6	14.63	1	3.03	17	17.89
20-29.9	7	33.33	16	39.02	15	45.45	38	40.00
10-19.9	4	19.04	12	29.25	7	21.21	23	24.21
0- 9.9	0	0.00	6*	14.63	8*	24.24	14	14.73
TOTAL	21	100.00	41	100.00	33	100.00	95	100.00

TABLE 4.10 (continued)

Percent of the Employed Civilian Labor Force Underemployed	West Tennessee		Middle Tennessee		East Tennessee		TOTAL	
	No. of Cos.	%	No. of Cos.	%	No. of Cos.	%	No. of Cos.	%
(Female 1970)								
Above 60	21	100.00	41	100.00	33	100.00	95	100.00
50-59.9	0	0.00	0	0.00	0	0.00	0	0.00
40-49.9	0	0.00	0	0.00	0	0.00	0	0.00
30-39.9	0	0.00	0	0.00	0	0.00	0	0.00
20-29.9	0	0.00	0	0.00	0	0.00	0	0.00
10-10.9	0	0.00	0	0.00	0	0.00	0	0.00
0- 9.9	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	21	100.00	41	100.00	33	100.00	95	100.00

*Three counties in the middle, one county in the east, in this group shows negative percentage of Underemployment; however, they are included in the (0-9.9) group for being consistent with the similar groups in the table. A negative Underemployment figure for county shows that the particular sex of the labor force in that county produces an output (medium income) above the norm (page 54).

It is basically an indicator of a county labor force productivity performance compared to a norm output or productivity level.

The 1960 and 1970 figures for this index [see column (8), Appendix Tables A-II and A-IV] show a considerable change for all counties of Tennessee for male labor force; it has declined in 35 counties and increased in 59 counties, while remaining the same in only one county. For the female labor force, it has substantially declined for all 95 counties from the year 1960 to the year 1970. See Table 4.9, pages 93-96, for the statistics of the changes in labor force utilization index.

Changes in Percent Underemployment

This figure is derived by subtracting the labor force utilization index from 100. The larger the labor force utilization index in a county, the smaller the percentage of underemployment for that particular county. The number of counties where the percent of employed civilian force underemployed has declined was 59, and it is exactly the number of counties where male labor force utilization index has increased. The same relation between labor force utilization index and percent underemployment exist in the case of female labor force (see Table 4.9).

Column (9) of Appendix Tables A-II and A-IV illustrate the percent underemployment figures for 1960 and 1970 by county and the changes during this period, for male and female labor force, respectively.

In Table 4.10, the level of underemployment of labor force in each county of the state is compared from the standpoint of time

(1960-1970), geographical location (East, West, and Middle Tennessee), and sex of the employed civilian labor force.

More counties in West Tennessee, had higher level of underemployment for male labor force in 1960 than in 1970. In 1960 about 53 percent of the state's counties had 50 percent or more underemployment of the male labor force, while in 1970 only 24 percent of the region's counties had 50 percent or more underemployment of the male civilian labor force.

In Middle Tennessee the percentage of the counties with 50 percent or more underemployment of the male civilian labor force decreased from 29 percent to about 20 percent from 1960 to 1970. During the same period in the East Tennessee counties with higher than 50 percent underemployment of male civilian labor force slightly increased. In the state as a whole, about 29 percent of the counties had 50 percent or more male underemployment in 1960, while in 1970 there were 20 percent of counties with the above mentioned level of underemployment.

In the case of female labor force, the situation in the state's three regions has changed in the opposite direction of the changes in the underemployment of the male labor force. In 1960, for female labor force, there were no counties with 50 percent or above underemployment level. Even there were only three counties above 40 percent in the three regions (Table 4.10, pages 102-103).

In 1970, all counties in the three regions had 60 percent or more underemployment of female labor force which is a drastic increase in underemployment compared to the year 1960. This change amounts to saying that female labor force has turned from being relatively efficiently utilized in 1960 to being inefficiently utilized in 1970.

The magnitude of the percent of the employed civilian labor force who are underemployed (unutilized) is illustrated by county for male and female labor force in Figures 2 and 3, respectively. In Figure 2, percent underemployment by county for the employed male civilian labor force is displayed in Map A and Map B for the years 1960 and 1970, respectively. Figure 3 illustrates percent underemployment by county for the employed female civilian labor force, where Map A and Map B refer to the years 1960 and 1970, respectively.*

Man-years economically unutilized is a quantitative unit measure of that portion of the employed labor force that are (disguised unemployed) underemployed. For any county, man-years labor economically unutilized related to any sex of the labor force and in any one of the two time periods, can be obtained by multiplying the percent figure for that county appearing in the corresponding map, into the related number of employed civilian labor force which is listed by county in column (10) of the Appendix Tables A-II and A-IV for male and female, respectively. The product of this multiplication is shown under column (11) of the related two Appendix tables.

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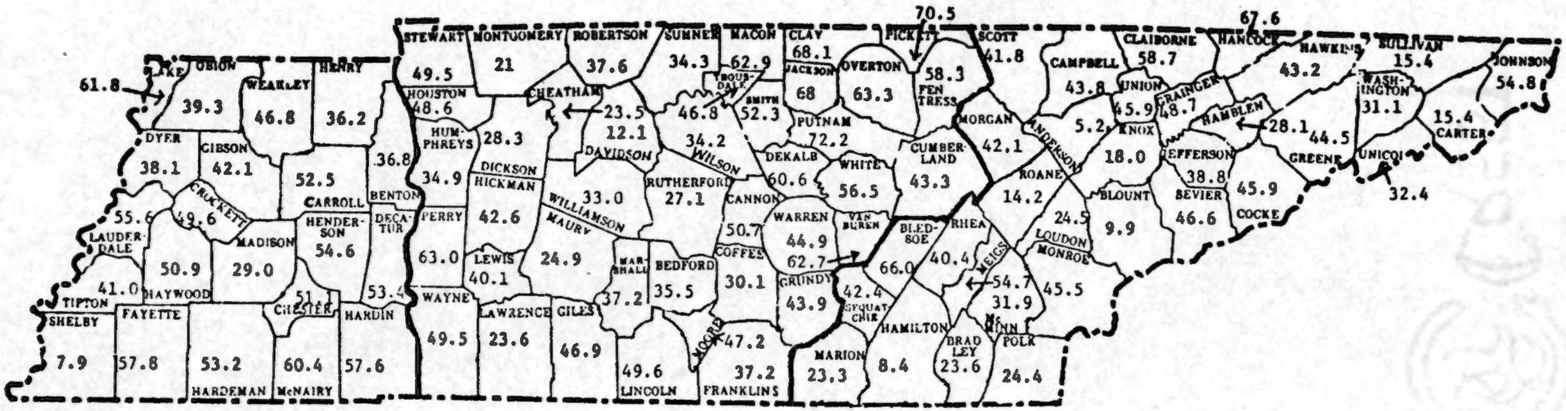
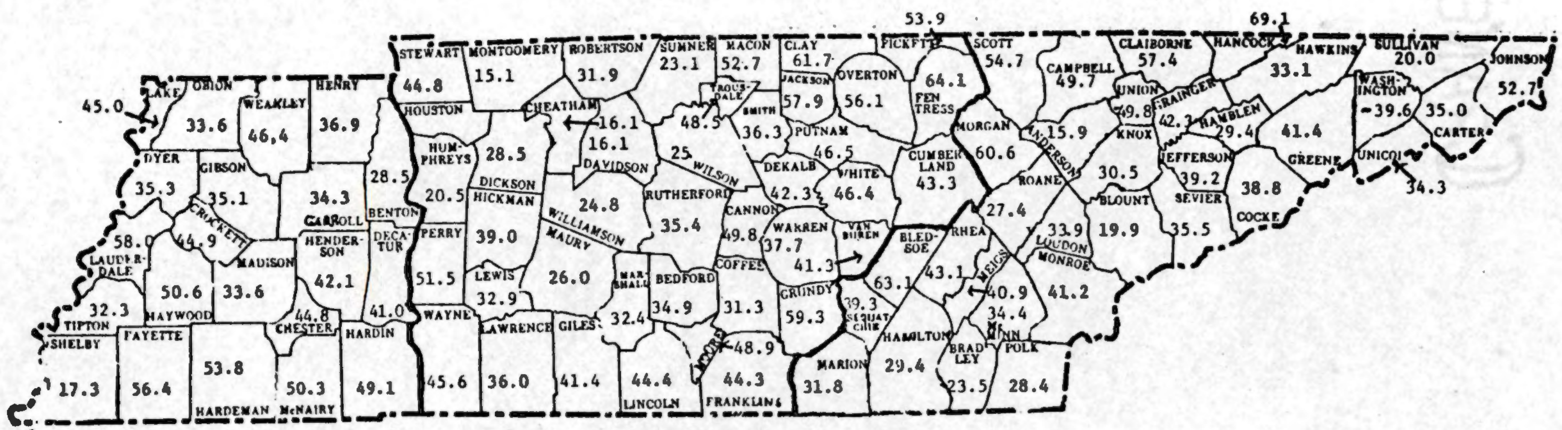
*Data presented on maps can also be found in Appendix C.

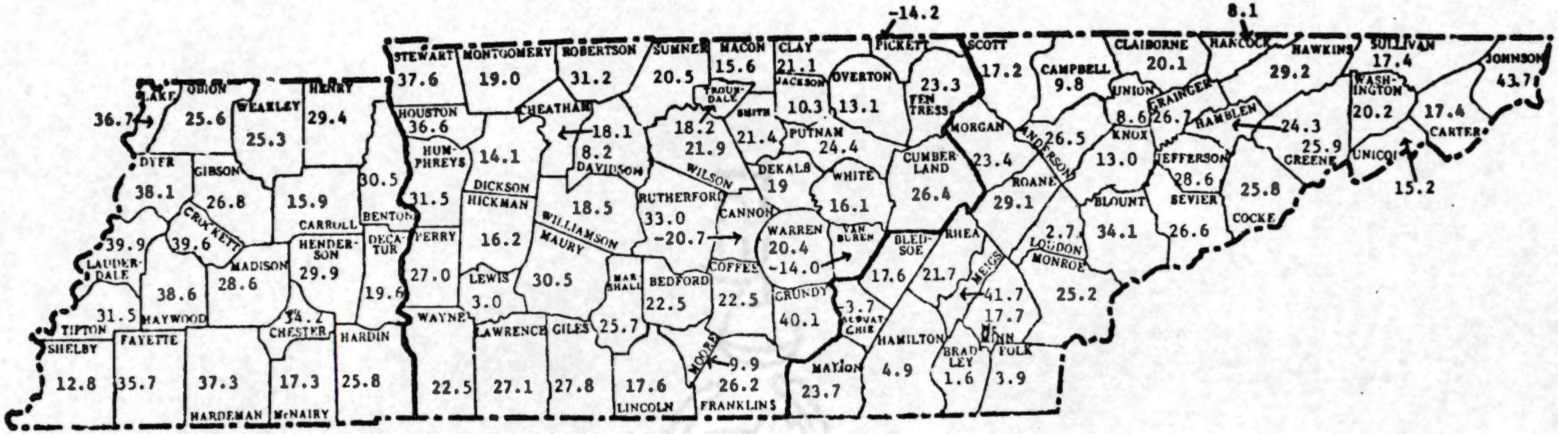


Map A

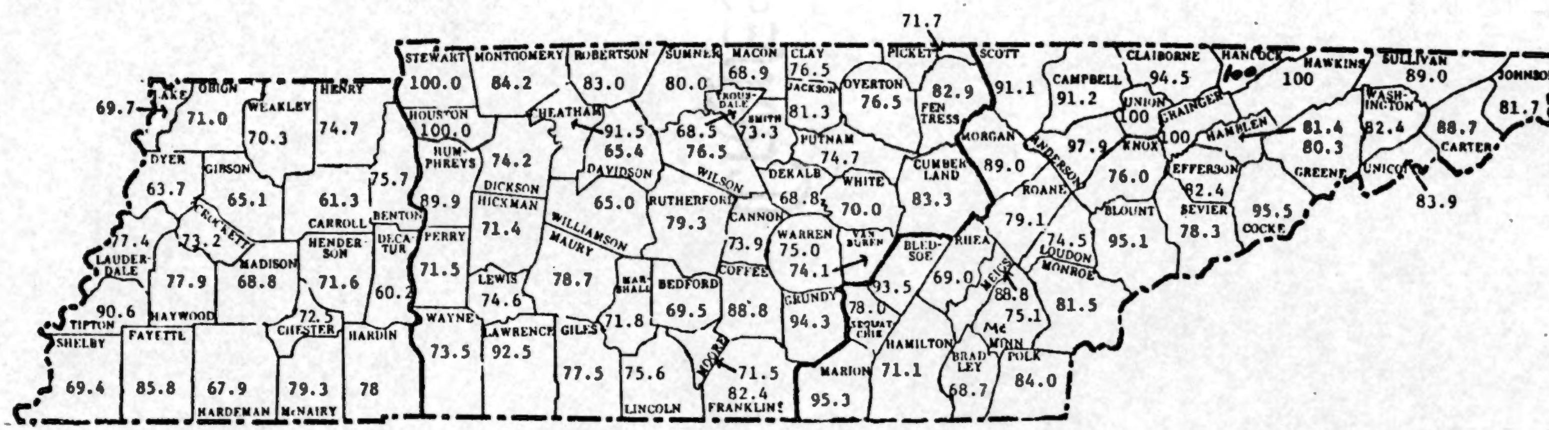


Map B

Figure 2. Percent of Employed Male Civilian Labor Force, Underemployed, by County, Tennessee, 1960 (Map A), 1970 (Map B).



Map A



Map B

Figure 3. Percent of Employed Female Civilian Labor Force, Underemployed, by County, Tennessee, 1960 (Map A), 1970 (Map B).

CHAPTER V

A SECOND-STAGE ESTIMATION OF LABOR FORCE UNDEREMPLOYMENT IN ALL COUNTIES OF TENNESSEE THROUGH A LEAST-SQUARE REGRESSION MODEL AND AN ALTERNATIVE SET OF VARIABLES FOR MALE AND FEMALE LABOR FORCE FOR THE YEARS 1960 AND 1970

The main interest in this chapter is to report the outcome of the second-stage estimation of the labor force underemployment in Tennessee. This includes male and female civilian labor force in the two time periods. More specifically, the economic interpretation of the statistical results will receive considerable scrutiny and will remain as a major focus. However, it is emphasized that the statistical results (later to be explained in the related section) demonstrated the second stage model to be more reliable for testing structural changes in the estimated parameters of labor force underemployment between time periods and sexes of labor force.

The findings from the least-square regression analysis are presented under two major headings: (1) interpretation of the results from the second-stage model, and (2) a statistical test for structural changes.

I. INTEPRETATION OF THE RESULTS FROM THE SECOND-STAGE MODEL

In the second-stage model, the percent of underemployed labor force by county (PU)* is the dependent variable [column (9), Appendix Tables A-I and A-II] and the groups of variables described in Table 3.1, page 61-63, were the independent variables.**

In general the model for male labor force 1960 and 1970 performed very respectably in term of (R^2) and standard error of estimate and over all level of significance (Table 5.1). The model for male labor force 1960 accounted for approximately 70 percent of the total variation in the percent underemployment. The male 1970 model accounted for 78 percent of the county variation in underemployment and is relatively good for cross-sectional model.

Problem arose in statistical testing due to strong multicollinearity. Evidence of this problem is manifested in relatively large (> .50) simple correlation between some of the independent variables (Tables 5.2 and 5.3).

Multicollinearity makes precise estimate of coefficients difficult and explodes the standard errors which makes the standard statistical test unreliable. Therefore, some of the estimated parameters may be economically important but would not test statistically significant.

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*($\bar{PU}$), instead of ($\bar{U}$), in order to account for the variation in the size of the civilian labor force employed.

**The independent variables for male 1960, female 1960 and for male and female common 1960, are listed by county in Appendix Tables B-I, B-II, and B-III, respectively. The independent variables for male 1970, female 1970, and for male and female common 1970, are displayed by county in Appendix Tables B-IV, B-V, and B-VI, respectively.

TABLE 5.1

THE LEAST-SQUARE REGRESSION COEFFICIENTS SECOND-STAGE ESTIMATE OF UNDEREMPLOYMENT OF MALE AND FEMALE LABOR FORCE BY COUNTY IN TENNESSEE FOR THE YEARS 1960 AND 1970

The Second-Stage Estimating Variables	Symbols	Male				Female			
		1960		1970		1960		1970	
		b	α Level	b	α Level	b	α Level	b	α Level
	a	63.260		-21.580		-325.630		239.520	
Percent employed Lab.F. in Agri. Forest and Fishery	X_1	.175		.115		4.598	(.05)	- 1.688	
Percent employed Lab.F. in Manufacturing	X_2	- .100		.182		3.437	(.25)	- 1.141	
Percent employed Lab.F. in Tr. Com.Ut.San.S.	X_3	.202		- .577	(.10)	3.193	(.25)	- .535	
Percent employed Lab.F. in Whol. S. and Ret. Trade.	X_4	.741	(.25)	.259		3.635	(.10)	- .240	
Percent employed Lab.F. in Service	X_5	.419		.828	(.005)	4.128	(.10)	- .884	
Percent of Total Pop. being M. or F. in Rur.F.	X_6	- .068		.944		- .569		- .246	
Percent of Total Pop. being M. or F. in Rur.N.F.	X_7	- .799		.623		- .117		- .551	
Percent of Total Pop. being M. or F. in Urb.A.	X_8	-1.165		.172		- .212		- .934	
Percent of Lab.Force Unemployed	X_9	.692	(.05)	.742	(.25)	.377		.114	
Percent of Total Employed Lab.F. Use Pub.Trans.	X_{10}	- .56		- .272		- 1.686	(.005)	- .564	

TABLE 5.1 (continued)

The Second Stage Estimating Variables	Symbols	Male 1960 b	Male 1960 α Level	Male 1970 b	Male 1970 α Level	Female 1960 b	Female 1960 α Level	Female 1970 b	Female 1970 α Level
Percent of Occupied Hous. Unit with No Auto.	X_{11}	.52	(.05)	.885	(.005)	.216	(.25)	.208	
Young Dependency Ratio	X_{12}	- .632		- .169		- 1.085	(.10)	- .309	
Old Dependency Ratio	X_{13}	- .244		.333		- .151		- 2.573	(.005)
Death/1000 Pop.due to Sick. and Disease	X_{14}	.569		.396		.396		- .058	
Industrial Variation	X_{15}	- .918		- .914	(.05)	.820		- .601	(.25)
	R^2	.699		.783		.547		.555	
	F	10.646		18.973		6.307		6.574	
	St.E	10.12		6.24		8.81		7.29	

TABLE 5.2

A MATRIX OF SIMPLE CORRELATION COEFFICIENTS OF VARIABLE USED IN THE SECOND-STAGE ESTIMATE OF UNDEREMPLOYMENT OF MALE LABOR FORCE IN TENNESSEE
UPPER DIAGONAL (1960) LOWER DIAGONAL (1970)

	PU	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
PU	1	.73	-.63	-.29	-.43	-.44	.71	.07	-.62	-.07	-.49	.49	-.07	.33	.37	-.55
X_1	.62	1	-.77	-.46	-.53	-.54	.95	-.21	-.59	-.36	-.49	.42	-.01	.29	.35	-.59
X_2	-.21	-.39	1	.10	.19	.11	-.67	.19	.38	.23	.33	-.42	.07	-.33	-.31	.24
X_3	-.35	-.44	-.02	1	.26	.18	-.48	.14	.26	.29	.23	-.17	-.02	-.04	-.03	.42
X_4	-.41	-.29	-.30	-.05	1	.58	.59	-.34	.75	-.03	.43	-.31	-.25	-.04	-.08	.75
X_5	-.19	-.35	-.49	.02	.54	1	-.58	-.20	.64	-.03	.50	-.27	-.09	-.13	-.29	.63
X_6	.62	.77	-.18	-.27	-.47	-.37	1	-.21	-.63	-.41	-.46	.33	-.06	.28	.33	-.64
X_7	.38	.12	.09	.06	-.53	-.42	.05	1	-.62	.61	-.28	.16	.17	.06	-.00	-.29
X_8	-.66	-.54	.02	.11	.69	.57	.61	.82	1	-.17	.59	-.40	-.08	-.28	-.27	.75
X_9	.52	1.8	-.04	-.08	-.26	-.05	.18	.31	-.36	1	-.04	.18	.20	-.10	-.10	.08
X_{10}	-.33	-.32	-.05	.10	.43	.38	-.26	-.49	.54	-.08	1	-.12	.06	-.30	-.45	.59
X_{11}	.59	.43	-.26	-.02	-.18	-.15	.31	.20	-.35	.54	-.01	1	.34	.13	.07	-.29
X_{12}	-.08	.01	-.06	.01	.03	.01	-.19	.15	-.01	.04	.03	.17	1	-.49	-.43	-.17
X_{13}	.44	.48	-.19	-.02	-.15	-.28	.44	.11	-.36	.13	-.25	.39	-.56	1	.59	-.14
X_{14}	.38	.43	-.18	-.18	-.02	-.24	.27	.09	-.25	.23	-.17	.38	-.38	.77	1	-.10
X_{15}	-.50	-.45	-.30	.22	.71	.62	-.52	-.39	.62	-.20	.53	-.17	.16	-.29	-.18	1

TABLE 5.3

A MATRIX OF SIMPLE CORRELATION COEFFICIENTS OF VARIABLE USED IN THE SECOND-STAGE ESTIMATE OF UNDEREMPLOYMENT OF FEMALE LABOR FORCE IN TENNESSEE UPPER DIAGONAL (1960) LOWER DIAGONAL (1970)

	PU	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
PU	1	.35	-.55	.15	.36	.46	.07	-.11	.03	.08	-.18	.14	.09	.02	.13	.16
X_1	.24	1	-.42	-.14	.06	.13	.68	-.26	-.29	-.11	-.24	.43	.37	-.05	.03	-.38
X_2	-.31	-.08	1	-.40	-.72	-.90	.07	.34	-.31	.08	-.31	-.10	-.33	.27	.24	-.36
X_3	.08	-.17	-.61	1	.25	.46	-.39	-.29	.52	.01	.32	-.29	.04	-.23	-.21	.52
X_4	.26	-.15	-.74	.41	1	.52	-.26	-.01	.21	.16	.25	.13	.17	-.17	-.17	.29
X_5	.26	.07	-.95	.55	.53	1	-.26	-.36	.46	-.14	.42	-.10	.24	-.28	-.26	.53
X_6	.15	.41	.33	-.43	-.37	-.29	1	-.16	-.61	-.09	-.45	.34	-.07	.27	.32	-.64
X_7	.21	.13	.39	-.45	-.38	-.33	.08	1	-.68	.23	-.31	.19	.15	.11	.05	-.34
X_8	-.27	-.33	-.48	.58	.50	.41	-.60	-.84	1	-.11	.59	-.39	-.08	-.27	-.26	.75
X_9	.26	.17	-.28	-.02	.29	.25	.03	.03	-.04	1	-.10	.02	.04	.05	-.01	-.03
X_{10}	-.07	-.18	-.47	.46	.36	.45	-.26	-.50	.54	-.05	1	.12	.06	-.30	-.46	.59
X_{11}	-.02	.13	.18	-.31	-.17	-.13	.31	.24	-.34	-.00	-.01	1	.34	.13	.07	.30
X_{12}	.33	.36	-.32	.10	.22	.29	-.17	.13	-.01	.25	.03	.17	1	-.49	-.43	-.17
X_{13}	-.40	-.04	.42	-.42	-.33	-.37	.43	.16	-.33	-.13	-.25	.39	-.56	1	.59	-.14
X_{14}	-.32	.06	.28	-.39	-.21	-.25	.26	.13	-.23	-.07	-.17	.38	-.38	.77	1	-.10
X_{15}	-.01	-.27	-.73	.49	.64	.68	-.51	-.43	.61	.02	.53	-.17	.16	-.29	-.18	1

Because of this little emphasis was placed on the discussion of statistically significant regression coefficients.

The estimated parameters for the four equations of the model are displayed in Table 5.1, page 111. They are compared for their sign, magnitude, level of significance and their economic implication. This comparison is presented in the order of the related groups of estimating variables.

The First Group

Five variables (X_1, X_2, X_3, X_4, and X_5) were the component of this group. Percent of employed labor force in mining and construction was the sixth variable which was deleted from this group in order to avoid singularity.

A negative sign of a coefficient of any variable means that a one unit increase in that variable reduces the county percent underemployment (PU) of the related labor force sex by the magnitude of the coefficient of that variable. Conversely, a positive sign indicates that a one unit increase in the related variable increases (PU) by the magnitude of the coefficient of the variable involved.

In the first group of variables for male 1960, the sign of all variables are positive except (X_2) which has a negative sign. This means, ignoring the level of statistical significant, that male labor force employed in manufacturing (X_2) in 1960 was absolutely efficient than any one of the other sector; thus the employment of labor force in the other four sectors, including the one omitted, involved opportunity costs relative to the employment in manufacturing sector (X_2) and relative to each other. The opportunity cost would be in terms of net reduction of percent underemployed male labor force in the county.

The opportunity cost of (X_1) relative to (X_2) in 1960 would be a net reduction in total county male labor force underemployment due to a transfer of one unit of labor force from (X_1) to (X_2).* Technically speaking, a reduction of 1 percent of employed male labor force in agriculture (X_1) for instance will reduce male labor force underemployment of given county by .175 percent (positive sign). If in the same time 1 percent labor force were increased in manufacturing (X_2) with a negative sign, then the net reduction in the percent underemployment of a county would be (.175 + .10 = .185), which is the opportunity cost of male labor force employed in agriculture. The opportunity cost of the male labor force in 1960 among the sectors with positive sign (inefficient sectors), for instance (X_4) with respect to (X_3), would be (.741 - .202 = .539 percent).

For male labor force the negative sign (efficient) has shifted from (X_2) at 1960 to (X_3) at 1970 where the last is statistically significant at (α = .10) while the former at the year 1960 was statistically nonsignificant. This shift has taken place in face of a considerable increase in the average of (X_2) for the state from 1960 to 1970. (See Table 5.4.) Economically, this implies that

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*Under the assumptions explained on pages 69-70, Chapter III.

TABLE 5.4

MEAN AND STANDARD DEVIATION OF THE VARIABLES APPLIED IN SECOND-STAGE MODEL TO ESTIMATE PERCENT UNDEREMPLOYMENT IN ALL COUNTIES OF TENNESSEE, FOR MALE AND FEMALE LABOR FORCE, FOR THE YEAR 1960 AND 1970

	Male				Female			
	1960		1970		1960		1970	
Variables	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
PU	42.40	16.14	39.59	12.27	21.64	11.97	80.03	10.02
X_1	29.14	15.84	12.56	7.84	4.57	4.91	1.29	1.05
X_2	24.16	9.96	34.14	7.71	34.34	15.30	41.94	13.22
X_3	6.40	3.81	7.43	3.34	1.94	1.05	1.70	1.12
X_4	13.62	3.65	14.45	3.60	18.17	5.17	15.44	4.36
X_5	13.83	4.85	16.85	5.62	40.48	9.84	38.28	9.45
X_6	15.96	8.51	10.29	6.50	15.38	8.29	10.15	6.42
X_7	23.02	8.78	25.78	9.21	23.57	8.84	26.68	9.41
X_8	10.46	10.41	12.79	11.15	11.61	11.51	14.29	12.23
X_9	5.79	2.68	4.65	2.12	6.38	3.00	5.94	2.80
X_{10}	2.04	2.98	1.33	1.60	2.04	2.98	1.33	1.60
X_{11}	26.42	7.02	18.59	4.53	26.42	7.02	18.59	4.53
X_{12}	29.59	2.68	25.62	2.13	29.59	2.68	25.62	2.13

TABLE 5.4 (continued)

Variables	Male				Female			
	1960		1970		1960		1970	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
X_{13}	10.03	2.54	11.18	1.97	10.03	2.54	11.18	1.97
X_{14}	8.48	1.54	9.66	1.63	8.48	1.55	9.65	1.63
X_{15}	10.30	2.15	11.68	2.81	10.30	2.15	11.68	2.81

percent employment of male labor force in manufacturing (X_2) has increased from 24 percent to 34 percent from 1960 to 1970 (Table 5.4) and this change has made manufacturing an inefficient sector for the male labor force in 1970 (Table 5.1, page 111).

For male, the percent of employed labor force in service industry (X_5) has a positive coefficient in both periods but the magnitude of the coefficient doubled and was highly significant in 1970 compared to 1960. The changing levels of significance in both periods for X_5 (and other variables in this group) cannot be relied upon because of the multicollinearity problem. (See Tables 5.2 and 5.3, pages 113-114.)

For female labor force, all of the coefficients of the variables in group I (X_1, X_2, X_3, X_4, X_5) changed from 1960 to 1970. The signs changed from positive to negative which implies that in 1960 female labor force in Tennessee was less underemployed than it was in 1970. An increase of female labor force in 1960 in any one of the five sectors caused an increase in the percent underemployment of female in a given county. This means that in 1960 female labor force employed in one sector had little or no opportunity cost relative to another sector.

In 1970, female labor force high rate of underemployment was reflected in the negative sign of the group I coefficients. In other words the negative signs in 1970 implies that female unutilized productive capacity in 1970 relative to 1960 has increased such that it can bring in as increase in efficiency of female labor utilization by increased employment in any one of the five sectors. The fact that in 1970, for female, the (group I) variables were nonsignificant is an indication of high multicollinearity which is one of the major statistical problems of this chapter (see Table 5.3, page 114).

The Second Group

These variables (X_6, X_7, and X_8) represent the regional distribution and sex composition (mix) of the population of a county at the same time. For instance (X_6) is the percent of the total population of a county being male (female) and living in the rural farm. (X_7) and (X_8) reflect the same aspects of the population for rural nonfarm and urban areas of a particular county.

The visible aspect of this group of variables (Table 5.1, pages 111-112) for male labor force is the change in sign of their coefficients from negative in 1960 to positive in 1970. The negative sign of the coefficient of (X_7), for example, means that a 1 percent increase in the male population-mix of a county living in rural nonfarm in 1960 is associated with the reduction of total (PU) of male labor force in that county by .799 percent. The same interpretation holds for (X_6) and (X_8).

The change in each one of the three coefficients from negative to a positive sign for the male labor force 1970 implies that a 1 percent increase in male makeup of the population (male population-mix) who lives in any one of the three regions of a county in 1970 is associated with increases (PU) of male labor force by the magnitude of the related coefficient.

For male labor force, the most inefficient rural-urban population-mix (X_6) among the group (X_6, X_7 and X_8) in 1960, remained the same in efficiency in 1970. The same was true for the most efficient (X_8) and (X_7) which took the middle position in both 1960 and 1970.

There was however a distinct shift in the level of efficiency as reflected in the fact that all signs of group (II) coefficients were negative in 1960 and positive in 1970. This means that while the relative efficiency has remained stable within the group, the efficiency has changed to inefficient factors in all cases (X_6, X_7, X_8) from 1960 to 1970 (Table 5.1, pages 111-112).

The changes in the coefficients of group (II) of variables for male 1960 and 1970 shown in Table 5.1 can also be compared to the changes in the average value of these variables for all counties. (Table 5.4, page 117). The average rural farm male population-mix (X_6) declined from 16 percent to 10 percent from the year 1960 to 1970. For (X_7) and (X_8) the averages increased.

For female labor force the signs of the coefficients were negative in both periods 1960 and 1970 (Table 5.1). The main change is in the magnitude of the coefficients. Rural farm population-mix (X_6) coefficient declined and the coefficient of (X_7) and (X_8) increased considerably during the years 1960 and 1970. This implies that in 1960 female population-mix of the counties rural farm (X_6) were more efficient than the same population-mix in rural nonfarm (X_7) and urban (X_8). In 1970, female population-mix of the counties urban

(X_8) and rural nonfarm (X_7) were more efficient, respectively, than that of the rural farm.

The change in the mean of the female population-mix in the three regions (X_6, X_7, and X_8) follows the same pattern as of the male population-mix (see Table 5.4, page 117). The fact that none of the variables of this group is statistically significant in any equation may be explained by high levels of multicollinearity between the variables of the group and with the variables of other groups as well (see Table 5.3, page 114).

The Third Group

Percent unemployment of labor force (X_9) is the only variable called the "third group." The sign of the coefficients of this variable is positive in every one of the four equations of the second stage model (Table 5.1, pages 111-112).

The economic interpretation of the sign of the coefficients of (X_9) is in agreement with Joan Robinson's (2) postulate on "disguised unemployment," where she proposed that, as unemployment increases due to a decline in aggregate demand,* workers will accept occupations that are below their productive capacity thus increasing the rate of underemployment.

The coefficient of (X_9) for male 1960 was (.692) which implies that a 1 percent increase in male labor force unemployment will

*This study is not concerned with the origin of unemployment.

increase (PU) of the male labor force by .692 percent. The same relation is true with the other coefficients and the related (PU).

The main aspect of comparison among the coefficient of (X_9) is the difference in magnitude and the level of significance between male and female labor force. For male labor force, the magnitude of the coefficient of (X_9) is relatively high and shift significant (at a low level) compared to those for the female labor force. Economically, this means that more male labor force that was unemployed in the years 1960 and 1970 has accepted jobs below the level of their productive capacity than female labor force did. In other words, under situation of unemployment male labor force has been more flexible in accepting employment (even below their capacity) in the job market than female labor force. Female labor force has preferred to stay more unemployed than being underemployed. Statistically however, the coefficient of (X_9) for female labor force was not significant.

The Fourth Group

The percent employed labor force using public transportation (X_{10}) and occupied housing units with no automobile (X_{11}) are included in this group. Both variables as proxies of transportation and commuting facilities are common between those male and female labor force equations for same year.

The coefficients of (X_{10}) and (X_{11}) (Table 5.1, pages 111-112) have opposite impact on underemployment in each one of the second-stage model equations. Percent of employed labor force using public transportation (X_{10}) will reduce (PU) and (X_{11}) will increase it by the amount of their related coefficients as each one of the respective variables is increased by one unit.

In 1960, the percent of employed labor force using public transportation (X_{10}) had a significantly greater impact (-1.686) on (PU) of the employed female labor force relative to its impact (-.56) on (PU) of the male labor force. The same relation existed in 1970 with the exception that none of the coefficient was statistically significant.

In 1960, the percent of occupied housing units with no automobile (X_{11}) had a significantly greater impact (.52) on (PU) of the employed male labor force relative to its impact (.216) on (PU) of employed male labor force. In 1970, the same relation was true with the exception that the impact of (X_{11}) was much greater (.885) and highly significant on (PU) of employed male labor force compared to its nonsignificant impact on (PU) of employed female labor force.

The Fifth Group

The component variables of this group are young dependency ratio (X_{12}) and old dependency ratio (X_{13}). Both are common factors in the second stage estimation of (PU) for male and female labor force for the same year.

Young dependency ratio (X_{12}) shows a negative relation with (PU) in both periods and for both sexes of employed labor force (Table 5.1, pages 111-112). This means a one unit increase in young dependency ratio (X_{12}) reduces underemployment by the magnitude of the coefficient of (X_{12}) in the related equation.

The economic implication of this negative relation would be that an increase in young dependent population is an inducement to the population in the working age (14-65 years old) to work more within their given potential productive capacity thus reducing (PU).

In 1960 the coefficient of (X_{12}) was (-1.085) and statistically significant for female and (-.632) and nonsignificant for male. This implies that young dependency ratio induced female labor force more toward efficient utilization of their potential productive capacity than male labor force. In 1970, the same relation holds between male and female labor force with one exception which was the coefficients of (X_{12}) for both sexes were not statistically significant (Table 5.1, pages 111-112).

The coefficient of old dependency ratio (X_{13}) in 1960 was (-.244) for male and (-.150) for female. This implies that (X_{13}) was a relatively more important factor in affecting (PU) of employed male labor force than that of the female. This is the opposite of the magnitude of impact of young dependency ratio (X_{12}) on (PU) of male and female in 1960.

In 1970 the coefficient for old dependency ratio (X_{13}) for male was (.33) and statistically nonsignificant while the coefficient for female was (-2.573) and highly significant. The positive sign of the coefficient of (X_{13}) for male 1970 implies that old dependent population were withholding male labor force from full capacity employment, while the same factor (X_{13}) in the same year for female shows a highly significant coefficient of (-2.573) which means, an inducing factor for full capacity employment of female labor force.

The Sixth Group

This group is represented by one variable (X_{14}), which is technically death rate per 1000 population due to sickness and disease, but it is used here as a proxy of the health status of the population of a county. This variable is common between male and female labor force equations for the same year.

For the year 1960, the coefficient of (X_{14}) was (.569) for male and (.396) for female implying that one unit increase in death rate (decrease in health status) will increase (PU) of male and female employed labor force in 1960 by the size of the above mentioned coefficient, respectively. For the year 1970, the coefficients of (X_{14}) are (.396) and (-.058) for male and female labor force, respectively.

The negative sign for the coefficient of (X_{14}) for female in 1970 is unexpected as it is indicating that increase in total death rate reduces (PU) of female labor force. It may be argued that female labor force had stronger competitive position in health and lower death rate in 1970 compared to the year 1960. Particularly, during this time the average total death rate for the state has increased from (8.48) to (9.66) (see Table 5.4, pages 117-118) thus turning (X_{14}), which is a combined variable, to a factor that reduces female underemployment instead of increasing it. The fact that none of the coefficients of (X_{14}) are statistically significant may be due to high intercorrelation between (X_{14}) and (X_{13}) in each one of the four equations of the model. (See Tables 5.2 and 5.3, pages 113-114.)

The Seventh Group

Industrial variation (X_{15}) is set as separate group. This is the third single-variable group that will be discussed following (X_9) and (X_{14}). Also, this variable is common between male and female labor force of the same year.

In 1960 the coefficient of (X_{15}) in the equation of male labor force was (-.918) and statistically nonsignificant. This coefficient means that an increase of one additional type of industry hiring 2 percent or more of the employed labor force in a county will reduce (PU) for male by (.918) percent. The statistical nonsignificance can be attributed to extents of high intercorrelation of (X_{15}) with other variables (see Tables 5.2 and 5.3, pages 113-114).

For female 1960 the coefficient of (X_{15}) was positive. This relation between (X_{15}) and (PU) becomes unexpected, by looking to the simple fact that more types of industries should open more alternatives to the various types of skills and talents that the labor force in a county may possess. This way (PU) must decrease (have negative sign) as (X_{15}) increases. However, it is possible that the types of industries may not have been female-oriented in the year 1960 and positive coefficient (.820) may reflect it. An additional industry may have turned female labor force relative to male to less efficient employment sources (due to competition), or the existing industries employing more female labor force may have been inefficient relative to male employment sources.

For the year 1970, male labor force, industrial variation (X_{15}), had a coefficient of (-.914) and statistically significant at (α .05). For female labor force at the same year, (X_{15}) had relatively smaller coefficient (-.601) and it was significant at very low α level.

II. THE STATISTICAL TEST FOR STRUCTURAL CHANGES

This section presents the result of a statistical test for structural changes between the pairs of least-square equations contained in the model of second-stage estimation of underemployment. More specifically, the test will reflect if the estimated parameters are significantly different between the two least-square estimates related to two stratifications of the labor force in each one of the two time periods.

The values of the computed "F_c"* was derived and is presented in the order of the related hypotheses that are explained in Section V, Chapter III.

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* $F_c = \dfrac{\left(\dfrac{Q_3}{K}\right)}{\dfrac{Q_2}{(m + n - 2K)}}$, explained on page 73 of Chapter III.

<u>First</u>: H_o: $B^{60}_{vm} = B^{70}_{vm}$ and

H_A: $B^{60}_{vm} \neq B^{70}_{vm}$

$$Q_1 = 12710$$

$$Q_2 = 8100.70 + 3077.67 = 11178.4$$

$$Q_3 = 12710 - 11178.4 = 1531.7$$

$$F_c = \frac{\left(\frac{1531.7}{15}\right)}{\frac{1117.4}{(190 - 30)}} = \frac{102.1}{69.86} = 1.46$$

Since $[F_c < F_{.05,\ 15,\ 160}]$ the null hypotheses was not rejected. This implies that there are no structural differences between the year 1960 and 1970 least-square estimates of male labor force undererployment in Tennessee.

<u>Second</u>: H_o: $B^{60}_{vf} = B^{70}_{vf}$ and

H_A: $B^{60}_{vf} \neq B^{70}_{vf}$

$$Q_1 = 75044.7$$

$$Q_2 = 6126.55 + 4195.1 = 19321.6$$

$$Q_3 = 75044.70 - 10321.6 = 64723.1$$

$$F_c = \frac{\left(\frac{64723.1}{15}\right)}{\frac{10321.6}{(190 - 30)}} = \frac{4315}{55} = 78.5$$

Since $[F_c < F_{.05,\ 15,\ 160}]$ the null hypotheses was rejected. This implies that the structure of the least-square estimate of underemployment for female labor force has changed from the year 1960 to the year 1970.

<u>Third</u>: H_o: $B_{vm}^{60} = B_{vf}^{60}$ and

H_A: $B_{vm}^{60} \neq B_{vf}^{69}$

$$Q_1 = 16477.9$$

$$Q_2 = 8100.7 + 3077.7 = 14227.2$$

$$Q_3 = 16477.9 - 14227.2 = 2251$$

$$F_c = \frac{\left(\frac{2251}{15}\right)}{\frac{14227.3}{(190 - 30)}} = \frac{150}{88.9} = 1.69$$

Since $[F_c < F_{.05,\ 15,\ 160}]$ the null hypotheses was not rejected. This means that there was no structural difference between the least-sqaure estimate of underemployment of the male and female labor force in 1960.

<u>Fourth</u>: H_o: $B_{vm}^{70} = B_{vf}^{70}$ and

H_A: $B_{vm}^{70} \neq B_{vf}^{70}$

$$Q_1 = 15128.5$$

$$Q_2 = 3077.7 + 4195.0 - 7272.8$$

$$Q_3 = 15128.5 - 7272.8 = 7855.7$$

$$F_c = \frac{\left(\frac{7855.7}{15}\right)}{\frac{7272.8}{(190 - 30)}} = \frac{523.7}{45.45} = 11.52$$

Since $[F_c < F_{.05, 15, 160}]$ the null hypotheses was rejected, implying that there was a structural change between the least-square estimate of underemployment of the male and female labor force in 1970.

The results of the tests for structural changes between the pairs of least-square estimates in the second stage are summarized in Table 5.5. In Table 5.5 vertically, the null hypothesis (H_o:) is concerned with change in the structure of the estimates related to male and female labor force in the same year. Horizontally the null hypothesis (H_o:) is concerend with change in the structure of the estimates for each sex of the labor force between the two time periods.

TABLE 5.5

THE SUMMARY RESULT OF THE TEST FOR STRUCTURAL CHANGES BETWEEN THE PAIRS OF LEAST-SQUARE ESTIMATES IN THE SECOND-STAGE ESTIMATION OF UNDEREMPLOYMENT

Years / Sex of Labor Force	1960	1970	H_o:
Male	$\underset{V}{B}$	$\underset{V}{B}$	not rejected
Female	$\underset{V}{B}$	$\underset{V}{B}$	rejected
H_o:	not rejected	rejected	

CHAPTER VI

SUMMARY AND CONCLUSIONS

I. INTRODUCTION AND STATMENT OF THE PROBLEM

Tennessee as part of the South of the United States has generally lagged behind the national standard of economic growth and prosperity. However,the gap has narrowed in recent years.

During the period 1950-1967, the increase in employment and the improvement of the quality of labor force has been the major source of the state economic growth. The impact of technology and the transfer of labor force from agriculture to more productive sectors are the second and third factors respectively that are responsible for this growth during the above mentioned period (46).

In spite of the fact that labor force has been a dominant factor behind the state economic growth during the decades of the 50's and 60's, studies on the subject of quantitative measurement of underemployment of labor force at the county level of the state, particularly, on a periodic bases, are rare in the available literature. The USDA publication on estimate of underemployment by county for all U.S. for the year 1960 is apparently the only basic empirical work available (35).

A periodic knowledge on the quantitative measure with a particular stress on the basic factors effecting underemployment at the county level is an essential element for sound economic planning and policymaking. It provides the basic ground for understanding the changes in the structure of the factor that effects underemployment of labor force through the course of economic development in time.

Among these factors, the intersectoral distribution of labor force leads to compare labor efficiency by sector in different time periods. This will provide guidelines for investment planning and allocation of labor and capital. The specification of a broader set of relevant factors effecting the underemployment of labor force, which is not yet at hand, will make it possible to predict underemployment of a county in any particular time period.

A study dealing with manpower employment, unemployment and underemployment in any particular county, region or locality is basically the study of the whole population with all of its socioeconomic and technological dimensions.

The main concern of this study has been an attempt to define and isolate underemployment as a specific dimension of manpower study, quantifying it in terms of man labor work units unutilized and specifying the number of factors effecting this aspect of labor force utilization in the state of Tennessee in two time periods 1960 and 1970.

A schematic derivation of underemployed manpower is constructed on page 6 as an introductory step toward obtaining a knowledge of quantitative measurement of underemployment. Later with the advantage of the available sources of literature, a definition of underemployment in the form of a general mathematical function is derived (page 12).

This definition links the phenomenon of underemployment to a broader base of socioeconomic, demographic and technological factors, which will serve as a major tool in achieving the main objectives of this study.

II. OBJECTIVES

The prime objectives of this study has been a two-stage estimation of male and female labor force underemployment by county in Tennessee, in two time periods 1960 and 1970.

In the first-stage, the mathematical technique developed by Williams and Glasgow (34, 46) was applied to estimate underemployment of male and female labor force in Tennessee for the year 1970. U.S.D.A. has published the 1960 estimate of underemployment by county for the entire United States through the application of the same technique.

In the second-stage a least-square regression model was applied, where the mathematical estimates of underemployment (PU) was used as the dependent variable and an alternative set of variables were selected as the estimating or independent variable. The regression coefficients related to the industrial distribution of labor force were used to compute the opportunity cost of a unit of labor employed in one sector with respect to employment in any other sector.

The last objective was to test for structural change in the second-stage estimate between the two time periods (1960-1970) for the two stratification of labor force (male and female) in all counties of Tennessee.

III. METHODOLOGY

The procedural framework to achieve the first-and second-stage estimates were based on these assumptions: (A) median income is an indicator of the employed civilian labor force productivity, (B) employed labor force has a realized median income and potential median income, (C) the county potential median income is an imputed relative potential median income not an absolute potential median income. (D) There is no limitation from the demand side for the labor force output. (E) Regional wages are compensated or adjusted by the regional variation in cost of living. (F) Alternative sources of employment for the labor force exist which can result in raising the existing county median income.

The data used in this study are (1) those at the U.S. level, (2) those at the county level. They are constructed or directly obtained from the secondary sources. (See pages 49-52, Chapter III.)

The Mathematical (First-Stage) Estimate

In the computation of the mathematical (first-stage) estimate of underemployment, obtaining a labor force utilization index for the labor force of a county is the basic step. This index was the expression of the county realized median income (output) as percentage of the U.S. realized median income (output) adjusted for the factors*

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*See income adjustment factors (pages 54-56) Chapter III and Tables 4.1-4.2, pages 76-79, Tables 4.3-4.4, pages 82-83, and Tables 4.5-4.8, pages 85-88, Chapter IV.

that effects labor force productivity (Y.D.). By subtracting this index from (100), percent of the county labor force (unutilized) (underemployed)(PU) was obtained. Multiplying (PU) to the number of related sex of the civilian labor force employed (C) in a county gave the estimate of the number of man-year labor economically unutilized or underemployed (U). For a summarized expression of the procedure for the mathematical (first-stage) estimate of underemployment, see page 54 and page 57, Chapter III.

The Second-Stage (Least-Square) Estimate

In this stage a least-square multiple regression was applied where percent underemployed labor force (PU) was the dependent variable and an alternative set of variables (Table 3.1, pages 61-63) were used as the dependent variable.

The conducting of the second-stage process was justified by the fact that median income which is the basic criteria of measurement of underemployment in the first-stage estimate was basically generated by a broader set of variables related to manpower utilization, rather than the four factors used in the first-stage estimate. The impact of the broader set of variables on underemployment may in the first-stage estimate remain implicit through median income, or may not be accounted for. Therefore, the second-stage estimate by county allowed the specification of a broader set of variables that affects underemployment, thus becoming more useful for planning and policymaking at the county level and permitted underemployment to be used as an economic indicator with a broader implication and interpretation.

There were four least-square equations in second-stage estimation model, two for male labor force for the years 1960 and 1970 and two for female labor force for the same years. The 15 independent variables were described in Table 3.1, page 61-63. In each group variables, each reflected a particular aspect of socioeconomic, demographic and technological dimension of the labor force life in any particular county.

In each one of the four equations of the second-stage estimate, stratified data for male and female was not available for variables (10 to 15). Thus, due to necessity these variables remain common between male and female labor force equation corresponding to the same time period.

The magnitude and the sign of regression coefficient of the first five variables (X_1, X_2, X_3, X_4, and X_5) provided a tool through which relative labor force efficiency in various sectors in terms of net change in (PU) was computed.

$$\text{Net Change in (PU)} = \begin{bmatrix}\Delta \text{ in (PU), due to} \\ \text{Employment of a unit} \\ \text{of labor in the ith} \\ \text{sector which is} \\ \text{withdrawn from the} \\ \text{jth sector}\end{bmatrix} \pm \begin{bmatrix}\Delta \text{ in (PU) due} \\ \text{to withdrawing} \\ \text{of that unit} \\ \text{of labor from} \\ \text{the jth sector}\end{bmatrix}$$

The basic assumption in computing the net change in (PU) was explained in Chapter III, pages 47-48. The second-stage estimate also provided the grounds for testing four null hypotheses related to the existence of structural changes between the pairs of least-square equation in the second-stage model. To test the hypotheses an "F" ratio was computed if [$F_c < F_{.05,\ 15,\ 160}$] the null hypotheses was rejected.

II. THE SUMMARY RESULTS OF THE TWO-STAGE ESTIMATE OF UNDEREMPLOYMENT

The Results of the First-Stage (Mathematical) Estimate

Underemployment was mathematically estimated for male and female labor force by county in Tennessee for the year 1970, and changes between the 1960 and 1970 estimates were analyzed.

The process of mathematical (first-stage) estimation started with construction of income adjustment factors for those labor force attributes that affects income earning (productivity) power. Anderson County was utilized as an example and the income adjustment factor for (1) age-color mix, (2) level education, (3) labor force participation status and (4) employment status were constructed in Tables 4.1 and 4.2, pages 76-79, Tables 4.3-4.4, pages 82-83, and Tables 4.5-4.8, pages 85-88, for male and female labor force. The four adjustment factors were multiplied and a combined adjustment factor for male and female labor force was obtained. (See pages 81-89 and .olumn (5), Appendix Tables A-I and A-II.)

By multiplication of the combined adjustment factors and the U.S. 1970 median income for male and female, a "warranted" or "required" median income (which was assumed to be a measure of the relative potential productivity capacity of male and female labor force of

Anderson County) was obtained. See page 89 and column (6) Appendix Tables A-I and A-II. By dividing the Anderson County realized median income of male and female labor force to the related labor force group "required" median income, a labor force utilization index was obtained. Subtracting it from a (100) gave the percent of labor force (male or female) unutilized or underemployed (PU). At the end of the product of civilian labor force employed and percent underemployment was equal to the number of man-years labor unutilized (underemployed). See pages 89-91 and columns (6-11) of Appendix Tables A-I and A-II.

In Table 4.9, pages 93-96, the statistics for the changes from 1960 to 1970 in some of the components of mathematical model, such as income adjustment factors for (1) age-color mix, (2) level of education, (3) labor force participation, and (4) employment status, with the combined adjustment factor, labor force utilization index and percent underemployment was presented.

From Table 4.9 it can be concluded that from 1960 to 1970:

1. Female labor force relative income earning capacity, attributed to the age-color mix factor has increased in 35 counties compared to the 4 counties for male labor force.
2. Female labor force relative income earning capacity attributed to the educational factor has increased in 11 counties compared to 7 counties for male.
3. Female and male labor force relative income earning capacity attributed to labor force participation has increased for almost all counties. However, the average for this increase

for all counties are substantially greater for female than for male.

4. Female labor force relative income earning capacity attributed to the employment status has increased in 20 counties compared to 46 counties for male labor force.

5. Female labor force relative income earning capacity, with respect to all of the four factors combined, has increased in 95 counties compared to the 78 counties for male. The mean of this change is 26.79 for female compared to 5.09 for male labor force.

6. Labor force utilization index has declined in all of the 95 counties of the state for female labor force where it has increased in 59 counties for male labor force.

7. For female labor force percent underemployment has increased in 95 counties compared to 35 counties for male labor force.

Table 4.10, pages 102-103, shows the distribution of counties in each one of the three regions of the state by the level (percent) of underemployment for male and female labor forces in 1960 and 1970. The actual data of percent underemployment (PU), by county and sexes of labor force for the two time periods in the three regions from which this table is derived, are displayed in Figures 2 and 3, pages 107 and 108, respectively, and Appendix C.

From Table 4.10 it appears that for male labor force, percent of counties in each region with high level of underemployment (50 percent or above) has declined from 1960 to 1970 considerably in West and

Middle Tennessee, while it has slightly increased in East Tennessee. For the state as a whole, percent of counties with 50 percent or above male underemployment has substantially decreased.

Looking into the level of underemployment of female labor force in Table 4.10, pages 102-103, the situation is drastically reversed of what was for male labor force. In 1960 there is no county with 50 percent or above underemployment; even above 40 percent level of underemployment there are only three counties in the entire state. In 1970, all counties (100 percent) in each one of the three regions has 60 percent or above level of underemployment for female labor force.

The Result of the Second-Stage (Statistical) Estimate

The results of the four equations of the least-square regression model was displayed in Chapter V, Table 5.1, pages 111-112.

In the first step, the coefficients of the variables in each one of the seven groups were discussed within the context of the possible economic and statistical interpretation (Chapter V, pages 115-128). The unique implication of the coefficient of the first group of variables in computing relative efficiency and the opportunity cost of labor force utilization among the industries were exemplified under the discussion of that specific group of variables (Chapter 5, pages 113-114 and pages 116 and 119).

The fact that the sign of the coefficient of the first group of variables for female labor force have changed from positive to negative

(Table 5.1, pages 111-112) implies that female labor force were less underemployed in 1960 than in 1970. In other words, in 1960 female labor force employed in one sector has little or no opportunity cost relative to another sector. In1970 the negative coefficients of the first group of variables for female reflects that female underemployment (unutilized productive capacity) has increased so that a reduction in (PU) can be achieved by employment at any of the five sectors.

In the final step, the result of a statistical test that tests for the existence of any structural change between the pairs of least-square equations of the second-stage estimation model was presented. The test reflects any significant difference between the estimated parameters of any two least-square equation related to two groups of labor force in each one of the two time periods.

A computed "F_c" value (49) was derived for the related pairs of least-square estimates. (See Chapter V, pages 128-129.) If $[F_c < F_{.05,\ 15,\ 160}]$ the related null hypothesis was rejected. The result of this test, which is summarized in Table 5.5, page 131, was as follows:

1. There are no structural differences between the year 1960 and 1970 least-square estimate of male labor force underemployment in Tennessee. However, with the same set of variables, the 1970 least-square estimate has explained 78 percent of the variation compared to 70 percent in 1960. (See R^2, Table 5.1, pages 111-112.)

2. The structure of least-square estimate of underemployment for female labor force has changed from the year 1960 to the year 1970 , in spite of the fact that (R^2) of the equations related to both periods is the same.
3. There was no structural difference between the least-square estimate of underemployment of male and female labor force in 1960. However, there were large differences in (R^2) value of the related equations (Table 5.1, pages 111-112).
4. There was structural change between the least-square estimates of underemployment of male and female force in 1970. The data,Table 5.1, shows that there was a large difference in (R^2) value of the related least-square estimates.

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APPENDICES

APPENDIX A

TABLE A-I

COMPONENTS OF COUNTY UNDEREMPLOYMENT MODEL, MALE, 1960 AND 1970
(COLUMNS 1-5)

	ADJUSTMENT FACTOR (OR INDEX)														
	(1) AGE-COLOR MIX			(2) EDUCATIONAL STATUS			(3) LABOR FORCE PARTICIPATION STATUS			(4) EMPLOYMENT STATUS			(5) COMBINED		
COUNTY	1960	1970	DIFF	1960	1970	DIFF	1960	1970	DIFF	1960	1970	DIFF	1960	1970	DIFF
ANDERSON	110.1	99.7	-10.4	103.3	89.3	-14.0	101.5	114.5	13.0	100.8	101.5	0.7	116.4	103.6	-12.8
BEDFORD	99.9	95.6	-4.3	87.0	83.8	-3.2	100.2	115.7	15.5	102.5	102.2	-0.3	89.3	94.7	5.4
BENTON	103.9	96.9	-7.0	82.4	78.4	-4.0	96.2	113.9	17.7	98.9	101.2	2.3	81.4	87.6	6.2
BLEDSOE	94.6	82.7	-11.9	73.5	73.9	0.4	98.4	114.6	16.2	101.6	101.8	0.2	69.5	71.4	1.9
BLOUNT	103.8	97.4	-6.4	90.2	86.8	-3.4	101.9	115.4	13.5	100.6	102.0	1.4	96.0	99.4	3.4
BRADLEY	102.1	98.0	-4.1	84.8	83.1	-1.7	102.2	115.6	13.4	101.9	102.2	0.3	90.2	96.2	6.0
CAMPBELL	98.7	93.4	-5.3	75.8	69.7	-6.1	92.8	109.7	16.9	97.7	97.9	0.2	67.7	69.9	2.2
CANNON	100.0	97.0	-3.0	76.4	74.6	-1.8	102.3	113.5	11.2	102.6	100.9	-1.7	80.2	82.9	2.7
CARROLL	95.7	92.5	-3.2	81.3	78.5	-2.8	94.2	114.9	20.7	102.8	101.9	-0.9	75.3	85.0	9.7
CARTER	102.8	97.6	-5.2	85.4	82.9	-2.5	97.7	113.4	15.7	98.8	100.7	1.9	84.7	92.3	7.6
CHEATHAM	96.1	96.6	0.5	78.0	79.6	1.6	98.6	116.2	17.6	102.0	102.7	0.7	75.4	91.8	16.4
CHESTER	94.5	87.9	-6.6	79.4	74.2	-5.2	90.5	116.0	25.5	102.4	102.2	-0.2	69.5	77.3	7.8
CLAIBORNE	97.1	91.8	-5.3	74.6	70.2	-4.4	95.2	112.2	17.0	101.6	99.9	-1.7	70.1	72.2	2.1
CLAY	99.1	96.5	-2.6	72.4	66.7	-5.7	97.3	112.2	14.9	103.4	99.9	-3.5	72.2	72.1	-0.1
COCKE	101.8	98.9	-2.9	74.2	72.8	-1.4	99.6	113.0	13.4	101.6	100.3	-1.3	76.4	81.6	5.2
COFFEE	105.9	100.9	-5.0	94.0	85.8	-8.2	103.2	115.2	12.0	101.4	101.4	0.0	104.2	101.0	-3.2
CROCKETT	92.2	89.0	-3.2	79.6	79.4	-0.2	91.4	114.3	22.9	102.0	101.5	-0.5	68.4	81.9	13.5
CUMBERLAND	98.0	95.4	-2.6	76.7	73.2	-3.5	93.5	112.9	19.4	100.7	100.3	-0.4	70.7	79.0	8.3
DAVIDSON	99.5	92.5	-7.0	98.2	89.6	-8.6	99.5	115.1	15.6	102.2	101.7	-0.5	99.4	97.1	-2.3
DECATUR	100.0	94.4	-5.6	80.4	76.1	-4.3	93.3	112.6	19.3	99.4	100.2	0.8	74.6	81.0	6.4
DE KALB	99.7	98.4	-1.5	78.9	76.2	-2.7	97.4	115.6	18.2	100.8	102.3	1.5	77.3	88.6	11.3
DICKSON	99.2	95.8	-3.4	79.8	77.1	-2.7	97.4	115.6	18.2	100.9	102.3	1.4	77.7	87.3	9.6
DYER	96.4	92.1	-4.3	79.7	76.1	-3.6	97.0	115.1	18.1	101.6	101.9	0.3	75.7	82.1	6.4
FAYETTE	70.4	72.2	1.8	69.7	70.3	0.6	102.4	113.4	11.0	102.9	100.8	-2.1	51.7	58.0	6.3
FENTRESS	94.9	92.6	-2.5	70.7	67.0	-3.7	87.9	111.8	23.9	98.4	99.6	1.2	58.0	69.0	11.0
FRANKLIN	97.5	91.4	-6.1	85.8	81.6	-4.2	96.5	114.7	18.2	101.3	101.3	0.0	81.8	86.6	4.8
GIBSON	95.1	91.5	-3.6	84.5	82.3	-2.2	95.2	115.0	19.8	101.0	101.9	0.9	77.3	88.3	11.0
GILES	94.2	92.1	-2.1	81.0	79.4	-1.6	99.9	115.8	15.9	102.7	102.5	-0.2	78.3	86.8	8.5
GRAINGER	102.2	98.2	-4.0	70.5	70.3	-0.2	102.7	114.9	12.2	101.4	101.9	0.5	75.1	80.8	5.7
GREENE	104.3	98.9	-5.4	82.8	77.9	-4.9	102.8	112.1	9.3	100.8	99.5	-1.3	89.5	86.0	-3.5
GRUNDY	102.5	93.7	-8.8	75.4	70.2	-5.2	99.8	114.7	14.9	94.8	101.8	7.0	73.1	76.8	3.7
HAMBLEN	103.8	101.7	-2.1	86.9	83.3	-3.6	103.4	115.5	12.1	102.2	102.2	0.0	95.2	100.0	4.8
HAMILTON	100.4	94.1	-6.3	96.4	89.9	-6.5	101.2	115.9	14.7	101.9	102.4	0.5	99.8	100.5	0.7

TABLE A.I (continued)

COUNTY	ADJUSTMENT FACTOR (OR INDEX) (1) AGE-COLOR MIX 1960	1970	DIFF	(2) EDUCATIONAL STATUS 1960	1970	DIFF	(3) LABOR FORCE PARTIC- IPATION STATUS 1960	1970	DIFF	(4) EMPLOYMENT STATUS 1960	1970	DIFF	(5) COMBINED 1960	1970	DIFF
HANCOCK	100.8	93.4	-7.4	69.3	65.5	-3.8	101.6	112.5	10.9	102.6	100.1	-2.5	72.8	68.9	-3.9
HARDEMAN	87.6	83.6	-4.0	76.3	73.3	-3.0	100.6	113.8	13.2	102.7	101.1	-1.6	69.0	70.5	1.5
HARDIN	100.0	95.2	-4.8	78.1	76.6	-1.5	95.4	113.9	18.5	100.0	101.0	1.0	74.5	83.8	9.3
HAWKINS	101.8	98.5	-3.3	77.3	75.5	-1.8	99.9	114.7	14.8	101.8	101.7	-0.1	80.0	86.7	6.7
HAYWOOD	75.6	75.7	0.1	71.6	70.9	-0.7	99.3	115.0	15.7	103.0	101.9	-1.1	55.4	62.9	7.5
HENDERSON	98.5	94.0	-4.5	79.0	74.0	-5.0	96.6	115.0	18.4	102.1	101.8	-0.3	76.7	81.5	4.8
HENRY	96.8	91.7	-5.1	84.0	80.7	-3.3	94.5	114.8	20.3	102.0	101.4	-0.6	78.4	86.1	7.7
HICKMAN	101.5	96.6	-4.9	76.4	73.3	-3.1	100.4	113.5	13.1	102.3	100.9	-1.4	79.7	81.1	1.4
HOUSTON	95.7	96.3	0.6	79.1	73.7	-5.4	95.4	115.2	19.8	101.5	102.1	0.6	73.2	83.5	10.3
HUMPHREYS	103.6	97.4	-6.2	83.1	82.7	-0.4	97.9	116.3	18.4	100.0	102.8	2.8	84.3	96.4	12.1
JACKSON	99.7	94.4	-5.3	71.9	65.0	-6.9	102.6	113.3	10.7	102.9	100.8	-2.1	75.6	70.1	-5.5
JEFFERSON	98.1	95.3	-2.8	82.5	79.8	-2.7	99.0	115.0	16.0	102.3	101.9	-0.4	82.0	89.2	7.2
JOHNSON	100.2	97.3	-2.9	76.3	73.3	-3.0	93.1	113.7	20.6	100.8	101.0	0.2	71.8	82.0	10.2
KNOX	103.4	93.3	-10.1	97.1	90.0	-7.1	99.1	115.3	16.2	101.3	101.9	0.6	100.7	98.8	-1.9
LAKE	93.8	88.6	-5.2	69.0	67.0	-2.0	96.7	109.8	13.1	102.3	97.7	-4.6	64.1	63.7	-0.4
LAUDERDALE	85.8	84.1	-1.7	72.2	71.9	-0.3	96.5	114.0	17.5	101.7	101.3	-0.4	60.8	69.8	9.0
LAWRENCE	99.9	96.5	-3.4	77.7	76.2	-1.5	97.0	114.8	17.8	101.6	101.7	0.1	76.5	85.9	9.4
LEWIS	102.6	97.1	-5.5	76.3	75.4	-0.9	99.0	113.1	14.1	100.9	100.4	-0.5	78.2	83.2	5.0
LINCOLN	98.3	95.0	-3.3	82.0	80.5	-1.5	101.5	115.0	13.5	102.8	101.9	-0.9	84.2	89.6	5.4
LOUDON	104.1	98.9	-5.2	82.0	79.3	-2.7	99.4	114.4	15.0	100.7	101.4	0.7	85.4	91.0	5.6
MC MINN	99.4	96.1	-3.3	82.9	80.5	-2.4	100.1	115.7	15.6	101.6	102.4	0.8	83.9	91.7	7.8
MC NAIRY	98.3	94.3	-4.0	82.9	79.7	-3.2	93.8	111.6	17.8	100.2	99.4	-0.8	76.6	83.3	6.7
MACON	102.0	95.5	-6.5	69.6	67.1	-2.5	99.1	114.3	15.2	103.0	101.5	-1.5	72.5	74.3	1.8
MADISON	90.8	85.9	-4.9	88.4	84.6	-3.8	98.3	115.2	16.9	101.9	102.0	0.1	80.4	85.5	5.1
MARION	100.6	94.5	-6.1	78.3	73.7	-4.6	99.9	114.3	14.4	99.0	101.4	2.4	77.8	80.7	2.9
MARSHALL	101.5	94.6	-6.9	86.4	82.4	-4.0	102.9	115.8	12.9	102.8	102.5	-0.3	92.7	92.6	-0.1
MAURY	98.0	92.2	-5.8	86.2	82.6	-3.6	102.1	114.8	12.7	102.5	101.7	-0.8	88.4	88.9	0.5
MEIGS	97.5	93.8	-3.7	72.0	69.9	-2.1	98.8	114.5	15.7	99.8	101.6	1.8	69.2	76.3	7.1
MONROE	97.9	93.4	-4.5	75.5	71.7	-3.8	100.6	113.0	12.4	100.1	100.4	0.3	74.4	76.0	1.6
MONTGOMERY	86.5	79.7	-6.8	93.0	87.9	-5.1	104.8	114.7	9.9	81.7	80.6	-1.1	68.9	64.7	-4.2
MOORE	99.5	95.8	-3.7	82.3	79.8	-2.5	102.4	116.9	14.5	103.3	103.2	-0.1	86.7	92.2	5.5
MORGAN	101.3	94.1	-7.2	75.4	76.6	1.2	89.6	110.4	20.8	98.4	98.6	0.2	67.4	78.5	11.1
OBION	97.0	93.4	-3.6	86.0	81.1	-4.9	98.7	115.5	16.8	101.4	102.2	0.8	83.5	89.4	5.9
OVERTON	101.0	94.8	-6.2	73.3	66.9	-6.4	99.6	112.5	12.9	99.7	100.2	0.5	73.5	71.5	-2.0
PERRY	103.2	96.0	-7.2	77.9	73.4	-4.5	95.9	110.6	14.7	100.0	98.5	-1.5	77.1	76.8	-0.3
PICKETT	100.2	96.9	-3.3	73.0	65.2	-7.8	97.0	110.9	13.9	101.5	99.0	-2.5	72.0	69.3	-2.7
POLK	102.2	97.8	-4.4	75.5	75.5	0.0	97.9	115.5	17.6	100.1	102.3	2.2	75.7	87.2	11.5
PUTNAM	95.2	88.2	-7.0	83.1	76.8	-6.3	91.5	114.4	22.9	101.0	101.4	0.4	73.1	78.6	5.5

TABLE A-I (continued)

COUNTY	(1) AGE-COLOR MIX 1960	1970	DIFF	(2) EDUCATIONAL STATUS 1960	1970	DIFF	(3) LABOR FORCE PARTICIPATION STATUS 1960	1970	DIFF	(4) EMPLOYMENT STATUS 1960	1970	DIFF	(5) COMBINED 1960	1970	DIFF
RHEA	98.4	93.4	-5.0	82.8	77.1	-5.7	98.1	114.2	16.1	100.1	101.4	1.3	80.0	83.4	3.4
ROANE	104.7	97.8	-6.9	84.9	81.7	-3.2	101.0	113.6	12.6	99.8	100.9	1.1	89.6	91.6	2.0
ROBERTSON	97.3	92.8	-4.5	81.3	79.9	-1.4	101.6	115.5	13.9	102.1	102.2	0.1	82.1	87.6	5.5
RUTHERFORD	99.1	91.1	-8.0	93.3	86.1	-7.2	99.1	115.4	16.3	90.2	101.4	11.2	82.7	91.8	9.1
SCOTT	97.9	92.9	-5.0	71.9	69.4	-2.5	87.8	111.8	24.0	98.9	99.6	0.7	61.1	71.8	10.7
SEQUATCHIE	98.5	97.4	-1.1	79.2	75.6	-3.6	99.0	114.6	15.6	99.7	101.7	2.0	77.0	85.8	8.8
SEVIER	101.9	98.6	-3.3	80.3	79.2	-1.1	100.1	115.0	14.9	101.8	101.9	0.1	83.4	91.5	8.1
SHELBY	91.7	84.9	-6.8	97.0	89.6	-7.4	101.8	114.7	12.9	99.1	97.7	-1.4	89.8	85.2	-4.6
SMITH	101.1	96.2	-4.9	80.2	76.1	-4.1	97.4	113.7	16.3	102.5	100.7	-1.8	81.0	83.8	2.8
STEWART	97.6	92.8	-4.8	76.0	73.5	-2.5	95.0	113.6	18.6	101.8	100.8	-1.0	71.8	78.2	6.4
SULLIVAN	108.7	100.9	-7.8	92.2	85.9	-6.3	102.3	115.2	12.9	101.8	102.0	0.2	104.4	101.9	-2.5
SUMNER	99.6	98.7	-0.9	79.7	83.0	3.3	98.6	115.9	17.3	102.1	102.4	0.3	80.0	97.3	17.3
TIPTON	85.4	85.1	-0.3	75.9	75.0	-0.9	98.4	114.2	15.8	100.6	97.2	-3.4	64.1	70.8	6.7
TROUSDALE	93.1	90.9	-2.2	71.5	68.8	-2.7	100.3	115.0	14.7	103.3	101.8	-1.5	68.9	73.3	4.4
UNICOI	103.3	97.8	-5.5	84.6	79.7	-4.9	101.3	112.5	11.2	100.0	100.1	0.1	88.6	87.8	-0.8
UNION	99.1	97.1	-2.0	71.3	71.1	-0.2	99.9	114.8	14.9	101.6	101.8	0.2	71.7	80.6	8.9
VAN BUREN	99.6	93.2	-6.4	71.2	71.6	0.4	92.0	114.4	22.4	100.1	101.5	1.4	65.3	77.6	12.3
WARREN	100.3	96.7	-3.6	84.3	80.6	-3.7	99.8	114.7	14.9	102.5	101.7	-0.8	86.4	91.0	4.6
WASHINGTON	101.2	94.7	-6.5	88.8	83.5	-5.3	92.3	114.9	22.6	100.9	101.7	0.8	83.7	92.3	8.6
WAYNE	99.7	94.8	-4.9	74.9	71.7	-3.2	98.1	114.5	16.4	100.1	101.6	1.5	73.3	79.0	5.7
WEAKLEY	94.7	86.2	-8.5	83.4	79.0	-4.4	92.4	115.7	23.3	102.3	102.2	-0.1	74.7	80.5	5.8
WHITE	102.5	97.1	-5.4	77.9	74.9	-3.0	96.5	113.6	17.1	101.4	100.9	-0.5	78.0	83.4	5.4
WILLIAMSON	96.3	95.4	-0.9	81.7	83.3	1.6	99.5	116.3	16.8	102.7	102.8	0.1	80.4	95.0	14.6
WILSON	98.5	96.1	-2.4	84.2	83.2	-1.0	100.7	116.1	15.4	102.6	102.5	-0.1	85.7	95.1	9.4

TABLE A-II

COMPONENTS OF COUNTY UNDEREMPLOYMENT MODEL, MALE, 1960 AND 1970
(COLUMNS 6-11)

COUNTY	(6) MEDIAN INCOME REQUIRED 1960	1970	DIFF	(7) ACTUAL 1960	1970	DIFF	(8) LABOR FORCE UTILIZATION INDEX 1960	1970	DIFF	(9) PERCENT UNDEREMPLOYMENT 1960	1970	DIFF	(10) NUMBER OF EMPLOYED CIVILIANS 1960	1970	DIFF	(11) MAN-YEARS ECONOMICALLY UNUTILIZED LABOR 1960	1970	DIFF
ANDERSON	4785.	6678.	1893.	4536.	5618.	1082.	94.8	84.1	-10.7	5.2	15.9	10.7	13836.	14599.	763.	719.	2318.	1599.
BEDFORD	3670.	6103.	2433.	2353.	3971.	1618.	64.1	65.1	1.0	35.9	34.9	-1.0	5944.	6324.	380.	2134.	2209.	75.
BENTON	3346.	5646.	2300.	2116.	4036.	1920.	63.2	71.5	8.3	36.8	28.5	-8.3	2412.	2736.	324.	888.	780.	-108.
BLEDSOE	2858.	4600.	1742.	968.	1698.	730.	33.9	36.9	3.0	66.1	63.1	-3.0	1644.	1478.	-166.	1087.	932.	-155.
BLOUNT	3947.	6408.	2461.	3556.	5133.	1577.	90.1	80.1	-10.0	9.9	19.9	10.0	13362.	15709.	2347.	1323.	3126.	1803.
BRADLEY	3708.	6199.	2491.	2832.	4742.	1910.	76.4	76.5	0.1	23.6	23.5	-0.1	9296.	12860.	3564.	2194.	3023.	829.
CAMPBELL	2785.	4507.	1722.	1566.	2265.	699.	56.2	50.3	-5.9	43.8	49.7	5.9	4783.	4121.	-662.	2095.	2050.	-45.
CANNON	3297.	5344.	2047.	1627.	2682.	1055.	49.3	50.2	0.9	50.7	49.8	-0.9	2237.	1968.	-269.	1134.	980.	-154.
CARROLL	3094.	5476.	2382.	1462.	3595.	2133.	47.3	65.7	18.4	52.7	34.3	-18.4	5529.	6204.	675.	2914.	2131.	-783.
CARTER	3483.	5949.	2466.	2946.	3866.	920.	84.6	65.0	-19.6	15.4	35.0	19.6	8683.	9664.	981.	1337.	3384.	2047.
CHEATHAM	3099.	5913.	2814.	2372.	4963.	2591.	76.5	83.9	7.4	23.5	16.1	-7.4	2318.	3343.	1025.	545.	537.	-8.
CHESTER	2855.	4984.	2129.	1397.	2751.	1354.	48.9	55.2	6.3	51.1	44.8	-6.3	2060.	2235.	175.	1053.	1001.	-52.
CLAIBORNE	2862.	4650.	1788.	1189.	1980.	791.	41.3	42.6	1.3	58.7	57.4	-1.3	4096.	3574.	-522.	2404.	2052.	-352.
CLAY	2967.	4649.	1682.	945.	1779.	834.	31.9	38.3	6.4	68.1	61.7	-6.4	1715.	1354.	-361.	1168.	836.	-332.
COCKE	3138.	5259.	2121.	1699.	3220.	1521.	54.1	61.2	7.1	45.9	38.8	-7.1	5365.	5573.	208.	2463.	2161.	-302.
COFFEE	4284.	6506.	2222.	2996.	4472.	1476.	69.9	68.7	-1.2	30.1	31.3	1.2	6850.	7932.	1082.	2062.	2480.	418.
CROCKETT	2813.	5278.	2465.	1419.	2910.	1491.	50.4	55.1	4.7	49.6	44.9	-4.7	3260.	3028.	-232.	1617.	1358.	-259.
CUMBERLAND	2908.	5091.	2183.	1649.	2886.	1237.	56.7	56.7	0.0	43.3	43.3	0.0	3738.	4229.	491.	1619.	1831.	212.
DAVIDSON	4086.	6259.	2173.	3591.	5252.	1661.	87.9	83.9	-4.0	12.1	16.1	4.0	96292.	108639.	12347.	11651.	17477.	5826.
DECATUR	3066.	5217.	2151.	1429.	3080.	1651.	46.6	59.0	12.4	53.4	41.0	-12.4	1727.	2079.	352.	922.	852.	-70.
DE KALB	3179.	5712.	2533.	1252.	3296.	2044.	39.4	57.7	18.3	60.6	42.3	-18.3	2532.	2794.	262.	1534.	1182.	-352.
DICKSON	3194.	5626.	2432.	2274.	4025.	1751.	71.2	71.5	0.3	28.8	28.5	-0.3	4311.	5308.	997.	1242.	1510.	268.
DYER	3113.	5294.	2181.	1926.	3425.	1499.	61.9	64.7	2.8	38.1	35.3	-2.8	6873.	7154.	281.	2619.	2525.	-94.
FAYETTE	2124.	3739.	1615.	897.	1632.	735.	42.2	43.6	1.4	57.8	56.4	-1.4	4876.	4177.	-699.	2818.	2354.	-464.
FENTRESS	2386.	4447.	2061.	995.	1595.	600.	41.7	35.9	-5.8	58.3	64.1	5.8	1949.	2282.	333.	1136.	1464.	328.
FRANKLIN	3361.	5578.	2217.	2112.	3109.	997.	62.8	55.7	-7.1	37.2	44.3	7.1	5819.	6273.	454.	2165.	2776.	611.
GIBSON	3178.	5690.	2512.	1841.	3692.	1851.	57.9	64.9	7.0	42.1	35.1	-7.0	10134.	10971.	837.	4266.	3852.	-414.
GILES	3218.	5591.	2373.	1708.	3279.	1571.	53.1	58.6	5.5	46.9	41.4	-5.5	5505.	5481.	-24.	2582.	2267.	-315.
GRAINGER	3087.	5208.	2121.	1585.	3005.	1420.	51.3	57.7	6.4	48.7	42.3	-6.4	3155.	3382.	227.	1536.	1431.	-105.
GREENE	3679.	5544.	1865.	2043.	3247.	1204.	55.5	58.6	3.1	44.5	41.4	-3.1	10535.	11197.	662.	4688.	4640.	-48.
GRUNDY	3003.	4948.	1945.	1685.	2015.	330.	56.1	40.7	-15.4	43.9	59.3	15.4	2097.	2258.	161.	921.	1338.	417.
HAMBLEN	3915.	6443.	2528.	2815.	4548.	1733.	71.9	70.6	-1.3	28.1	29.4	1.3	8605.	10053.	1448.	2418.	2956.	538.
HAMILTON	4101.	6474.	2373.	3755.	5350.	1595.	91.6	82.6	-9.0	8.4	17.4	9.0	56571.	61472.	4901.	4752.	10676.	5924.
HANCOCK	2993.	4437.	1444.	969.	1369.	400.	32.4	30.9	-1.5	67.6	69.1	1.5	1760.	1175.	-585.	1190.	812.	-378.
HARDEMAN	2837.	4541.	1704.	1327.	2099.	772.	46.8	46.2	-0.6	53.2	53.8	0.6	4209.	4082.	-127.	2239.	2195.	-44.
HARDIN	3061.	5403.	2342.	1297.	2752.	1455.	42.4	50.9	8.5	57.6	49.1	-8.5	3789.	4088.	299.	2182.	2006.	-176.
HAWKINS	3290.	5586.	2296.	1870.	3737.	1867.	56.8	66.9	10.1	43.2	33.1	-10.1	7172.	8103.	931.	3098.	2682.	-416.
HAYWOOD	2276.	4055.	1779.	1118.	2005.	887.	49.1	49.4	0.3	50.9	50.6	-0.3	4829.	3832.	-997.	2458.	1937.	-521.
HENDERSON	3155.	5253.	2098.	1431.	3042.	1611.	45.4	57.9	12.5	54.6	42.1	-12.5	3825.	4028.	203.	2088.	1695.	-393.
HENRY	3222.	5550.	2328.	2056.	3503.	1447.	63.8	63.1	-0.7	36.2	36.9	0.7	5241.	5532.	291.	1897.	2041.	144.

TABLE A-II (continued)

COUNTY	(6) MEDIAN INCOME REQUIRED 1960	1970	DIFF	(7) ACTUAL 1960	1970	DIFF	(8) LABOR FORCE UTILIZATION INDEX 1960	1970	DIFF	(9) PERCENT UNDEREMPLOYMENT 1960	1970	DIFF	(10) NUMBER OF EMPLOYED CIVILIANS 1960	1970	DIFF	(11) MAN-YEARS ECONOMICALLY UNUTILIZED LABOR 1960	1970	DIFF
HICKMAN	3276.	5228.	1952.	1880.	3187.	1307.	57.4	61.0	3.6	42.6	39.0	-3.6	3020.	2817.	-203.	1287.	1100.	-187.
HOUSTON	3010.	5383.	2373.	1546.	3616.	2070.	51.4	67.2	15.8	48.6	32.8	-15.8	1076.	1372.	296.	523.	450.	-73.
HUMPHREYS	3464.	6211.	2747.	2256.	4940.	2684.	65.1	79.5	14.4	34.9	20.5	-14.4	2653.	3252.	599.	926.	666.	-260.
JACKSON	3109.	4514.	1405.	996.	1902.	906.	32.0	42.1	10.1	68.0	57.9	-10.1	2303.	1706.	-597.	1566.	987.	-579.
JEFFERSON	3371.	5748.	2377.	2063.	3496.	1433.	61.2	60.8	-0.4	38.8	39.2	0.4	5531.	5962.	431.	2146.	2336.	190.
JOHNSON	2949.	5283.	2334.	1333.	2501.	1168.	45.2	47.3	2.1	54.8	52.7	-2.1	2186.	2498.	312.	1198.	1315.	117.
KNOX	4138.	6365.	2227.	3395.	4421.	1026.	82.0	69.5	-12.5	18.0	30.5	12.5	57846.	63628.	5782.	10412.	19436.	9024.
LAKE	2635.	4103.	1468.	1007.	2258.	1251.	38.2	55.0	16.8	61.8	45.0	-16.8	2232.	1518.	-714.	1379.	683.	-696.
LAUDERDALE	2500.	4458.	1958.	1109.	1888.	779.	44.4	42.0	-2.4	55.6	58.0	2.4	4845.	3860.	-985.	2694.	2240.	-454.
LAWRENCE	3146.	5534.	2388.	2318.	3540.	1222.	73.7	64.0	-9.7	26.3	36.0	9.7	6330.	6393.	63.	1665.	2304.	639.
LEWIS	3214.	5359.	2145.	1924.	3598.	1674.	59.9	67.1	7.2	40.1	32.9	-7.2	1369.	1508.	139.	549.	495.	-54.
LINCOLN	3461.	5774.	2313.	1746.	3209.	1463.	50.4	55.6	5.2	49.6	44.4	-5.2	6018.	5814.	-204.	2985.	2583.	-402.
LOUDON	3511.	5866.	2355.	2650.	3875.	1225.	75.5	66.1	-9.4	24.5	33.9	9.4	5469.	5757.	288.	1340.	1954.	614.
MC MINN	3447.	5908.	2461.	2347.	3877.	1530.	68.1	65.6	-2.5	31.9	34.4	2.5	7909.	8523.	614.	2523.	2930.	407.
MC NAIRY	3146.	5368.	2222.	1246.	2667.	1421.	39.6	49.7	10.1	60.4	50.3	-10.1	3822.	3821.	-1.	2308.	1922.	-386.
MACON	2981.	4790.	1809.	1107.	2265.	1158.	37.1	47.3	10.2	62.9	52.7	-10.2	3182.	3046.	-136.	2001.	1606.	-395.
MADISON	3304.	5508.	2204.	2346.	3655.	1309.	71.0	66.4	-4.6	29.0	33.6	4.6	13920.	14467.	547.	4037.	4868.	831.
MARION	3200.	5199.	1999.	2549.	3548.	999.	79.7	68.2	-11.5	20.3	31.8	11.5	4316.	4572.	256.	876.	1452.	576.
MARSHALL	3812.	5964.	2152.	2394.	4030.	1636.	62.8	67.6	4.8	37.2	32.4	-4.8	4436.	4508.	72.	1650.	1462.	-188.
MAURY	3635.	5730.	2095.	2729.	4242.	1513.	75.1	74.0	-1.1	24.9	26.0	1.1	10672.	10644.	-28.	2657.	2765.	108.
MEIGS	2843.	4917.	2074.	1287.	2908.	1621.	45.3	59.1	13.8	54.7	40.9	-13.8	1065.	1194.	129.	583.	488.	-95.
MONROE	3058.	4897.	1839.	1666.	2879.	1213.	54.5	58.8	4.3	45.5	41.2	-4.3	5119.	5146.	27.	2329.	2121.	-208.
MONTGOMERY	2831.	4172.	1341.	2236.	3527.	1291.	79.0	84.5	5.5	21.0	15.5	-5.5	9773.	11308.	1535.	2052.	1748.	-304.
MOORE	3564.	5942.	2378.	1883.	3157.	1274.	52.8	53.1	0.3	47.2	46.9	-0.3	870.	1030.	160.	411.	483.	72.
MORGAN	2768.	5057.	2289.	1604.	1993.	389.	57.9	39.4	-18.5	42.1	60.6	18.5	2476.	2331.	-145.	1042.	1412.	370.
OBION	3430.	5763.	2333.	2083.	3829.	1746.	60.7	66.4	5.7	39.3	33.6	-5.7	6726.	7412.	686.	2643.	2487.	-156.
OVERTON	3022.	4608.	1586.	1109.	2024.	915.	36.7	43.9	7.2	63.3	56.1	-7.2	3079.	3068.	-11.	1949.	1720.	-229.
PERRY	3170.	4947.	1777.	1172.	2400.	1228.	37.0	48.5	11.5	63.0	51.5	-11.5	1194.	1129.	-65.	752.	581.	-171.
PICKETT	2961.	4465.	1504.	874.	2057.	1183.	29.5	46.1	16.6	70.5	53.9	-16.6	938.	685.	-253.	661.	369.	-292.
POLK	3111.	5617.	2506.	2352.	4021.	1669.	75.6	71.6	-4.0	24.4	28.4	4.0	2600.	2812.	212.	634.	799.	165.
PUTNAM	3003.	5064.	2061.	1587.	2709.	1122.	52.8	53.5	0.7	47.2	46.5	-0.7	6484.	7693.	1209.	3060.	3578.	518.
RHEA	3289.	5375.	2086.	1959.	3061.	1102.	59.6	56.9	-2.7	40.4	43.1	2.7	3319.	3604.	285.	1341.	1552.	211.
ROANE	3682.	5900.	2218.	3159.	4286.	1127.	85.8	72.6	-13.2	14.2	27.4	13.2	8593.	9001.	408.	1220.	2462.	1242.
ROBERTSON	3373.	5645.	2272.	2105.	3843.	1738.	62.4	68.1	5.7	37.6	31.9	-5.7	7172.	7123.	-49.	2697.	2274.	-423.
RUTHERFORD	3400.	5915.	2515.	2480.	3819.	1339.	72.9	64.6	-8.3	27.1	35.4	8.3	9952.	13916.	3964.	2697.	4931.	2234.
SCOTT	2510.	4627.	2117.	1462.	2097.	635.	58.2	45.3	-12.9	41.8	54.7	12.9	2463.	2580.	117.	1030.	1411.	381.
SEQUATCHIE	3165.	5530.	2365.	1823.	3358.	1535.	57.6	60.7	3.1	42.4	39.3	-3.1	1221.	1400.	179.	518.	550.	32.
SEVIER	3427.	5895.	2468.	1830.	3803.	1973.	53.4	64.5	11.1	46.6	35.5	-11.1	5893.	6929.	1036.	2746.	2459.	-287.
SHELBY	3691.	5492.	1801.	3399.	4543.	1144.	92.1	82.7	-9.4	7.9	17.3	9.4	141442.	158409.	16967.	11174.	27384.	16210.
SMITH	3328.	5400.	2072.	1588.	3439.	1851.	47.7	63.7	16.0	52.3	36.3	-16.0	3115.	3243.	128.	1629.	1178.	-451.

TABLE A-II (continued)

COUNTY	(6) MEDIAN INCOME REQUIRED 1960	REQUIRED 1970	REQUIRED DIFF	(7) ACTUAL 1960	ACTUAL 1970	ACTUAL DIFF	(8) LABOR FORCE UTILIZATION INDEX 1960	1970	DIFF	(9) PERCENT UNDEREMPLOYMENT 1960	1970	DIFF	(10) NUMBER OF EMPLOYED CIVILIANS 1960	1970	DIFF	(11) MAN-YEARS ECONOMICALLY UNUTILIZED LABOR 1960	1970	DIFF
STEWART	2950.	5037.	2087.	1490.	2779.	1289.	50.5	55.2	4.7	49.5	44.8	-4.7	1857.	1692.	-165.	919.	758.	-161.
SULLIVAN	4293.	6568.	2275.	3638.	5254.	1616.	84.7	80.0	-4.7	15.3	20.0	4.7	27830.	32075.	4245.	4258.	6415.	2157.
SUMNER	3287.	6270.	2983.	2159.	4819.	2660.	65.7	76.9	11.2	34.3	23.1	-11.2	9060.	14435.	5375.	3108.	3341.	233.
TIPTON	2636.	4565.	1929.	1554.	3090.	1536.	59.0	67.7	8.7	41.0	32.3	-8.7	6038.	5510.	-528.	2476.	1781.	-695.
TROUSDALE	2834.	4721.	1887.	1509.	2430.	921.	53.2	51.5	-1.7	46.8	48.5	1.7	1286.	1406.	120.	602.	682.	80.
UNICOI	3642.	5660.	2018.	2461.	3717.	1256.	67.6	65.7	-1.9	32.4	34.3	1.9	3430.	3365.	-65.	1111.	1155.	44.
UNION	2949.	5196.	2247.	1596.	2609.	1013.	54.1	50.2	-3.9	45.9	49.8	3.9	1950.	2143.	193.	895.	1067.	172.
VAN BUREN	2684.	4998.	2314.	1000.	2935.	1935.	37.3	58.7	21.4	62.7	41.3	-21.4	727.	898.	171.	456.	371.	-85.
WARREN	3553.	5861.	2308.	1956.	3654.	1698.	55.1	62.3	7.2	44.9	37.7	-7.2	5636.	6662.	1026.	2531.	2509.	-22.
WASHINGTON	3440.	5950.	2510.	2369.	3592.	1223.	68.9	60.4	-8.5	31.1	39.6	8.5	14468.	17297.	2829.	4500.	6855.	2355.
WAYNE	3013.	5092.	2079.	1521.	2769.	1248.	50.5	54.4	3.9	49.5	45.6	-3.9	2594.	2716.	122.	1284.	1239.	-45.
WEAKLEY	3069.	5190.	2121.	1634.	2784.	1150.	53.2	53.6	0.4	46.8	46.4	-0.4	5916.	6755.	839.	2769.	3132.	363.
WHITE	3206.	5372.	2166.	1391.	2880.	1489.	43.4	53.6	10.2	56.6	46.4	-10.2	3404.	3613.	209.	1927.	1676.	-251.
WILLIAMSON	3304.	6120.	2816.	2213.	4603.	2390.	67.0	75.2	8.2	33.0	24.8	-8.2	6190.	8842.	2652.	2043.	2191.	148.
WILSON	3525.	6127.	2602.	2318.	4594.	2276.	65.8	75.0	9.2	34.2	25.0	-9.2	7090.	9348.	2258.	2425.	2338.	-87.

TABLE A-III

COMPONENTS OF COUNTY UNDEREMPLOYMENT MODEL, FEMALE, 1960 AND 1970
(COLUMNS 1-5)

	ADJUSTMENT FACTOR (OR INDEX)														
	(1) AGE-COLOR MIX			(2) EDUCATIONAL STATUS			(3) LABOR FORCE PARTICIPATION STATUS			(4) EMPLOYMENT STATUS			(5) COMBINED		
COUNTY	1960	1970	DIFF	1960	1970	DIFF	1960	1970	DIFF	1960	1970	DIFF	1960	1970	DIFF
ANDERSON	109.7	105.6	-4.1	101.7	90.5	-11.2	102.1	133.9	31.8	100.1	98.4	-1.7	114.0	125.9	11.9
BEDFORD	98.6	101.0	2.4	87.8	83.7	-4.1	104.8	137.3	32.5	100.2	100.4	0.2	90.9	116.6	25.7
BENTON	104.2	103.7	-0.5	77.3	78.1	0.8	95.9	134.0	38.1	98.5	98.5	0.0	76.0	106.9	30.9
BLEDSOE	103.8	102.0	-1.8	77.4	74.5	-2.9	97.1	136.5	39.4	98.9	100.0	1.1	77.1	103.7	26.6
BLOUNT	104.4	103.6	-0.8	91.5	85.6	-5.9	97.6	134.7	37.1	100.3	98.9	-1.4	93.5	118.1	24.6
BRADLEY	104.8	103.6	-1.2	82.1	81.6	-0.5	103.5	137.5	34.0	98.9	100.5	1.6	88.0	116.9	28.9
CAMPBELL	103.4	101.4	-2.0	73.5	69.1	-4.4	94.5	135.8	41.3	99.6	99.6	0.0	71.5	94.8	23.3
CANNON	104.5	101.3	-3.2	75.3	75.5	0.2	104.6	137.3	32.7	101.0	100.4	-0.6	83.1	105.3	22.2
CARROLL	96.8	98.0	1.2	79.0	78.3	-0.7	95.9	136.4	40.5	100.5	99.9	-0.6	73.8	104.6	30.8
CARTER	107.5	103.6	-3.9	83.3	80.5	-2.8	96.7	133.4	36.7	97.0	98.1	1.1	84.0	109.2	25.2
CHEATHAM	101.9	103.4	1.5	80.8	80.2	-0.6	95.7	137.6	41.9	100.5	100.6	0.1	79.1	114.8	35.7
CHESTER	94.8	95.0	0.2	78.5	74.8	-3.7	94.1	135.3	41.2	100.9	98.9	-2.0	70.7	95.0	24.3
CLAIBORNE	104.0	102.7	-1.3	72.1	70.8	-1.3	87.4	134.7	47.3	101.1	99.0	-2.1	66.2	97.0	30.8
CLAY	101.5	101.1	-0.4	71.5	66.0	-5.5	93.4	135.0	41.6	100.8	99.1	-1.7	68.4	89.2	20.8
COCKE	105.4	102.7	-2.7	74.5	73.7	-0.8	91.7	130.2	38.5	96.9	96.0	-0.9	69.8	94.6	24.8
COFFEE	104.6	102.3	-2.3	89.9	86.3	-3.6	101.4	134.6	33.2	99.7	98.9	-0.8	95.1	117.5	22.4
CROCKETT	93.8	96.2	2.4	79.8	79.3	-0.5	80.1	133.2	53.1	99.9	98.0	-1.9	59.8	99.7	39.9
CUMBERLAND	103.5	101.2	-2.3	75.7	74.4	-1.3	94.5	134.3	39.8	99.5	98.7	-0.8	73.7	99.8	26.1
DAVIDSON	98.6	98.6	0.0	99.1	90.6	-8.5	103.7	137.3	33.6	101.0	100.4	-0.6	102.3	123.3	21.0
DECATUR	100.8	101.6	0.8	73.7	74.8	1.1	96.0	138.2	42.2	100.0	100.9	0.9	71.3	106.0	34.7
DE KALB	101.7	102.4	0.7	75.8	73.2	-2.6	101.2	136.9	35.7	101.6	100.2	-1.4	79.2	102.7	23.5
DICKSON	99.8	101.7	1.9	79.7	77.8	-1.9	100.2	137.3	37.1	101.0	100.4	-0.6	80.4	109.0	28.6
DYER	98.0	98.0	0.0	79.2	76.0	-3.2	86.2	136.4	50.2	99.9	99.9	0.0	66.9	101.5	34.6
FAYETTE	73.8	83.7	9.9	71.1	72.1	1.0	87.3	131.7	44.4	100.3	97.0	-3.3	45.9	77.1	31.2
FENTRESS	103.1	101.2	-1.9	70.4	65.3	-5.1	102.3	137.0	34.7	100.9	100.0	-0.9	74.9	90.5	15.6
FRANKLIN	101.1	100.8	-0.3	87.1	84.3	-2.8	101.1	134.0	32.9	100.4	98.5	-1.9	89.4	112.1	22.7
GIBSON	95.3	97.0	1.7	85.5	83.3	-2.2	95.0	135.7	40.7	96.1	99.5	3.4	74.4	109.1	34.7
GILES	93.9	97.4	3.5	84.1	80.6	-3.5	96.2	137.7	41.5	101.2	100.6	-0.6	76.8	108.8	32.0
GRAINGER	105.0	103.0	-2.0	69.1	71.1	2.0	94.0	132.3	38.3	99.6	97.5	-2.1	68.0	94.5	26.5
GREENE	106.4	103.4	-3.0	84.8	80.7	-4.1	101.7	127.9	26.2	96.1	94.3	-1.8	88.2	100.6	12.4
GRUNDY	100.6	101.2	0.6	74.4	69.5	-4.9	89.7	137.1	47.4	99.2	100.3	1.1	66.6	96.6	30.0
HAMBLEN	104.7	103.9	-0.8	88.4	82.9	-5.5	101.9	133.8	31.9	98.8	98.4	-0.4	93.2	113.4	20.2
HAMILTON	98.7	99.2	0.5	94.1	89.6	-4.5	103.3	136.9	33.6	100.3	100.2	-0.1	96.1	121.9	25.8

TABLE A-III (continued)

COUNTY	ADJUSTMENT FACTOR (OR INDEX) (1) AGE-COLOR MIX 1960	1970	DIFF	(2) EDUCATIONAL STATUS 1960	1970	DIFF	(3) LABOR FORCE PARTIC-IPATION STATUS 1960	1970	DIFF	(4) EMPLOYMENT STATUS 1960	1970	DIFF	(5) COMBINED 1960	1970	DIFF
HANCOCK	103.2	102.9	-0.3	66.5	63.5	-3.0	69.6	136.7	67.1	102.7	100.1	-2.6	49.1	89.5	40.4
HARDEMAN	86.1	92.4	6.3	76.2	74.9	-1.3	92.8	134.4	41.6	100.1	98.6	-1.5	61.0	91.7	30.7
HARDIN	102.6	100.4	-2.2	78.6	75.6	-3.0	100.7	135.9	35.2	97.9	99.6	1.7	79.5	102.8	23.3
HAWKINS	104.0	103.8	-0.2	78.0	77.1	-0.9	89.9	134.9	45.0	99.9	99.0	-0.9	72.9	106.9	34.0
HAYWOOD	77.8	84.9	7.1	77.1	73.4	-3.7	97.9	132.1	34.2	101.2	97.3	-3.9	59.4	80.2	20.8
HENDERSON	101.0	99.5	-1.5	75.0	72.6	-2.4	95.7	136.0	40.3	98.9	99.7	0.8	71.7	97.9	26.2
HENRY	96.8	98.6	1.8	87.7	81.6	-6.1	96.9	133.5	36.6	100.5	98.2	-2.3	82.7	105.4	22.7
HICKMAN	101.4	100.8	-0.6	76.1	74.6	-1.5	93.9	133.9	40.0	99.1	98.5	-0.6	71.8	99.3	27.5
HOLSTON	100.2	99.3	-0.9	79.9	76.3	-3.6	90.2	128.3	38.1	99.1	94.8	-4.3	71.5	92.2	20.7
HUMPHREYS	104.2	102.5	-1.7	80.9	81.2	0.3	96.1	138.1	42.0	99.5	100.8	1.3	80.6	115.8	35.2
JACKSON	101.6	102.1	0.5	67.9	64.0	-3.9	90.7	135.6	44.9	99.7	99.4	-0.3	62.4	88.1	25.7
JEFFERSON	103.6	102.6	-1.0	87.6	81.4	-6.2	93.6	131.4	37.8	98.3	96.8	-1.5	83.5	106.2	22.7
JOHNSON	104.1	103.0	-1.1	74.2	71.5	-2.7	80.8	137.6	56.8	99.5	100.6	1.1	62.1	102.0	39.9
KNOX	102.9	100.4	-2.5	96.2	89.4	-6.8	101.4	136.6	35.2	100.4	100.0	-0.4	100.8	122.6	21.8
LAKE	94.9	93.8	-1.1	71.2	70.0	-1.2	71.8	136.2	64.4	96.2	99.8	3.6	46.6	89.2	42.6
LAUDERDALE	88.4	92.2	3.8	74.9	73.0	-1.9	82.0	132.7	50.7	98.8	97.7	-1.1	53.7	87.2	33.5
LAWRENCE	102.4	102.9	0.5	76.7	75.5	-1.2	93.6	134.7	41.1	99.6	98.9	-0.7	73.1	103.5	30.4
LEWIS	104.1	102.0	-2.1	74.3	76.9	2.6	95.5	138.5	43.0	97.2	101.1	3.9	71.9	109.8	37.9
LINCOLN	99.0	100.1	1.1	84.2	82.1	-2.1	103.6	132.3	28.7	100.7	97.3	-3.4	87.0	105.9	18.9
LOUDON	106.0	103.7	-2.3	79.2	78.6	-0.6	102.6	137.7	35.1	100.6	100.6	0.0	86.6	112.9	26.3
MC MINN	103.0	102.4	-0.6	81.2	79.7	-1.5	101.1	136.2	35.1	99.8	99.8	0.0	84.5	110.9	26.4
MC NAIRY	100.6	101.8	1.2	77.3	76.7	-0.6	97.4	133.6	36.2	98.5	98.2	-0.3	74.6	102.5	27.9
MACON	103.7	102.8	-0.9	68.1	68.5	0.4	104.2	135.5	31.3	96.5	99.4	2.9	71.0	94.9	23.9
MADISON	90.3	92.1	1.8	92.1	86.1	-6.0	98.2	135.0	36.8	99.7	99.1	-0.6	81.5	106.1	24.6
MARION	102.9	101.6	-1.3	77.6	75.0	-2.6	97.3	135.3	38.0	99.6	99.3	-0.3	77.3	102.4	25.1
MARSHALL	99.7	98.9	-0.8	87.5	83.7	-3.8	100.0	137.2	37.2	100.7	100.3	-0.4	87.8	114.0	26.2
MAURY	97.2	98.7	1.5	87.7	84.5	-3.2	100.5	135.8	35.3	99.4	99.5	0.1	85.2	112.7	27.5
MEIGS	103.1	101.8	-1.3	75.3	73.2	-2.1	97.9	137.7	39.8	98.2	100.7	2.5	74.7	103.3	28.6
MONROE	101.2	101.1	-0.1	75.9	71.8	-4.1	100.1	133.3	33.2	97.9	98.1	0.2	75.2	95.0	19.8
MONTGOMERY	98.7	98.3	-0.4	93.2	87.8	-5.4	97.0	134.1	37.1	99.6	97.6	-2.0	88.8	113.0	24.2
MOORE	101.4	103.1	1.7	81.0	80.1	-0.9	109.7	132.8	23.1	100.7	97.6	-3.1	90.7	107.1	16.4
MORGAN	102.5	101.2	-1.3	72.0	75.7	3.7	87.2	136.0	48.8	100.5	99.7	-0.8	64.7	103.9	39.2
OBION	98.0	100.3	2.3	86.9	83.5	-3.4	97.3	136.1	38.8	99.4	99.8	0.4	82.4	113.8	31.4
OVERTON	103.1	103.4	0.3	70.1	68.6	-1.5	97.0	137.4	40.4	100.1	100.5	0.4	70.1	98.0	27.9
PERRY	101.3	102.5	1.2	75.9	72.2	-3.7	101.3	138.4	37.1	97.0	101.0	4.0	75.6	103.5	27.9
PICKETT	106.8	99.9	-6.9	69.5	69.1	-0.4	104.7	139.2	34.5	98.1	101.5	3.4	76.2	97.4	21.2
POLK	104.4	103.6	-0.8	72.8	73.4	0.6	91.7	137.6	45.9	97.1	100.6	3.5	67.7	105.3	37.6
PUTNAM	102.2	99.6	-2.6	79.5	74.4	-5.1	98.3	135.8	37.5	99.9	99.6	-0.3	79.7	100.2	20.5

TABLE A-III (continued)

COUNTY	ADJUSTMENT FACTOR (OR INDEX) (1) AGE-COLOR MIX 1960	1970	DIFF	(2) EDUCATIONAL STATUS 1960	1970	DIFF	(3) LABOR FORCE PARTICIPATION STATUS 1960	1970	DIFF	(4) EMPLOYMENT STATUS 1960	1970	DIFF	(5) COMBINED 1960	1970	DIFF
RHEA	100.8	101.4	0.6	81.5	77.7	-3.8	98.0	130.7	32.7	96.7	96.3	-0.4	77.9	99.3	21.4
ROANE	105.7	103.2	-2.5	83.7	81.6	-2.1	95.2	135.6	40.4	100.3	99.5	-0.8	84.4	113.6	29.2
ROBERTSON	96.5	98.6	2.1	85.9	82.7	-3.2	90.8	136.1	45.3	100.0	99.7	-0.3	75.4	110.7	35.3
RUTHERFORD	100.2	96.7	-3.5	97.3	88.4	-8.9	101.9	136.7	34.8	100.7	100.0	-0.7	100.1	116.9	16.8
SCOTT	103.6	101.4	-2.2	71.5	68.6	-2.9	86.9	132.2	45.3	101.2	97.4	-3.8	65.2	89.6	24.4
SEQUATCHIE	103.2	102.8	-0.4	77.2	77.0	-0.2	103.5	132.6	29.1	99.9	97.7	-2.2	82.4	102.5	20.1
SEVIER	104.6	103.9	-0.7	78.9	78.1	-0.8	95.2	132.8	37.6	98.5	97.7	-0.8	77.5	105.2	27.7
SHELBY	91.9	94.4	2.5	97.9	90.4	-7.5	104.0	135.4	31.4	100.2	99.1	-1.1	93.8	114.4	20.6
SMITH	101.9	101.0	-0.9	77.3	74.3	-3.0	92.8	135.5	42.7	101.5	99.4	-2.1	74.2	101.0	26.8
STEWART	103.3	102.0	-1.3	76.8	74.4	-2.4	87.9	135.6	47.7	99.7	99.5	-0.2	69.6	102.4	32.8
SULLIVAN	108.7	106.1	-2.6	92.1	85.8	-6.3	104.0	135.5	31.5	100.6	99.3	-1.3	104.7	122.5	17.8
SUMNER	100.9	103.6	2.7	82.4	84.9	2.5	101.2	136.0	34.8	99.9	99.7	-0.2	84.0	119.3	35.3
TIPTON	88.0	93.1	5.1	78.6	75.3	-3.3	87.6	132.0	44.4	98.8	97.1	-1.7	59.9	89.8	29.9
TROUSDALE	96.8	97.0	0.2	75.9	73.2	-2.7	102.5	135.8	33.3	102.1	99.5	-2.6	76.8	95.9	19.1
UNICOI	106.3	103.6	-2.7	83.3	78.2	-5.1	100.8	134.5	33.7	98.6	98.8	0.2	88.0	107.7	19.7
UNION	105.3	104.5	-0.8	69.9	66.9	-3.0	100.7	136.5	35.8	101.2	100.0	-1.2	75.0	95.4	20.4
VAN BUREN	102.9	101.5	-1.4	70.0	70.0	0.0	87.2	139.7	52.5	99.0	101.7	2.7	62.2	101.0	38.8
WARREN	103.9	101.7	-2.2	83.1	79.7	-3.4	101.4	135.0	33.6	99.5	99.1	-0.4	87.1	108.4	21.3
WASHINGTON	104.8	101.8	-3.0	92.9	85.8	-7.1	99.9	134.6	34.5	99.6	98.8	-0.8	96.0	116.2	20.2
WAYNE	105.1	101.8	-3.3	73.8	70.5	-3.3	99.8	136.6	36.8	93.8	100.0	6.2	72.6	98.0	25.4
WEAKLEY	98.2	96.3	-1.9	83.6	80.0	-3.6	97.2	134.9	37.7	99.4	99.0	-0.4	79.4	102.9	23.5
WHITE	103.6	103.3	-0.3	76.7	74.2	-2.5	97.5	135.9	38.4	99.9	99.6	-0.3	77.4	103.7	26.3
WILLIAMSON	95.3	100.1	4.8	88.2	86.6	-1.6	99.1	137.7	38.6	100.7	100.5	-0.2	83.9	119.9	36.0
WILSON	97.3	100.8	3.5	86.0	84.6	-1.4	102.8	136.8	34.0	100.4	100.1	-0.3	86.3	116.8	30.5

TABLE A-IV

COMPONENTS OF COUNTY UNDEREMPLOYMENT MODEL, FEMALE, 1960 AND 1970
(COLUMNS 6-11)

COUNTY	(6) MEDIAN INCOME REQUIRED 1960	1970	DIFF	(7) ACTUAL 1960	1970	DIFF	(8) LABOR FORCE UTILIZATION INDEX 1960	1970	DIFF	(9) PERCENT UNDEREMPLOYMENT 1960	1970	DIFF	(10) NUMBER OF EMPLOYED CIVILIANS 1960	1970	DIFF	(11) MAN-YEARS ECONOMICALLY UNUTILIZED LABOR 1960	1970	DIFF
ANDERSON	1613.	2932.	1319.	1186.	63.	-1123.	73.5	2.1	-71.4	26.5	97.9	71.4	5853.	7175.	1322.	1551.	7021.	5470.
BEDFORD	1285.	2714.	1429.	996.	829.	-167.	77.5	30.5	-47.0	22.5	69.5	47.0	3311.	4307.	996.	745.	2991.	2246.
BENTON	1075.	2489.	1414.	747.	605.	-142.	69.5	24.3	-45.2	30.5	75.7	45.2	1119.	1614.	495.	341.	1222.	881.
BLEDSOE	1090.	2413.	1323.	898.	157.	-741.	82.4	6.5	-75.9	17.6	93.5	75.9	683.	786.	103.	120.	735.	615.
BLOUNT	1323.	2750.	1427.	872.	134.	-738.	65.9	4.9	-61.0	34.1	95.1	61.0	4770.	7542.	2772.	1627.	7174.	5547.
BRADLEY	1245.	2722.	1477.	1225.	852.	-373.	98.4	31.3	-67.1	1.6	68.7	67.1	4576.	8385.	3809.	73.	5761.	5688.
CAMPBELL	1021.	2206.	1185.	913.	194.	-719.	90.2	8.8	-81.4	9.8	91.2	81.4	2527.	2482.	-45.	248.	2264.	2016.
CANNON	1176.	2452.	1276.	1420.	641.	-779.	120.7	26.1	-94.6	-20.7	73.9	94.6	1086.	1307.	221.	-225.	965.	1190.
CARROLL	1043.	2434.	1391.	877.	942.	65.	84.1	38.7	-45.4	15.9	61.3	45.4	2861.	4397.	1536.	455.	2695.	2240.
CARTER	1188.	2541.	1353.	981.	288.	-693.	82.6	11.3	-71.3	17.4	88.7	71.3	3601.	5102.	1501.	627.	4524.	3897.
CHEATHAM	1119.	2673.	1554.	916.	228.	-688.	81.9	8.5	-73.4	18.1	91.5	73.4	768.	1553.	785.	139.	1421.	1282.
CHESTER	999.	2212.	1213.	657.	608.	-49.	65.8	27.5	-38.3	34.2	72.5	38.3	1130.	1489.	359.	386.	1080.	694.
CLAIBORNE	937.	2257.	1320.	749.	124.	-625.	79.9	5.5	-74.4	20.1	94.5	74.4	1228.	1949.	721.	247.	1842.	1595.
CLAY	967.	2077.	1110.	763.	489.	-274.	78.9	23.5	-55.4	21.1	76.5	55.4	641.	852.	211.	135.	651.	516.
COCKE	987.	2202.	1215.	732.	76.	-656.	74.2	3.5	-70.7	25.8	96.5	70.7	1575.	2735.	1160.	406.	2641.	2235.
COFFEE	1346.	2735.	1389.	1043.	307.	-736.	77.5	11.2	-66.3	22.5	88.8	66.3	2968.	4290.	1322.	668.	3808.	3140.
CROCKETT	846.	2320.	1474.	511.	621.	110.	60.4	26.8	-33.6	39.6	73.2	33.6	1131.	1935.	804.	448.	1417.	969.
CUMBERLAND	1043.	2324.	1281.	768.	388.	-380.	73.6	16.7	-56.9	26.4	83.3	56.9	1372.	2395.	1023.	362.	1995.	1633.
DAVIDSON	1448.	2870.	1422.	1329.	993.	-336.	91.8	34.6	-57.2	8.2	65.4	57.2	57095.	76376.	19281.	4682.	49955.	45273.
DECATUR	1009.	2466.	1457.	811.	982.	171.	80.4	39.8	-40.6	19.6	60.2	40.6	915.	1669.	754.	179.	1005.	826.
DE KALB	1121.	2392.	1271.	908.	746.	-162.	81.0	31.2	-49.8	19.0	68.8	49.8	1480.	1916.	436.	281.	1318.	1037.
DICKSON	1138.	2536.	1398.	978.	655.	-323.	85.9	25.8	-60.1	14.1	74.2	60.1	2055.	3196.	1141.	290.	2371.	2081.
DYER	947.	2364.	1417.	586.	858.	272.	61.9	36.3	-25.6	38.1	63.7	25.6	2898.	5191.	2293.	1104.	3307.	2203.
FAYETTE	649.	1796.	1147.	417.	255.	-162.	64.3	14.2	-50.1	35.7	85.8	50.1	1479.	2206.	727.	528.	1893.	1365.
FENTRESS	1060.	2106.	1046.	813.	360.	-453.	76.7	17.1	-59.6	23.3	82.9	59.6	1375.	1636.	261.	320.	1356.	1036.
FRANKLIN	1264.	2609.	1345.	933.	459.	-474.	73.8	17.6	-56.2	26.2	82.4	56.2	2717.	3635.	918.	712.	2996.	2284.
GIBSON	1052.	2539.	1487.	770.	885.	115.	73.2	34.9	-38.3	26.8	65.1	38.3	4926.	8243.	3317.	1320.	5370.	4050.
GILES	1087.	2533.	1446.	785.	569.	-216.	72.2	22.5	-49.7	27.8	77.5	49.7	2640.	3241.	601.	734.	2513.	1779.
GRAINGER	961.	2199.	1238.	704.	0.	-704.	73.3	0.0	-73.3	26.7	100.0	73.3	840.	1311.	471.	224.	1311.	1087.
GREENE	1248.	2342.	1094.	925.	461.	-464.	74.1	19.7	-54.4	25.9	80.3	54.4	3978.	6013.	2035.	1030.	4830.	3800.
GRUNDY	942.	2250.	1308.	564.	128.	-436.	59.9	5.7	-54.2	40.1	94.3	54.2	690.	1147.	457.	277.	1082.	805.
HAMBLEN	1318.	2641.	1323.	998.	490.	-508.	75.7	18.6	-57.1	24.3	81.4	57.1	3482.	5223.	1741.	846.	4254.	3408.
HAMILTON	1360.	2839.	1479.	1293.	819.	-474.	95.1	28.9	-66.2	4.9	71.1	66.2	30814.	40863.	10049.	1510.	29073.	27563.
HANCOCK	694.	2084.	1390.	638.	0.	-638.	91.9	0.0	-91.9	8.1	100.0	91.9	237.	429.	192.	19.	429.	410.
HARDEMAN	863.	2135.	1272.	541.	685.	144.	62.7	32.1	-30.6	37.3	67.9	30.6	1440.	2669.	1229.	537.	1813.	1276.
HARDIN	1125.	2393.	1268.	835.	526.	-309.	74.2	22.0	-52.2	25.8	78.0	52.2	1909.	2652.	743.	493.	2069.	1576.
HAWKINS	1031.	2489.	1458.	730.	0.	-730.	70.8	0.0	-70.8	29.2	100.0	70.8	1923.	3134.	1211.	562.	3134.	2572.
HAYWOOD	940.	1967.	1027.	516.	412.	-104.	61.4	22.1	-39.3	38.6	77.9	39.3	2207.	2185.	-22.	852.	1703.	851.
HENDERSON	1014.	2279.	1265.	711.	648.	-63.	70.1	28.4	-41.7	29.9	71.6	41.7	1720.	2367.	647.	514.	1694.	1180.
HENRY	1170.	2454.	1284.	826.	622.	-204.	70.6	25.3	-45.3	29.4	74.7	45.3	2771.	3333.	562.	815.	2488.	1673.

TABLE A-IV (continued)

COUNTY	(6) MEDIAN INCOME REQUIRED 1960	REQUIRED 1970	REQUIRED DIFF	(7) ACTUAL 1960	ACTUAL 1970	ACTUAL DIFF	(8) LABOR FORCE UTILIZATION INDEX 1960	1970	DIFF	(9) PERCENT UNDEREMPLOYMENT 1960	1970	DIFF	(10) NUMBER OF EMPLOYED CIVILIANS 1960	1970	DIFF	(11) MAN-YEARS ECONOMICALLY UNUTILIZED LABOR 1960	1970	DIFF
HICKMAN	1016.	2311.	1295.	851.	198.	-653.	83.8	8.6	-75.2	16.2	91.4	75.2	1015.	1434.	419.	164.	1311.	1147.
HOUSTON	1012.	2147.	1135.	642.	0.	-642.	63.4	0.0	-63.4	36.6	100.0	63.4	357.	503.	146.	131.	503.	372.
HUMPHREYS	1139.	2697.	1558.	780.	273.	-507.	68.5	10.1	-58.4	31.5	89.9	58.4	1028.	1517.	489.	324.	1363.	1039.
JACKSON	882.	2052.	1170.	791.	383.	-408.	89.7	18.7	-71.0	10.3	81.3	71.0	710.	971.	261.	73.	790.	717.
JEFFERSON	1181.	2473.	1292.	843.	436.	-407.	71.4	17.6	-53.8	28.6	82.4	53.8	1979.	3208.	1229.	566.	2642.	2076.
JOHNSON	878.	2374.	1496.	494.	434.	-60.	56.3	18.3	-38.0	43.7	81.7	38.0	535.	1547.	1012.	234.	1264.	1030.
KNOX	1425.	2654.	1429.	1240.	686.	-554.	87.0	24.0	-63.0	13.0	76.0	63.0	31513.	41176.	9663.	4097.	31280.	27183.
LAKE	659.	2077.	1418.	417.	630.	213.	63.3	30.3	-33.0	36.7	69.7	33.0	596.	1066.	470.	219.	743.	524.
LAUDERDALE	759.	2029.	1270.	456.	458.	2.	60.1	22.6	-37.5	39.9	77.4	37.5	1676.	2299.	623.	669.	1780.	1111.
LAWRENCE	1034.	2410.	1376.	754.	181.	-573.	72.9	7.5	-65.4	27.1	92.5	65.4	2388.	3438.	1050.	647.	3180.	2533.
LEWIS	1017.	2556.	1539.	986.	648.	-338.	97.0	25.4	-71.6	3.0	74.6	71.6	550.	997.	447.	17.	744.	727.
LINCOLN	1231.	2464.	1233.	1014.	602.	-412.	82.4	24.4	-58.0	17.6	75.6	58.0	2999.	3635.	636.	528.	2747.	2219.
LOUDON	1225.	2628.	1403.	1192.	669.	-523.	97.3	25.5	-71.8	2.7	74.5	71.8	2647.	3773.	1126.	71.	2813.	2742.
MC MINN	1195.	2582.	1387.	984.	642.	-342.	82.3	24.9	-57.4	17.7	75.1	57.4	3736.	5206.	1470.	661.	3912.	3251.
MC NAIRY	1055.	2386.	1331.	872.	494.	-378.	82.7	20.7	-62.0	17.3	79.3	62.0	1799.	2398.	599.	311.	1901.	1590.
MACON	1004.	2210.	1206.	847.	688.	-159.	84.4	31.1	-53.3	15.6	68.9	53.3	1327.	1931.	604.	207.	1330.	1123.
MADISON	1152.	2471.	1319.	822.	770.	-52.	71.4	31.2	-40.2	28.6	68.8	40.2	7448.	10033.	2585.	2130.	6907.	4777.
MARION	1094.	2383.	1289.	835.	113.	-722.	76.3	4.7	-71.6	23.7	95.3	71.6	1531.	2043.	512.	363.	1946.	1583.
MARSHALL	1242.	2653.	1411.	923.	748.	-175.	74.3	28.2	-46.1	25.7	71.8	46.1	1785.	2774.	989.	459.	1992.	1533.
MAURY	1205.	2624.	1419.	838.	559.	-279.	69.5	21.3	-48.2	30.5	78.7	48.2	4269.	6325.	2056.	1302.	4978.	3676.
MEIGS	1056.	2406.	1350.	616.	270.	-346.	58.3	11.2	-47.1	41.7	88.8	47.1	343.	726.	383.	143.	645.	502.
MONROE	1064.	2211.	1147.	796.	408.	-388.	74.8	18.5	-56.3	25.2	81.5	56.3	2057.	3067.	1010.	518.	2501.	1983.
MONTGOMERY	1257.	2630.	1373.	1018.	415.	-603.	81.0	15.8	-65.2	19.0	84.2	65.2	5118.	7227.	2109.	972.	6087.	5115.
MOORE	1283.	2494.	1211.	1156.	710.	-446.	90.1	28.5	-61.6	9.9	71.5	61.6	488.	571.	83.	48.	408.	360.
MORGAN	914.	2418.	1504.	700.	266.	-434.	76.6	11.0	-65.6	23.4	89.0	65.6	775.	1336.	561.	181.	1189.	1008.
OBION	1166.	2649.	1483.	867.	768.	-99.	74.4	29.0	-45.4	25.6	71.0	45.4	3355.	4663.	1308.	859.	3311.	2452.
OVERTON	991.	2281.	1290.	861.	537.	-324.	86.9	23.5	-63.4	13.1	76.5	63.4	1573.	2080.	507.	206.	1590.	1384.
PERRY	1069.	2410.	1341.	780.	687.	-93.	73.0	28.5	-44.5	27.0	71.5	44.5	585.	816.	231.	158.	583.	425.
PICKETT	1078.	2268.	1190.	1231.	641.	-590.	114.2	28.3	-85.9	-14.2	71.7	85.9	524.	539.	15.	-74.	387.	461.
POLK	957.	2451.	1494.	920.	391.	-529.	96.1	16.0	-80.1	3.9	84.0	80.1	888.	1345.	457.	35.	1130.	1095.
PUTNAM	1128.	2333.	1205.	853.	590.	-263.	75.6	25.3	-50.3	24.4	74.7	50.3	3333.	5200.	1867.	813.	3885.	3072.
RHEA	1102.	2311.	1209.	863.	717.	-146.	78.3	31.0	-47.3	21.7	69.0	47.3	1699.	2238.	539.	369.	1544.	1175.
ROANE	1194.	2646.	1452.	847.	554.	-293.	70.9	20.9	-50.0	29.1	79.1	50.0	4216.	5804.	1588.	1227.	4589.	3362.
ROBERTSON	1066.	2577.	1511.	733.	437.	-296.	68.8	17.0	-51.8	31.2	83.0	51.8	2670.	3674.	1004.	833.	3051.	2218.
RUTHERFORD	1415.	2721.	1306.	948.	562.	-386.	67.0	20.7	-46.3	33.0	79.3	46.3	5393.	8642.	3249.	1780.	6857.	5077.
SCOTT	922.	2085.	1163.	763.	186.	-577.	82.8	8.9	-73.9	17.2	91.1	73.9	1029.	1466.	437.	177.	1335.	1158.
SEQUATCHIE	1165.	2387.	1222.	1208.	524.	-684.	103.7	22.0	-81.7	-3.7	78.0	81.7	650.	684.	34.	-24.	534.	558.
SEVIER	1096.	2450.	1354.	805.	532.	-273.	73.4	21.7	-51.7	26.6	78.3	51.7	2189.	3791.	1602.	582.	2968.	2386.
SHELBY	1326.	2664.	1338.	1156.	816.	-340.	87.2	30.6	-56.6	12.8	69.4	56.6	81288.	109083.	27795.	10405.	75673.	65268.
SMITH	1049.	2352.	1303.	825.	627.	-198.	78.6	26.7	-51.9	21.4	73.3	51.9	1197.	1891.	694.	256.	1387.	1131.

TABLE A-IV (continued)

COUNTY	(6) MEDIAN INCOME REQUIRED 1960	1970	DIFF	(7) ACTUAL 1960	1970	DIFF	(8) LABOR FORCE UTILIZATION INDEX 1960	1970	DIFF	(9) PERCENT UNDEREMPLOYMENT 1960	1970	DIFF	(10) NUMBER OF EMPLOYED CIVILIANS 1960	1970	DIFF	(11) MAN-YEARS ECONOMICALLY UNUTILIZED LABOR 1960	1970	DIFF
STEWART	984.	2384.	1400.	614.	0.	-614.	62.4	0.0	-62.4	37.6	100.0	62.4	528.	752.	224.	199.	752.	553.
SULLIVAN	1481.	2853.	1372.	1224.	313.	-911.	82.6	11.0	-71.6	17.4	89.0	71.6	12460.	17182.	4722.	2168.	15297.	13129.
SUMNER	1188.	2777.	1589.	945.	554.	-391.	79.5	20.0	-59.5	20.5	80.0	59.5	4261.	7923.	3662.	874.	6342.	5468.
TIPTON	847.	2090.	1243.	580.	196.	-384.	68.5	9.4	-59.1	31.5	90.6	59.1	2192.	2776.	584.	690.	2516.	1826.
TROUSDALE	1087.	2233.	1146.	889.	704.	-185.	81.8	31.5	-50.3	18.2	68.5	50.3	620.	896.	276.	113.	613.	500.
UNICOI	1244.	2508.	1264.	1055.	404.	-651.	84.8	16.1	-68.7	15.2	83.9	68.7	1444.	1748.	304.	219.	1466.	1247.
UNION	1061.	2222.	1161.	970.	0.	-970.	91.4	0.0	-91.4	8.6	100.0	91.4	666.	971.	305.	57.	571.	514.
VAN BUREN	880.	2350.	1470.	1031.	608.	-423.	114.0	25.9	-88.1	-14.0	74.1	88.1	314.	623.	309.	-43.	462.	505.
WARREN	1232.	2524.	1292.	981.	630.	-351.	79.6	25.0	-54.6	20.4	75.0	54.6	2621.	4140.	1519.	535.	3107.	2572.
WASHINGTON	1358.	2705.	1347.	1084.	475.	-609.	79.8	17.6	-62.2	20.2	82.4	62.2	6692.	9693.	3001.	1352.	7991.	6639.
WAYNE	1027.	2280.	1253.	796.	604.	-192.	77.5	26.5	-51.0	22.5	73.5	51.0	922.	1789.	867.	207.	1315.	1108.
WEAKLEY	1123.	2395.	1272.	839.	711.	-128.	74.7	29.7	-45.0	25.3	70.3	45.0	2953.	4447.	1494.	747.	3127.	2380.
WHITE	1095.	2414.	1319.	919.	724.	-195.	83.9	30.0	-53.9	16.1	70.0	53.9	1767.	2533.	766.	284.	1773.	1489.
WILLIAMSON	1187.	2790.	1603.	967.	461.	-506.	81.5	16.5	-65.0	18.5	83.5	65.0	2638.	4781.	2143.	488.	3991.	3503.
WILSON	1221.	2718.	1497.	954.	639.	-315.	78.1	23.5	-54.6	21.9	76.5	54.6	3349.	5580.	2231.	733.	4268.	3535.

APPENDIX B

TABLE B-I

INDEPENDENT VARIABLES BY COUNTY APPLIED IN THE SECOND-STAGE ESTIMATE OF THE 1960 EMPLOYED MALE CIVILIAN LABOR FORCE UNDEREMPLOYMENT

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
ANDERSON	3.54	51.20	3.55	10.92	18.01	1.78	21.25	26.20	5.83
BEDFORD	23.28	29.69	5.99	15.93	16.20	12.61	14.54	21.40	3.77
BENTON	20.39	17.59	15.55	16.19	13.63	11.10	26.20	12.44	10.63
BLEDSOE	36.58	25.47	2.65	8.90	11.81	16.46	36.18	0.00	5.41
BLOUNT	8.14	44.79	4.42	16.18	15.55	5.47	25.53	18.13	6.85
BRADLEY	8.30	45.14	5.14	18.36	14.02	5.03	23.79	19.88	4.88
CAMPBELL	15.37	23.04	7.70	6.28	18.88	6.24	31.91	10.40	12.73
CANNON	39.89	21.73	3.72	9.48	13.52	24.81	24.88	0.00	3.29
CARROLL	34.76	18.39	7.94	14.68	15.35	18.95	22.69	7.19	3.20
CARTER	8.42	46.40	4.35	14.27	15.05	7.53	29.16	12.39	10.77
CHEATHAM	28.59	23.68	6.24	10.88	11.94	15.93	34.96	0.00	4.65
CHESTER	42.08	13.05	6.36	15.16	13.25	20.60	14.59	12.73	3.78
CLAIBORNE	50.64	9.32	3.88	12.97	12.13	26.41	23.65	0.00	5.38
CLAY	55.46	12.70	2.00	10.07	9.78	28.25	21.54	0.00	2.00
COCKE	29.84	35.32	4.63	13.30	7.35	16.77	19.27	13.30	5.43
COFFEE	15.81	18.68	3.84	13.01	35.72	8.80	12.90	27.50	5.19
CROCKETT	60.67	6.08	3.43	11.53	9.20	28.92	20.32	0.00	4.45
CUMBERLAND	20.17	23.17	5.17	16.07	12.90	13.23	25.62	11.86	6.90
DAVIDSON	1.66	27.83	10.38	21.15	28.13	0.66	5.57	41.67	3.66
DECATUR	33.87	14.22	8.84	14.40	13.74	17.37	31.80	0.00	9.53
DE KALB	44.42	13.50	3.10	13.25	11.70	23.06	26.25	0.00	6.88
DICKSON	21.14	26.45	7.28	14.85	13.68	13.73	23.54	12.38	6.61
DYER	35.22	17.25	5.48	18.75	14.46	14.70	14.10	19.75	5.30
FAYETTE	66.38	6.65	3.33	8.21	6.73	34.15	15.51	0.00	2.77
FENTRESS	28.09	24.78	4.79	15.11	13.18	12.53	36.63	0.00	11.45
FRANKLIN	24.00	18.92	7.45	15.01	24.86	12.77	28.85	9.02	5.58
GIBSON	35.12	17.58	5.55	17.97	13.55	17.24	12.27	18.63	6.55

TABLE B-I (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
GILES	36.80	18.67	4.60	15.45	14.63	21.06	14.16	13.40	3.18
GRAINGER	44.66	23.00	3.45	7.97	7.55	28.37	21.61	0.00	5.57
GREENE	37.76	24.77	3.76	13.58	12.25	20.89	15.04	13.23	6.77
GRUNDY	16.61	25.55	6.30	12.89	14.15	5.29	44.53	0.00	18.44
HAMBLEN	11.91	44.35	5.33	16.21	12.89	6.88	11.01	30.78	4.17
HAMILTON	1.88	38.21	9.63	18.13	23.16	0.65	9.67	37.27	4.58
HANCOCK	63.16	10.72	2.19	5.98	6.05	38.35	10.69	0.00	3.19
HARDEMAN	40.68	20.31	6.30	10.95	14.99	19.63	21.69	7.24	3.29
HARDIN	28.00	20.57	4.99	17.27	14.71	13.18	24.62	11.79	8.30
HAWKINS	31.46	27.78	8.63	12.07	10.71	19.92	24.79	4.74	4.92
HAYWOOD	66.77	5.77	3.63	6.85	9.20	32.89	5.63	10.54	2.62
HENDERSON	38.00	18.88	5.31	14.86	11.94	21.28	16.66	11.64	4.49
HENRY	24.91	22.36	8.53	16.99	15.88	13.15	15.83	19.43	4.40
HICKMAN	28.47	37.41	5.38	8.50	9.81	16.90	33.17	0.00	3.97
HOUSTON	21.30	29.47	8.22	10.61	18.16	13.00	36.94	0.00	5.36
HUMPHREYS	18.41	20.40	19.49	12.36	11.74	11.30	26.57	12.17	8.42
JACKSON	60.85	9.56	2.81	8.00	11.26	31.97	17.58	0.00	2.99
JEFFERSON	25.20	30.17	3.77	11.30	11.51	15.96	23.68	10.31	4.04
JOHNSON	52.85	12.91	6.36	7.88	11.83	27.58	21.90	0.00	6.86
KNOX	3.16	29.24	10.27	22.59	23.29	1.66	13.73	32.53	5.83
LAKE	59.55	9.34	2.50	12.74	11.85	24.37	24.90	0.00	4.04
LAUDERDALE	54.76	6.94	4.13	13.50	13.13	23.75	18.12	7.99	5.19
LAWRENCE	21.65	40.57	3.69	13.46	10.93	17.32	18.45	13.58	5.37
LEWIS	17.75	30.63	4.47	12.63	14.23	12.25	37.31	0.00	6.74
LINCOLN	36.51	17.65	3.72	15.31	13.59	20.56	15.30	13.16	2.90
LOUDON	15.47	39.17	6.18	13.95	11.52	9.56	21.92	17.46	7.04
MC MINN	17.02	37.41	8.74	14.83	13.12	10.64	16.34	21.79	5.35
MC NAIRY	39.43	20.85	5.18	12.23	11.85	20.18	29.22	0.00	7.97
MACON	54.92	13.28	4.35	10.42	9.51	31.00	18.83	0.00	2.66
MADISON	18.57	21.27	11.79	19.72	19.77	9.84	9.79	28.21	4.70
MARION	8.04	29.42	8.70	12.78	11.32	3.66	36.57	9.62	10.46

TABLE B-I (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
MARSHALL	26.61	34.68	5.71	12.90	11.84	14.81	16.06	17.28	3.10
MAURY	20.77	31.18	6.28	15.16	12.82	11.21	14.18	23.28	3.50
MEIGS	30.47	23.27	11.98	7.67	7.95	21.12	29.63	0.19	8.82
MONROE	26.51	30.82	4.06	13.67	12.89	16.11	25.14	8.36	8.25
MONTGOMERY	18.75	18.55	5.88	20.36	24.42	7.35	23.49	22.87	3.76
MOORE	33.57	24.22	2.21	8.94	13.29	26.40	23.60	0.29	2.14
MORGAN	12.62	28.14	10.27	11.79	14.76	7.15	45.35	0.00	11.38
OBION	30.12	18.53	7.61	20.01	14.10	13.41	15.43	19.49	5.89
OVERTON	36.57	19.24	3.69	12.18	10.50	18.12	22.32	9.01	9.04
PERRY	34.62	17.32	7.93	14.57	9.46	15.17	34.19	0.00	8.15
PICKETT	44.94	20.27	1.42	10.37	9.11	33.40	17.92	-1.69	4.87
POLK	11.99	37.43	6.31	11.04	8.87	7.38	42.09	0.00	8.29
PUTNAM	19.73	21.91	4.82	19.61	20.49	11.73	24.74	13.95	6.27
RHEA	15.58	26.74	14.68	15.03	16.60	7.08	30.83	10.48	8.16
ROANE	6.00	40.88	10.22	16.62	13.26	4.18	27.55	17.09	8.76
ROBERTSON	37.03	22.06	5.35	14.72	11.80	18.61	15.02	15.84	4.41
RUTHERFORD	19.59	18.40	5.89	18.93	24.42	8.90	22.15	20.59	3.97
SCOTT	7.60	27.93	10.44	12.22	13.89	5.03	44.81	0.00	3.99
SEQUATCHIE	20.05	33.41	5.97	10.20	11.88	10.06	39.48	0.00	9.02
SEVIER	26.32	23.55	4.04	13.54	15.92	18.12	25.62	5.55	4.91
SHELBY	3.01	26.54	12.84	22.70	25.22	1.09	5.54	41.53	4.14
SMITH	51.25	9.99	5.04	10.09	10.82	29.00	20.58	0.00	3.77
STEWART	31.53	17.88	5.65	12.21	17.02	18.05	31.96	0.00	4.96
SULLIVAN	6.21	44.09	7.89	16.58	14.10	3.95	22.24	22.26	4.90
SUMNER	27.93	24.88	9.93	14.44	11.90	15.98	23.32	10.32	4.38
TIPTON	45.86	13.21	5.66	12.52	12.42	23.55	17.27	8.71	4.88
TROUSDALE	51.47	13.27	3.20	11.85	9.87	29.16	21.14	0.00	2.21
UNICOI	18.61	20.75	28.23	12.33	10.09	9.43	29.37	9.77	8.12
UNION	39.74	27.18	3.85	6.80	8.39	25.58	24.25	0.00	5.34
VAN BUREN	37.06	27.02	4.37	10.56	7.73	17.76	31.71	0.19	8.32
WARREN	29.04	25.52	5.78	15.40	13.10	13.38	17.50	18.60	3.63

TABLE B-I (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
WASHINGTON	14.38	29.92	6.41	18.11	19.79	8.87	17.95	23.70	6.48
WAYNE	24.51	37.83	6.07	10.20	9.14	17.15	32.85	0.00	8.31
WEAKLEY	34.28	16.45	6.24	16.85	15.06	18.41	21.10	9.83	4.10
WHITE	31.21	27.08	3.98	15.89	9.56	18.24	16.68	13.61	5.78
WILLIAMSON	29.74	22.96	6.37	16.41	13.95	17.97	18.57	12.69	3.33
WILSON	24.91	23.37	6.36	16.49	16.51	14.92	15.85	18.27	3.30

TABLE B-II

INDEPENDENT VARIABLES BY COUNTY APPLIED IN THE SECOND-STAGE ESTIMATE OF THE 1960 EMPLOYED FEMALE CIVILIAN LABOR FORCE UNDEREMPLOYMENT

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
ANDERSON	0.29	31.37	2.85	19.10	45.68	1.76	21.80	27.22	5.29
BEDFORD	3.15	46.40	2.35	13.07	34.41	12.08	15.56	23.81	5.10
BENTON	4.12	41.34	1.01	14.85	38.31	10.33	26.36	13.58	8.50
BLEDSOE	1.79	57.46	0.00	10.30	30.45	15.23	32.12	0.00	7.70
BLOUNT	1.39	17.17	1.59	24.05	54.74	4.99	26.09	19.78	4.77
BRADLEY	1.68	42.97	2.46	17.98	34.65	4.61	24.31	22.38	7.65
CAMPBELL	0.82	33.55	1.63	34.07	29.53	6.17	33.47	11.81	6.27
CANNON	1.62	62.99	0.76	10.28	23.98	24.10	26.22	0.00	3.47
CARROLL	3.58	50.34	1.68	13.13	30.98	17.80	25.13	8.24	4.44
CARTER	0.73	30.57	2.61	21.55	43.81	7.07	30.04	13.82	11.55
CHEATHAM	1.55	31.83	2.25	16.06	47.18	15.22	33.89	0.00	4.48
CHESTER	7.30	38.92	1.08	13.69	39.01	20.34	16.35	15.39	3.67
CLAIBORNE	11.35	17.91	2.02	22.04	46.68	25.77	24.17	0.00	3.31
CLAY	12.40	48.49	1.11	11.29	26.71	28.45	21.76	0.00	3.75
COCKE	9.01	16.40	1.15	33.94	39.23	16.44	19.96	14.26	11.72
COFFEE	2.54	33.77	2.20	17.60	43.33	8.57	13.71	28.52	6.02
CROCKETT	12.66	36.10	1.43	13.55	35.92	27.59	23.17	0.00	5.67
CUMBERLAND	4.79	23.46	3.59	23.38	43.50	11.64	25.11	12.53	6.35
DAVIDSON	0.27	17.34	3.81	20.62	57.05	0.61	5.46	46.03	3.33
DECATUR	0.34	54.66	2.27	16.02	26.36	17.18	33.65	0.00	5.48
DE KALB	2.84	62.86	0.83	10.58	22.61	22.45	28.23	0.00	2.18
DICKSON	1.21	42.57	1.81	16.57	37.63	12.84	23.21	14.31	3.43
DYER	3.34	26.15	1.16	22.19	46.42	13.84	15.03	22.57	5.54
FAYETTE	20.87	7.10	0.84	16.58	54.32	32.62	17.73	0.00	4.89
FENTRESS	1.73	62.73	0.30	8.26	26.67	12.61	38.24	0.00	3.71
FRANKLIN	1.44	31.34	2.31	17.32	46.87	12.25	26.89	10.21	4.67
GIBSON	6.02	31.74	2.59	18.14	41.26	16.58	13.83	21.45	14.51

TABLE B-II (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
GILES	7.54	34.31	1.26	14.88	41.85	19.96	15.30	16.13	3.01
GRAINGER	15.65	29.22	1.22	18.22	34.35	27.93	22.09	0.00	6.25
GREENE	6.52	26.70	1.35	18.91	46.00	20.51	15.68	14.66	13.18
GRUNDY	3.06	32.36	0.58	18.80	43.44	5.88	44.30	0.00	7.01
HAMBLEN	1.56	31.58	1.62	21.96	42.75	6.75	11.09	33.48	7.86
HAMILTON	0.62	23.61	3.06	19.27	52.79	0.69	9.81	41.91	4.80
HANCOCK	20.26	3.02	0.00	22.84	50.43	38.93	12.03	0.00	0.00
HARDEMAN	8.62	13.45	1.75	17.94	58.23	18.92	24.25	8.27	5.14
HARDIN	2.42	53.20	2.10	13.11	28.32	12.89	24.51	13.01	9.65
HAWKINS	7.86	18.87	2.33	19.41	50.60	19.26	25.79	5.50	5.55
HAYWOOD	29.74	12.26	3.22	17.95	36.66	32.54	5.75	12.65	3.07
HENDERSON	5.77	46.25	1.49	15.12	31.37	19.98	17.61	12.83	7.58
HENRY	2.22	32.34	3.46	17.54	44.00	12.57	16.58	22.44	4.38
HICKMAN	3.36	42.12	2.52	19.64	31.51	15.94	33.98	0.00	7.14
HOUSTON	2.37	18.99	0.00	34.12	44.51	11.74	38.32	0.00	7.27
HUMPHREYS	2.10	32.23	2.20	18.92	44.54	10.68	26.34	12.94	6.46
JACKSON	2.34	44.88	3.07	15.79	33.92	30.71	19.74	0.00	5.96
JEFFERSON	3.31	30.54	3.67	18.74	43.53	16.00	23.19	10.85	8.84
JOHNSON	10.52	13.29	0.79	25.40	49.21	27.23	23.29	0.00	6.47
KNOX	0.39	23.40	3.31	21.67	50.45	1.72	13.94	36.42	4.58
LAKE	8.70	12.52	3.65	31.13	44.00	21.86	28.88	0.00	13.12
LAUDERDALE	10.91	9.83	3.07	21.04	54.67	23.10	17.71	9.32	7.81
LAWRENCE	6.05	29.47	1.84	20.81	41.66	16.39	19.16	15.09	6.32
LEWIS	0.00	53.36	0.77	16.70	29.17	10.93	39.51	0.00	11.00
LINCOLN	7.76	39.51	0.81	14.06	37.11	19.98	15.61	15.39	4.00
LOUDON	1.40	48.91	1.52	17.75	30.11	9.19	22.33	19.54	4.30
MC MINN	2.42	40.91	1.44	17.31	37.59	10.03	17.47	23.74	5.80
MC NAIRY	3.85	59.06	1.38	11.85	23.63	20.74	29.85	0.00	8.49
MACON	9.07	47.77	2.11	14.07	26.97	29.93	20.24	0.00	12.41
MADISON	4.96	13.63	3.32	20.04	57.50	9.64	9.77	32.76	5.98
MARION	0.27	22.93	2.14	25.67	47.93	3.45	36.70	10.02	6.30

TABLE B-II (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
MARSHALL	4.03	30.60	2.37	19.28	43.00	14.71	16.83	20.31	4.08
MAURY	2.19	18.60	3.35	20.12	54.56	10.46	14.88	25.99	6.61
MEIGS	12.42	20.91	2.42	18.18	46.06	20.19	29.05	-0.19	9.02
MONROE	3.25	36.04	1.90	16.22	42.59	15.31	25.66	9.41	9.70
MONTGOMERY	0.72	19.92	2.99	20.84	54.81	6.98	14.60	24.70	6.30
MOORE	2.54	57.84	0.00	11.02	27.75	25.48	24.52	-0.29	3.94
MORGAN	3.33	33.02	3.20	15.58	44.87	6.45	41.05	0.00	4.44
OBION	2.50	30.89	2.90	21.04	42.24	13.21	15.85	22.61	6.73
OVERTON	1.86	59.91	0.46	11.66	26.11	18.49	21.85	10.20	5.30
PERRY	4.43	45.21	0.00	21.63	28.72	15.59	35.05	0.00	11.36
PICKETT	0.00	74.95	0.79	5.72	18.54	30.78	19.52	0.07	9.34
POLK	3.26	38.84	1.40	18.60	36.98	6.31	44.23	0.00	11.29
PUTNAM	0.66	39.96	1.72	13.99	43.55	10.92	25.91	12.74	5.66
RHEA	1.95	45.36	1.65	15.45	35.23	6.88	33.15	11.58	12.01
ROANE	1.56	41.30	3.51	17.42	36.01	3.80	28.17	19.21	4.87
ROBERTSON	2.41	27.80	1.34	18.43	49.87	17.82	14.83	17.89	5.35
RUTHERFORD	2.62	15.89	2.94	18.98	58.92	8.53	17.25	22.58	3.95
SCOTT	2.35	29.62	2.86	20.74	43.21	4.74	45.42	0.00	2.92
SEQUATCHIE	2.52	58.27	0.00	14.02	24.57	10.08	40.39	0.00	5.66
SEVIER	3.81	23.35	1.22	27.02	44.21	17.20	27.15	6.36	8.37
SHELBY	0.67	11.60	3.56	24.62	58.71	1.10	4.46	46.28	4.94
SMITH	3.06	45.28	2.38	18.61	29.99	27.83	22.59	0.00	2.37
STEWART	4.51	17.01	1.84	26.23	48.77	16.75	33.24	0.00	6.05
SULLIVAN	1.06	32.00	3.67	21.20	41.54	4.02	22.58	24.94	4.14
SUMNER	1.75	39.67	3.29	14.50	40.69	15.16	23.72	11.50	5.54
TIPTON	10.69	7.60	1.88	23.26	55.82	22.43	18.20	9.84	7.86
TROUSDALE	4.41	33.82	1.31	14.54	45.26	26.76	22.93	0.00	1.27
UNICOI	2.73	33.05	3.67	17.93	42.61	9.29	30.63	11.51	8.20
UNION	9.93	40.44	0.00	13.78	35.85	26.14	24.03	0.00	3.06
VAN BUREN	2.94	57.52	1.31	11.44	26.80	15.85	34.68	-0.19	7.37
WARREN	5.04	45.59	2.28	15.13	31.64	13.08	17.02	20.41	6.43

TABLE B-II (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
WASHINGTON	1.80	18.87	3.24	20.81	54.34	8.66	18.41	22.41	6.24
WAYNE	1.95	46.90	1.83	16.51	32.80	15.54	34.46	0.00	17.83
WEAKLEY	2.75	45.04	1.88	16.14	33.74	18.56	21.68	10.43	6.67
WHITE	1.87	55.70	0.94	11.86	28.93	18.44	17.69	15.34	5.61
WILLIAMSON	8.17	14.85	2.54	16.80	56.74	17.36	18.49	14.92	4.00
WILSON	1.68	30.90	3.33	19.99	43.49	14.81	16.42	19.72	4.70

TABLE B-III

INDEPENDENT VARIABLES BY COUNTY APPLIED IN THE SECOND-STAGE ESTIMATE OF THE 1960 EMPLOYED MALE AND FEMALE CIVILIAN LABOR FORCE UNDEREMPLOYMENT

COUNTY	X10	X11	X12	X13	X14	X15
ANDERSON	3.70	14.30	33.26	4.78	5.36	10.00
BEDFORD	0.40	21.30	27.23	11.16	9.37	11.00
BENTON	1.80	22.10	26.06	12.80	9.19	12.00
BLEDSOE	0.70	33.00	31.52	9.12	8.32	9.00
BLOUNT	7.10	15.90	29.95	7.26	7.30	14.00
BRADLEY	2.10	18.30	30.48	7.27	7.20	11.00
CAMPBELL	1.30	41.90	30.88	9.34	8.63	11.00
CANNON	2.20	19.20	26.23	10.52	8.79	8.00
CARROLL	0.20	24.00	25.30	13.30	10.82	10.00
CARTER	6.70	29.00	29.31	7.44	6.69	11.00
CHEATHAM	1.80	17.90	29.35	10.60	8.59	7.00
CHESTER	1.00	24.60	26.83	11.45	9.41	11.00
CLAIBORNE	1.60	38.90	29.61	9.51	9.34	10.00
CLAY	0.40	36.70	29.77	9.69	8.78	7.00
COCKE	0.50	30.80	31.33	8.18	8.04	8.00
COFFEE	1.00	17.60	31.29	7.55	6.61	11.00
CROCKETT	0.20	32.10	29.75	11.85	9.87	9.00
CUMBERLAND	1.60	31.00	32.75	9.17	7.58	12.00
DAVIDSON	15.00	23.00	28.83	7.92	0.77	16.00
DECATUR	0.70	34.30	26.68	12.41	8.53	10.00
DE KALB	0.20	30.50	26.58	12.01	10.02	8.00
DICKSON	0.30	31.20	28.31	11.50	10.83	11.00
DYER	0.60	30.60	28.36	11.48	9.62	12.00
FAYETTE	1.20	46.20	39.63	8.37	6.88	8.00
FENTRESS	1.20	40.90	34.41	8.10	9.33	9.00
FRANKLIN	0.30	19.00	30.77	9.21	8.38	12.00
GIBSON	0.30	30.10	27.61	12.41	10.94	12.00

TABLE B-III (continued)

COUNTY	X10	X11	X12	X13	X14	X15
GILES	0.70	24.10	26.39	12.77	11.56	13.00
GRAINGER	1.20	37.60	29.58	9.20	7.04	10.00
GREENE	1.90	16.40	28.22	8.29	7.54	11.00
GRUNDY	0.80	29.90	33.06	9.38	7.73	10.00
HAMBLEN	0.60	19.80	29.27	7.22	6.71	10.00
HAMILTON	12.20	25.40	29.89	7.83	8.01	14.00
HANCOCK	0.60	40.20	31.22	8.66	7.73	6.00
HARDEMAN	0.60	32.30	29.92	11.86	8.92	9.00
HARDIN	0.60	29.60	29.23	9.90	8.39	9.00
HAWKINS	2.50	22.80	29.51	8.88	7.52	9.00
HAYWOOD	0.50	35.90	37.25	9.06	8.29	7.00
HENDERSON	0.50	26.60	28.04	11.17	9.12	9.00
HENRY	0.40	25.30	25.81	14.27	10.86	13.00
HICKMAN	1.70	20.40	28.00	11.22	8.01	9.00
HOUSTON	5.10	35.20	28.24	13.25	10.64	10.00
HUMPHREYS	1.00	17.70	29.57	10.66	10.08	11.00
JACKSON	0.60	29.00	26.64	11.92	11.26	8.00
JEFFERSON	1.10	17.10	26.52	8.72	8.05	10.00
JOHNSON	0.80	33.10	29.29	10.71	8.55	9.00
KNOX	11.60	21.50	28.23	8.12	7.47	15.00
LAKE	0.30	33.80	33.93	8.56	8.25	10.00
LAUDERDALE	0.50	32.10	31.17	10.42	9.66	9.00
LAWRENCE	3.90	26.20	30.10	9.75	8.88	10.00
LEWIS	0.40	28.20	30.52	25.81	9.25	8.00
LINCOLN	0.60	24.00	28.45	9.93	9.95	9.00
LOUDON	2.00	19.00	28.95	8.52	8.54	10.00
MC MINN	1.50	22.00	29.13	9.10	8.44	11.00
MC NAIRY	1.00	30.10	27.84	11.66	8.40	7.00
MACON	0.80	21.80	26.81	11.28	8.03	8.00
MADISON	5.50	28.40	29.57	10.91	9.45	15.00
MARION	1.00	25.30	33.39	8.00	8.08	12.00

TABLE B-III (continued)

COUNTY	X10	X11	X12	X13	X14	X15
MARSHALL	0.60	18.00	27.17	11.74	10.26	9.00
MAURY	2.80	21.40	29.50	9.63	9.78	13.00
MEIGS	1.50	17.30	32.60	8.08	8.91	11.00
MONROE	1.80	22.00	30.66	9.24	9.18	10.00
MONTGOMERY	3.60	21.80	30.24	6.27	5.98	12.00
MOORE	0.30	14.90	26.26	10.86	9.84	8.00
MORGAN	2.40	33.90	31.60	8.26	6.29	11.00
OBION	0.60	24.30	26.03	13.38	9.87	13.00
OVERTON	2.20	43.90	29.37	10.85	7.98	10.00
PERRY	0.90	29.10	25.28	11.64	8.72	10.00
PICKETT	2.90	26.40	30.90	9.32	7.00	6.00
POLK	1.10	31.60	30.88	8.84	8.63	10.00
PUTNAM	0.40	20.90	26.34	10.26	7.25	12.00
RHEA	1.70	26.20	30.49	9.43	8.76	11.00
ROANE	1.00	19.40	32.05	6.94	6.80	11.00
ROBERTSON	1.60	25.60	29.26	10.91	8.63	11.00
RUTHERFORD	0.90	16.80	30.73	7.70	7.47	13.00
SCOTT	0.90	34.10	34.54	7.78	6.16	6.00
SEQUATCHIE	0.20	24.90	33.12	8.71	8.79	9.00
SEVIER	2.20	25.20	29.52	8.15	7.09	10.00
SHELBY	17.90	25.90	32.10	7.31	7.44	17.00
SMITH	0.30	18.90	25.33	12.85	9.29	9.00
STEWART	3.20	35.60	27.41	13.08	9.30	11.00
SULLIVAN	5.30	15.60	30.14	6.18	6.05	12.00
SUMNER	0.90	24.40	29.07	10.33	10.27	12.00
TIPTON	0.70	32.90	35.54	8.27	5.81	8.00
TROUSDALE	0.50	25.40	27.17	12.37	10.18	9.00
UNICOI	0.60	23.70	29.96	9.12	8.16	11.00
UNION	4.00	26.10	30.44	9.04	6.83	7.00
VAN BUREN	0.60	20.20	32.91	8.69	8.72	9.00
WARREN	0.60	28.40	28.93	10.28	8.83	11.00

TABLE B-III (continued)

COUNTY	X10	X11	X12	X13	X14	X15
WASHINGTON	5.30	24.60	27.52	9.45	7.91	14.00
WAYNE	2.10	33.10	31.32	9.22	8.73	9.00
WEAKLEY	0.50	23.90	23.34	15.42	10.86	11.00
WHITE	0.70	25.40	28.34	11.27	9.76	8.00
WILLIAMSON	3.10	22.30	31.19	9.53	8.83	12.00
WILSON	1.10	21.00	27.70	11.49	10.01	12.00

TABLE B-IV

INDEPENDENT VARIABLES BY COUNTY APPLIED IN THE SECOND-STAGE ESTIMATE OF THE 1970 EMPLOYED MALE CIVILIAN LABOR FORCE UNDEREMPLOYMENT

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
ANDERSON	1.67	44.45	5.76	12.21	22.61	2.29	18.94	27.18	4.31
BEDFORD	10.15	35.73	5.90	14.97	19.70	9.94	15.17	22.92	2.74
BENTON	6.83	29.35	12.17	13.71	16.30	6.98	29.80	11.71	5.03
BLEDSOE	18.47	28.96	4.26	13.67	16.44	11.50	41.16	0.00	3.90
BLOUNT	2.78	42.89	6.57	16.48	18.98	3.88	24.74	20.27	3.10
BRADLEY	3.84	48.89	3.69	15.66	17.46	2.67	21.58	24.16	2.91
CAMPBELL	4.56	20.50	8.27	14.20	21.33	4.30	31.36	12.01	11.15
CANNON	16.57	32.16	7.32	12.09	15.70	15.83	32.66	0.00	5.66
CARROLL	9.49	39.57	9.00	15.39	15.47	10.32	22.58	15.65	3.65
CARTER	2.71	45.54	7.22	12.94	18.39	5.41	29.74	13.43	5.85
CHEATHAM	8.85	32.16	9.42	13.73	13.91	9.52	40.87	0.00	1.99
CHESTER	11.72	30.40	7.62	16.64	18.52	10.84	21.06	16.65	2.19
CLAIBORNE	17.80	25.03	6.04	16.63	16.38	19.93	28.58	0.00	7.41
CLAY	26.96	23.04	4.87	7.61	16.62	21.36	27.05	0.00	7.58
COCKE	9.99	53.92	4.23	12.35	9.33	10.80	24.19	13.42	6.56
COFFEE	6.24	22.19	5.86	13.65	40.31	6.34	11.73	30.54	3.43
CROCKETT	26.06	28.24	5.42	13.64	13.34	13.10	35.33	0.00	4.54
CUMBERLAND	7.26	33.07	7.58	15.53	17.90	5.37	31.84	12.11	6.54
DAVIDSON	1.11	24.97	9.55	21.61	31.80	0.22	1.10	46.30	3.44
DECATUR	10.87	35.64	9.62	15.78	13.85	8.81	40.87	0.00	7.06
DE KALB	20.22	29.71	4.69	10.06	15.89	14.97	20.78	12.29	2.85
DICKSON	8.29	33.37	9.95	13.76	16.97	7.94	29.08	11.94	2.86
DYER	16.10	30.67	4.77	20.19	15.98	6.05	19.32	22.28	3.51
FAYETTE	30.45	23.29	5.26	13.43	15.82	17.01	31.45	0.00	5.82
FENTRESS	21.52	27.69	4.56	11.70	20.33	13.48	35.63	0.00	8.02
FRANKLIN	11.22	21.12	6.57	15.65	33.01	6.32	33.81	9.99	3.97
GIBSON	13.81	40.22	5.66	14.59	14.32	8.40	16.15	23.12	3.55

TABLE B-IV (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
GILES	13.67	38.31	5.57	15.65	14.52	11.93	22.10	14.48	2.49
GRAINGER	17.95	38.93	3.98	11.66	8.55	21.14	28.55	0.00	3.73
GREENE	17.15	36.84	5.61	14.65	13.91	13.89	21.17	13.38	8.16
GRUNDY	13.42	28.92	5.18	14.17	14.97	5.87	43.61	0.00	3.87
HAMBLEN	5.95	46.80	6.00	16.89	14.38	4.33	19.27	24.75	3.03
HAMILTON	1.28	37.00	10.42	18.29	22.86	0.94	8.55	37.60	2.41
HANCOCK	27.83	30.68	1.47	10.08	17.32	34.71	14.57	0.00	6.89
HARDEMAN	12.84	36.18	6.52	13.25	21.19	8.65	25.56	13.78	5.14
HARDIN	10.96	35.16	7.91	17.04	14.91	7.53	26.75	14.29	5.06
HAWKINS	10.23	46.05	7.13	11.24	10.53	11.74	23.39	14.11	4.02
HAYWOOD	32.25	20.69	5.48	15.66	14.48	15.09	16.45	16.35	3.45
HENDERSON	15.74	37.56	5.90	15.90	11.65	13.32	21.89	13.30	3.54
HENRY	11.21	32.78	7.70	17.46	18.49	9.10	19.77	19.10	3.86
HICKMAN	10.83	39.63	7.61	12.70	14.16	9.39	30.33	9.85	5.69
HOUSTON	6.56	29.08	22.67	7.51	11.30	7.84	41.51	0.00	3.24
HUMPHREYS	5.69	35.58	15.47	12.42	12.52	5.15	30.79	13.36	1.84
JACKSON	30.72	27.78	4.69	11.37	10.32	25.06	24.19	0.00	5.85
JEFFERSON	11.72	35.88	4.80	12.95	14.61	9.86	29.37	9.47	3.53
JOHNSON	17.37	40.27	5.80	10.25	9.73	20.53	28.06	0.00	5.34
KNOX	1.82	24.20	10.74	22.37	29.16	1.29	13.86	32.54	3.11
LAKE	25.96	26.94	3.62	13.90	19.04	3.71	44.33	0.00	11.95
LAUDERDALE	23.81	27.10	5.80	17.05	16.74	9.86	28.49	11.04	4.76
LAWRENCE	6.55	43.64	7.50	15.04	13.56	9.58	24.79	14.45	3.81
LEWIS	8.36	37.33	8.55	13.26	14.32	6.60	17.35	23.98	6.39
LINCOLN	18.64	27.33	4.56	15.93	20.66	13.39	22.04	13.16	3.65
LOUDON	6.36	40.99	7.20	14.37	17.42	6.31	24.43	17.14	4.51
MC MINN	6.93	42.77	8.35	14.82	15.04	5.66	21.87	20.57	2.63
MC NAIRY	11.49	34.55	7.59	16.23	17.53	13.44	26.41	8.71	8.52
MACON	29.97	29.22	6.34	10.75	13.08	21.85	17.04	10.04	4.54
MADISON	6.93	28.14	8.94	21.26	23.01	5.45	13.79	27.76	3.25
MARION	4.22	38.65	12.86	14.02	12.64	3.05	37.38	8.56	4.61

TABLE B-IV (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
MARSHALL	11.98	44.13	5.11	14.97	12.21	9.57	19.27	19.03	2.55
MAURY	9.29	30.82	7.82	19.36	16.23	6.66	14.38	27.18	4.00
MEIGS	14.32	39.03	12.14	6.37	8.29	10.67	38.93	0.00	4.17
MONROE	13.89	37.74	4.97	14.42	15.78	11.69	23.31	13.64	6.39
MONTGOMERY	6.77	24.27	9.88	22.39	27.46	4.31	12.90	36.56	3.93
MOORE	21.65	34.85	5.05	10.49	13.40	18.55	32.37	0.00	1.15
MORGAN	5.32	35.37	9.28	10.14	20.54	5.94	45.30	0.07	9.97
OBION	14.72	30.11	6.54	19.83	19.56	8.64	16.27	22.93	2.92
OVERTON	14.02	35.16	3.75	14.56	17.47	12.01	27.79	9.58	7.06
PERRY	10.54	50.58	6.40	9.69	11.47	9.81	39.29	0.00	10.25
PICKETT	18.39	30.22	4.53	10.22	16.64	24.85	24.85	0.00	9.39
POLK	5.01	37.88	8.07	6.68	9.32	4.12	44.71	0.00	2.97
PUTNAM	6.25	27.91	5.67	19.45	25.79	6.20	23.35	20.62	4.33
RHEA	7.24	41.86	10.64	11.97	17.11	9.59	27.04	11.88	4.58
ROANE	2.22	46.46	8.76	14.57	14.43	2.70	20.48	25.05	5.65
ROBERTSON	23.82	30.06	6.79	13.81	12.32	14.04	18.97	15.59	2.88
RUTHERFORD	7.50	26.38	6.54	18.52	27.93	4.81	16.75	27.76	3.02
SCOTT	9.11	33.97	11.39	15.39	17.96	5.21	36.26	7.67	8.02
SEQUATCHIE	8.29	35.50	6.44	11.24	11.52	5.21	44.43	0.00	4.04
SEVIER	7.89	27.35	6.08	19.43	19.80	9.13	35.59	4.20	3.60
SHELBY	1.54	24.99	11.56	23.27	29.52	0.54	2.35	45.13	4.08
SMITH	29.02	22.24	5.68	15.16	9.51	18.00	31.03	0.00	5.73
STEWART	15.96	22.76	18.82	10.81	20.73	28.80	21.04	0.00	5.42
SULLIVAN	2.84	45.67	8.05	16.42	15.38	3.05	18.90	26.31	3.33
SUMNER	8.61	35.99	8.19	16.90	15.73	7.60	17.19	24.47	2.42
TIPTON	18.40	27.84	7.25	18.67	16.16	11.08	28.33	9.74	4.64
TROUSDALE	31.86	34.42	3.84	12.52	6.97	23.06	25.68	0.00	3.83
UNICOI	7.90	38.47	19.79	11.60	13.45	6.50	19.63	22.45	7.25
UNION	18.53	33.64	7.70	9.80	14.65	23.32	26.28	0.00	3.94
VAN BUREN	13.25	47.66	6.68	4.34	11.36	13.94	35.84	0.00	4.37
WARREN	13.55	37.81	6.05	16.56	14.59	8.13	21.99	18.42	4.02

TABLE B-IV (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
WASHINGTON	5.65	33.30	5.52	17.55	23.74	5.57	21.39	22.76	3.69
WAYNE	4.16	53.46	11.01	11.82	10.60	10.42	38.70	0.00	4.27
WEAKLEY	17.31	28.89	5.51	15.36	21.29	11.55	23.86	13.88	2.65
WHITE	14.03	40.27	4.79	14.59	15.44	15.40	18.42	13.92	5.54
WILLIAMSON	13.27	24.07	8.46	19.77	21.03	8.88	27.58	12.71	1.92
WILSON	9.38	34.76	7.64	17.82	16.54	8.40	24.58	15.72	2.22

TABLE B-V

INDEPENDENT VARIABLES BY COUNTY APPLIED IN THE SECOND-STAGE ESTIMATE OF THE 1970 EMPLOYED FEMALE CIVILIAN LABOR FORCE UNDEREMPLOYMENT

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
ANDERSON	0.60	22.01	1.91	21.13	53.57	2.66	19.68	29.26	7.57
BEDFORD	1.63	44.57	2.67	12.85	37.00	9.97	15.94	26.05	3.47
BENTON	0.56	46.03	1.05	18.96	31.91	6.14	31.96	13.39	7.40
BLEDSOE	3.18	48.22	0.51	10.43	33.59	10.30	37.04	0.00	4.38
BLOUNT	0.24	20.64	3.42	21.42	53.15	3.71	25.52	21.88	6.51
BRADLEY	1.18	46.65	1.25	13.73	35.63	2.63	22.36	26.60	3.21
CAMPBELL	0.28	41.30	0.36	16.76	39.97	4.43	33.40	14.49	5.19
CANNON	0.00	55.55	0.31	11.40	31.83	16.43	35.09	0.00	3.47
CARROLL	0.89	54.97	1.16	12.00	30.01	10.10	23.67	17.68	4.54
CARTER	0.63	34.69	2.53	17.76	43.48	5.40	30.63	15.39	8.20
CHEATHAM	3.48	30.07	1.67	15.20	45.91	8.89	40.72	0.00	3.12
CHESTER	0.47	47.24	0.39	17.66	31.72	10.03	21.99	19.42	5.88
CLAIBORNE	2.46	24.78	1.91	15.30	54.97	20.84	30.64	0.00	6.48
CLAY	1.76	49.88	0.00	11.03	37.32	20.56	31.02	0.00	6.17
COCKE	1.32	41.33	1.54	18.76	36.02	11.21	24.82	15.56	12.56
COFFEE	0.51	34.75	1.87	16.45	45.49	6.03	11.81	33.53	6.66
CROCKETT	2.74	57.31	0.62	10.90	27.49	13.07	38.50	0.00	8.47
CUMBERLAND	0.96	34.10	1.55	18.45	43.92	4.84	32.00	13.84	7.03
DAVIDSON	0.28	15.29	4.08	20.75	57.80	0.25	1.07	51.07	3.42
DECATUR	0.00	62.96	0.02	11.67	23.97	8.86	41.46	0.00	2.40
DE KALB	1.83	48.33	1.15	14.82	31.63	14.81	22.56	14.58	3.96
DICKSON	0.53	44.37	3.85	15.30	34.58	7.59	29.61	13.83	3.41
DYER	0.71	44.62	1.89	14.31	36.44	6.17	20.73	25.45	4.54
FAYETTE	4.13	28.95	2.25	14.15	49.98	16.57	34.97	0.00	10.43
FENTRESS	3.24	46.94	2.14	10.70	35.94	12.51	38.38	0.00	3.76
FRANKLIN	1.27	30.48	0.80	15.98	50.34	6.91	31.59	11.38	7.51
GIBSON	1.88	50.89	2.43	11.63	31.80	8.29	16.96	27.07	5.42

TABLE B-V (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
GILES	1.30	43.14	1.23	13.67	40.03	10.33	24.07	17.09	2.99
GRAINGER	2.67	47.87	0.84	19.50	27.31	21.69	28.61	0.00	9.59
GREENE	2.06	39.33	1.11	16.13	40.33	13.92	22.21	15.43	16.21
GRUNDY	2.53	41.76	0.96	18.92	34.18	5.77	44.76	0.00	3.69
HAMBLEN	0.11	42.07	1.94	23.94	31.18	4.65	19.23	27.75	7.69
HAMILTON	0.56	23.82	4.06	19.05	51.10	0.97	8.75	43.20	3.89
HANCOCK	4.90	25.90	1.19	13.28	48.54	34.42	16.30	0.00	4.03
HARDEMAN	1.46	34.62	0.71	12.29	50.32	9.21	26.83	15.97	6.97
HARDIN	1.36	44.92	1.17	16.87	34.61	7.64	27.47	16.33	5.05
HAWKINS	1.47	33.56	2.68	21.32	40.31	12.43	23.21	15.12	6.28
HAYWOOD	3.11	30.57	0.78	20.18	44.85	15.18	17.50	19.43	9.86
HENDERSON	0.84	59.31	1.34	13.35	25.20	12.97	23.17	15.35	4.94
HENRY	0.57	29.10	1.46	27.28	40.50	8.95	20.52	22.55	8.13
HICKMAN	1.19	48.90	0.41	16.39	30.01	9.47	29.37	11.57	7.48
HOUSTON	0.00	24.85	4.57	15.71	53.28	8.20	42.46	0.00	15.03
HUMPHREYS	1.05	27.20	3.69	21.57	43.16	5.84	30.24	14.62	2.57
JACKSON	0.62	60.04	0.72	9.37	28.22	24.37	26.38	0.00	5.45
JEFFERSON	1.87	39.23	2.25	13.73	41.99	9.69	30.54	11.08	10.99
JOHNSON	0.84	60.05	0.90	9.57	28.25	21.19	30.23	0.00	3.07
KNOX	0.35	19.89	3.80	20.99	53.48	1.45	14.29	36.57	4.31
LAKE	1.59	46.62	0.84	12.20	37.71	4.38	47.58	0.00	4.74
LAUDERDALE	1.78	40.23	0.70	19.57	37.23	8.84	29.16	12.61	9.13
LAWRENCE	0.26	49.77	1.71	15.21	31.71	9.86	25.22	16.10	6.50
LEWIS	1.10	59.78	1.81	10.43	26.38	6.30	18.10	27.67	2.06
LINCOLN	3.08	40.73	0.74	11.94	40.62	13.66	22.01	15.75	9.85
LOUDON	0.77	53.69	1.34	14.15	29.15	6.42	25.53	20.16	3.03
MC MINN	0.88	48.93	1.60	15.90	31.45	5.91	22.79	23.21	4.70
MC NAIRY	0.75	57.88	1.33	11.59	28.07	13.26	28.65	9.52	7.95
MACON	1.40	54.86	1.46	8.72	32.59	21.55	18.59	10.94	5.57
MADISON	1.18	20.98	3.47	20.66	51.90	5.68	14.24	33.09	6.17
MARION	1.57	30.00	2.30	20.36	44.64	2.91	38.68	9.42	5.77

TABLE B-V (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
MARSHALL	0.72	48.77	1.56	11.67	36.62	9.68	19.87	22.58	3.58
MAURY	0.74	33.30	3.17	16.64	44.91	6.92	14.41	30.45	5.22
MEIGS	2.07	52.34	2.20	6.61	34.57	11.57	38.82	0.00	2.94
MONROE	1.47	50.09	1.34	13.95	31.01	12.42	22.96	15.99	8.34
MONTGOMERY	0.47	20.73	4.74	22.46	50.61	3.95	13.48	28.80	7.37
MOORE	2.45	57.97	1.05	12.26	24.87	15.50	33.58	0.00	9.22
MORGAN	0.45	55.19	1.86	11.98	30.55	5.75	42.82	0.13	4.98
OBION	0.86	38.69	1.95	18.55	39.03	8.44	17.93	25.79	4.82
OVERTON	0.00	57.22	0.67	9.54	31.31	10.92	28.76	10.94	3.30
PERRY	0.00	61.91	-0.01	10.05	27.61	8.69	42.21	0.00	2.16
PICKETT	0.00	59.00	0.74	15.58	23.01	22.97	27.32	0.00	1.28
POLK	1.19	48.28	0.80	12.28	35.68	3.98	47.19	0.00	3.03
PUTNAM	0.27	34.40	3.58	15.16	45.33	5.91	24.33	19.60	5.18
RHEA	0.80	48.80	1.20	13.94	34.33	9.43	28.58	13.48	11.96
ROANE	0.24	50.90	1.45	14.95	30.76	2.50	20.86	28.41	5.44
ROBERTSON	2.97	29.57	1.91	16.72	47.01	13.81	19.78	17.81	4.84
RUTHERFORD	0.58	21.68	2.41	18.33	55.79	4.19	15.56	30.94	4.13
SCOTT	1.64	30.21	1.35	16.10	49.17	5.47	36.11	9.28	9.73
SEQUATCHIE	1.32	47.24	-0.01	9.21	40.54	5.65	44.70	0.00	9.16
SEVIER	1.37	28.60	0.83	26.29	41.34	9.13	36.73	5.22	9.11
SHELBY	0.34	13.77	3.75	23.27	57.24	0.53	2.39	49.05	5.70
SMITH	1.32	44.60	1.21	10.25	41.28	17.10	33.87	0.00	5.59
STEWART	0.53	44.84	0.53	17.60	35.75	28.50	21.66	0.00	5.41
SULLIVAN	0.65	33.42	3.83	20.77	40.20	2.93	19.27	29.54	5.58
SUMNER	1.29	32.96	3.26	17.68	42.48	6.92	17.92	25.90	4.95
TIPTON	1.59	21.47	0.97	26.16	48.36	11.61	28.26	10.97	9.99
TROUSDALE	2.46	46.32	1.90	12.17	36.72	24.00	27.26	0.00	5.29
UNICOI	3.43	48.41	2.33	13.45	32.11	7.21	19.25	24.96	6.72
UNION	2.27	51.49	0.41	11.95	33.26	24.18	26.21	0.00	4.33
VAN BUREN	1.28	81.70	1.28	6.90	8.03	11.42	38.80	0.00	0.80
WARREN	2.54	43.66	1.51	17.44	33.30	7.84	22.51	21.11	6.19

TABLE B-V (continued)

COUNTY	X1	X2	X3	X4	X5	X6	X7	X8	X9
WASHINGTON	1.15	24.79	2.55	17.22	52.50	5.89	21.46	22.92	6.69
WAYNE	0.00	66.42	0.57	8.84	23.89	10.51	40.38	0.00	4.28
WEAKLEY	0.97	43.74	1.33	14.63	38.58	10.90	25.71	14.10	6.30
WHITE	0.99	61.90	1.14	11.17	23.37	15.27	20.78	16.22	5.17
WILLIAMSON	0.92	25.89	3.55	15.87	51.82	8.83	27.31	14.68	3.04
WILSON	1.76	37.70	2.49	16.95	39.64	7.97	25.28	18.05	4.04

TABLE B-VI

INDEPENDENT VARIABLES BY COUNTY APPLIED IN THE SECOND-STAGE ESTIMATE OF THE 1970 EMPLOYED MALE AND FEMALE CIVILIAN LABOR FORCE UNDEREMPLOYMENT

COUNTY	X10	X11	X12	X13	X14	X15
ANDERSON	0.80	11.80	26.35	7.37	7.06	13.00
BEDFORD	0.60	13.50	24.83	11.55	11.30	12.00
BENTON	0.50	18.10	24.42	13.67	11.96	13.00
BLEDSOE	0.30	18.80	24.72	10.07	11.25	8.00
BLOUNT	2.80	11.60	24.44	9.29	7.67	15.00
BRADLEY	0.30	12.50	27.87	7.28	6.75	12.00
CAMPBELL	2.00	28.50	25.87	12.10	11.06	15.00
CANNON	0.00	20.20	23.08	13.13	11.93	11.00
CARROLL	0.70	17.20	22.72	14.53	11.85	10.00
CARTER	7.40	16.40	24.27	9.51	8.18	13.00
CHEATHAM	0.50	11.90	28.16	9.46	8.86	13.00
CHESTER	0.80	16.40	23.39	13.26	11.18	13.00
CLAIBORNE	1.70	25.50	25.49	11.68	10.30	11.00
CLAY	0.30	28.70	24.52	12.17	10.87	10.00
COCKE	2.30	20.60	27.49	8.92	9.93	8.00
COFFEE	0.70	12.40	27.46	8.61	7.89	11.00
CROCKETT	0.60	19.30	25.13	14.26	11.73	7.00
CUMBERLAND	0.70	16.40	27.97	11.02	8.59	14.00
DAVIDSON	7.60	15.60	25.19	8.81	8.20	19.00
DECATUR	0.30	17.90	23.13	14.43	10.57	12.00
DE KALB	0.50	16.00	23.81	13.22	11.48	8.00
DICKSON	0.60	21.00	26.94	11.92	9.24	11.00
DYER	1.00	19.10	25.08	12.86	11.24	12.00
FAYETTE	1.30	26.50	34.17	9.60	7.93	12.00
FENTRESS	0.20	26.80	28.13	10.36	9.61	9.00
FRANKLIN	0.50	14.50	25.62	10.32	8.59	16.00
GIBSON	1.00	19.70	24.77	13.05	10.90	10.00

TABLE B-VI (continued)

COUNTY	X10	X11	X12	X13	X14	X15
GILES	1.70	20.00	23.59	13.35	12.74	10.00
GRAINGER	0.90	16.50	26.94	10.09	8.10	10.00
GREENE	0.90	13.40	24.89	8.97	8.92	10.00
GRUNDY	0.40	18.60	26.57	11.11	10.82	11.00
HAMBLEN	0.40	12.50	27.34	7.50	7.68	12.00
HAMILTON	5.00	18.40	25.43	9.78	9.27	18.00
HANCOCK	3.00	21.60	25.75	11.01	11.76	10.00
HARDEMAN	0.50	22.60	27.63	13.03	8.56	12.00
HARDIN	1.30	23.20	24.92	12.11	10.60	14.00
HAWKINS	1.20	16.90	26.57	9.23	8.90	10.00
HAYWOOD	2.60	30.20	30.42	12.02	10.05	11.00
HENDERSON	0.80	20.20	23.94	12.86	12.09	10.00
HENRY	1.10	20.00	23.04	14.96	12.63	15.00
HICKMAN	0.40	19.80	24.57	12.19	11.08	15.00
HOUSTON	0.20	20.80	25.47	12.68	10.44	12.00
HUMPHREYS	1.10	17.60	26.33	11.35	9.00	12.00
JACKSON	0.00	24.20	22.64	14.18	11.42	6.00
JEFFERSON	0.60	11.90	25.08	9.52	7.30	10.00
JOHNSON	1.90	21.40	25.02	11.67	9.34	7.00
KNOX	4.60	16.70	23.83	9.82	8.26	17.00
LAKE	0.00	25.80	29.29	10.83	12.66	12.00
LAUDERDALE	0.40	29.20	27.26	13.08	12.04	11.00
LAWRENCE	1.70	17.50	26.95	11.21	9.11	12.00
LEWIS	1.50	16.50	25.97	10.90	10.65	12.00
LINCOLN	1.10	18.70	25.18	11.71	10.57	13.00
LOUDON	0.80	16.60	24.13	10.57	10.18	13.00
MC MINN	1.10	15.90	25.72	10.73	8.94	9.00
MC NAIRY	0.30	19.10	23.86	13.21	10.56	11.00
MACON	1.30	17.90	22.43	14.35	9.66	7.00
MADISON	3.50	21.10	25.52	12.03	10.51	18.00
MARION	0.70	18.90	27.85	9.29	9.14	13.00

TABLE B-VI (continued)

COUNTY	X10	X11	X12	X13	X14	X15
MARSHALL	1.30	14.10	23.14	13.19	11.43	12.00
MAURY	2.60	18.10	26.26	10.33	10.11	14.00
MEIGS	0.30	16.00	25.87	9.50	7.66	8.00
MONROE	0.60	16.70	26.07	10.39	8.48	9.00
MONTGOMERY	1.50	15.90	25.69	6.83	6.71	16.00
MOORE	0.00	10.20	24.30	12.11	10.37	8.00
MORGAN	0.90	21.30	27.30	9.98	9.40	10.00
OBION	1.40	18.90	23.52	14.30	11.79	13.00
OVERTON	0.90	32.10	24.82	12.46	9.35	9.00
PERRY	2.10	22.40	21.63	15.20	12.22	9.00
PICKETT	1.50	22.60	23.90	12.53	10.86	10.00
POLK	0.10	18.40	25.69	9.62	8.14	7.00
PUTNAM	0.70	17.10	21.95	10.73	8.06	13.00
RHEA	1.30	20.70	26.94	10.43	9.77	11.00
ROANE	0.80	14.40	26.59	9.09	8.67	10.00
ROBERTSON	2.50	20.20	26.57	12.37	10.45	14.00
RUTHERFORD	0.90	11.20	25.32	8.62	7.17	17.00
SCOTT	0.80	24.20	29.03	10.24	9.21	14.00
SEQUATCHIE	0.00	15.30	28.21	9.41	9.00	10.00
SEVIER	1.50	15.50	25.81	10.05	7.54	12.00
SHELBY	10.20	21.00	27.92	8.16	7.91	19.00
SMITH	1.00	16.90	24.05	14.10	12.79	11.00
STEWART	0.60	22.70	22.34	14.09	8.61	12.00
SULLIVAN	2.10	12.80	25.61	7.78	7.19	13.00
SUMNER	1.80	13.30	28.53	8.79	7.68	15.00
TIPTON	0.80	22.60	30.78	10.18	9.68	15.00
TROUSDALE	0.00	20.30	23.41	13.64	10.09	9.00
UNICOI	0.30	17.80	24.94	10.92	8.39	7.00
UNION	0.20	16.30	28.53	10.27	6.72	11.00
VAN BUREN	0.70	22.60	24.77	10.35	5.85	7.00
WARREN	0.50	19.40	26.08	11.21	9.90	12.00

TABLE B-VI (continued)

COUNTY	X10	X11	X12	X13	X14	X15
WASHINGTON	3.00	11.60	23.75	10.35	9.28	14.00
WAYNE	2.40	21.50	26.87	10.72	9.06	10.00
WEAKLEY	0.90	15.20	20.13	15.05	11.41	11.00
WHITE	0.50	18.10	24.45	11.56	10.39	9.00
WILLIAMSON	1.90	13.00	27.52	9.50	7.95	15.00
WILSON	0.80	14.90	26.64	10.25	9.16	13.00

APPENDIX C

TABLE C-I

PERCENT OF EMPLOYED CIVILIAN LABOR FORCE UNDEREMPLOYED (UNUTILIZED) BY COUNTY, IN THREE REGIONS OF TENNESSEE FOR MALE AND FEMALE 14 YEARS AND OVER FOR THE YEARS 1960 AND 1970

County	Male		Female	
	1960	1970	1960	1970
East Tennessee				
Anderson	5.2	15.9	26.5	97.9
Bradley	23.6	23.5	1.6	68.7
Bledsoe	66.0	63.1	17.6	93.5
Blount	9.9	19.9	34.1	95.1
Campbell	43.8	49.7	9.8	91.2
Carter	15.4	35.0	17.4	88.7
Claiborne	58.7	57.4	20.1	94.5
Cocke	45.9	38.8	25.8	95.5
Grainger	48.7	42.3	26.7	100
Greene	44.5	41.4	25.9	80.3
Hamilton	8.4	17.4	4.9	71.1
Hamblen	28.1	29.4	24.3	81.4
Hancock	67.6	69.1	8.1	100
Hawkins	43.2	33.1	29.2	100
Jefferson	38.8	39.2	28.6	82.4
Johnson	54.8	52.7	43.7	81.7
Knox	18.0	30.5	13.00	76.00
Loudon	24.5	33.9	2.7	74.5
Marion	23.3	31.8	23.7	95.3
McMinn	31.9	34.4	17.7	75.1
Monroe	45.5	41.2	25.2	81.5
Meigs	54.7	40.9	41.7	88.8
Morgan	42.1	60.6	23.4	89.0
Polk	24.4	28.4	3.9	84.0
Rhea	40.4	43.1	21.7	69.0
Roane	14.2	27.4	29.1	79.1
Scott	41.8	54.7	17.2	91.1
Sequatchie	42.4	39.3	-3.7	78.0
Sullivan	15.3	20.0	17.4	89.0
Sevier	46.6	35.5	26.6	78.3
Unicoi	32.4	34.3	15.2	83.9
Union	45.9	49.8	8.6	100.0
Washington	31.1	39.6	20.2	82.4

TABLE C-I (continued)

County	Male 1960	Male 1970	Female 1960	Female 1970
Middle Tennessee				
Bedford	35.5	34.9	22.5	69.5
Cannon	50.7	49.8	-20.7	73.9
Cheatham	23.5	16.1	18.1	91.5
Clay	68.1	61.7	21.1	76.5
Coffee	30.1	31.3	22.5	88.8
Cumberland	43.3	43.3	26.4	83.3
Davidson	12.1	16.1	8.2	65.4
DeKalb	60.6	42.3	19	68.8
Dickson	28.3	28.5	14.1	74.2
Fentress	58.3	64.1	23.3	82.9
Franklin	37.2	44.3	26.2	82.4
Giles	46.9	41.4	27.8	72.5
Grundy	43.9	59.3	40.1	94.3
Jackson	68	57.9	10.3	81.3
Lawrence	23.6	36.0	27.1	92.5
Lewis	40.1	32.9	3.0	74.6
Lincoln	49.6	44.4	17.6	75.6
Houston	48.6	32.8	36.6	100.0
Hickman	42.6	39.0	16.2	91.4
Humphreys	34.9	20.5	31.5	89.9
Marshall	37.2	32.4	25.7	71.8
Macon	62.9	52.7	15.6	68.9
Moore	47.2	46.9	9.9	71.5
Montgomery	21	15.1	19.0	84.2
Maury	24.9	26.0	30.5	78.7
Overton	63.3	56.1	13.1	76.5
Perry	63.0	51.5	27.0	71.5
Pickett	70.5	53.9	-14.2	71.7
Putnam	72.2	46.5	24.4	74.7
Robertson	37.6	31.9	31.2	83.0
Rutherford	27.1	35.4	33.0	79.3
Smith	52.3	36.3	21.4	73.3
Stewart	49.5	44.8	37.6	100.0
Sumner	34.3	23.1	20.5	80.0
Trousdale	46.8	48.5	18.2	68.5
Van Buren	62.7	41.3	-14.0	74.1
Warren	44.9	37.7	20.4	75.0
Wayne	49.5	45.6	22.5	73.5
White	56.5	46.4	15.1	70.0
Williamson	33.0	24.8	18.5	65.0
Wilson	34.2	25	21.9	76.5

TABLE C-I (continued)

County	Male 1960	Male 1970	Female 1960	Female 1970
West Tennessee				
Benton	36.8	28.5	30.5	75.7
Carroll	52.5	34.3	15.9	61.3
Dyer	38.1	35.3	38.1	63.7
Decatur	53.4	41.0	19.6	60.2
Chester	51.1	44.8	34.2	72.5
Crockett	49.6	44.9	39.6	73.2
Fayette	57.8	56.4	35.7	85.8
Gibson	42.1	35.1	26.8	65.1
Hardin	57.6	49.1	25.8	78
Hardeman	53.2	53.8	37.3	67.9
Haywood	50.9	50.6	38.6	77.9
Henderson	54.6	42.1	29.9	71.6
Henry	36.2	36.9	29.4	74.7
Lake	61.8	45.0	36.7	69.7
Lauderdale	55.6	58.0	39.9	77.4
Madison	29.0	33.6	28.6	68.8
McNairy	60.4	50.3	17.3	79.3
Obion	39.3	33.6	25.6	71.0
Shelby	7.9	17.3	12.8	69.4
Tipton	41.0	32.3	31.5	90.6
Weakley	46.8	46.4	25.3	70.3

VITA

Khairulah Dawlaty was born in Gardaz, the capital city of the Province of Paktia, Afghanistan, on May 15, 1936. He attended the primary and secondary schools in that city and entered the vocational Agriculture high school in Kabul in 1955, from where he received the high school diploma in 1957. He then entered the University of Kabul in 1958 and received a B.S. degree in general agriculture in 1961. He was retained in the College of Agriculture where he worked as a laboratory assistant in the Plant Science section during the year 1962.

In 1963 he received a U.S.A.I.D. scholarship through the University of Kabul and was sent to the United States. He received a M.S. degree in Agricultural Economics from the University of Wyoming in August 1965. He then returned home and served as a staff member of the College of Agriculture, University of Kabul, up to August 1971. During this period he taught Agricultural Economics, conducted research and coauthored four technical bulletins, attended the Employment and Unemployment Conference of the Near East and Southest Asian countries in Nepal, July 6-9, 1970, where he presented a paper "The Effect of Tractors on Farm Output Income and Employment During the Initial Stage of Farm Machinization in Afghanistan," worked as a survey advisor with the Ministry of Planning in Afghanistan's Farmer's Survey, Summer 1970, and served as a member of a team who evaluated the United Nation's Credit and Cooperative Project in Afghanistan (PACCA), Spring 1971.

In September 1971, the University of Kabul, through the U.S.A.I.D. Program, sent him to the University of Tennessee, Knoxville, to pursue further graduate study in Agricultural Economics. There he received his Ph.D. in the above field in August 1975.

He is married and has a son, three years and five months old.