THE POTENTIAL LABOR SUPPLY: A CROSS-SECTIONAL ESTIMATION METHOD*

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This paper addresses conceptual inadequacies of standard labor force and unemployment statistics for the purpose of representing relative stocks of available labor among regions. It attempts to rectify some of these inadequacies by applying relatively simple statistical adjustments. These are based on secondary data relating to local population characteristics and national participation rate norms.

Current criteria used to determine labor force participation depend on solicited statements regarding attempts of an individual to secure employment, or his current status as a gainfully employed person. Using labor force participation as defined by these criteria, it has been observed that labor-force size varies directly with level of economic activity and demand for labor over time [3, 9]. During periods in which unemployment rises, the size of the labor force normally declines.

However, as rates of unemployment of the family's principal income earner increase, one would expect more wives, teenagers and elderly people to become available for employment in an effort to maintain family standards of living. This leads to the conclusion that unemployment measures, while useful indicators of temporal variations in the economic health of the nation or area, may not provide good estimates of labor availability or reserves at existing wage rates. Evidently, the proportion of working age people who actively seek employment is related to expectations with regard to job availability.

Those people who do not actively seek work but would make themselves available if they believed employment opportunities existed, will be termed the "hidden unemployed." The hidden unemployed component of the labor supply has been the object of estimation attempts in the past. These efforts have relied on regression analysis [2, 3, 7, 9], trend functions [4, 8], and probability models [1] to define the size of the labor force at full employment. The hidden unemployed component is then estimated by subtracting actual labor force, conventionally defined, from estimated full employment labor force.

As mentioned, methods have been devised for aggregative estimation of the hidden unemployed based on temporal data. However, if labor force participation varies with demand for labor over time, analogous reasoning suggests that persistent cross-sectional differences in demand for labor would affect labor force participation rates interregionally. Thus, hidden unemployment may vary markedly among regions and be dependent on the level of demand for labor within regions. Case illustrations of voluminous applications for new industrial jobs in areas with nominally modest unemployment levels support this hypothesis.

The magnitude of the hidden unemployed component of the labor supply is of considerable importance in analyzing a variety of regional poverty and economic development problems. A method of estimation is outlined in this paper. It was originally developed specifically for use in studying factors related to growth of manufacturing plants in Kentucky and Tennessee communities (Project S-96). However, development of an estimating procedure

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suited to this purpose has much more general applicability.[1]

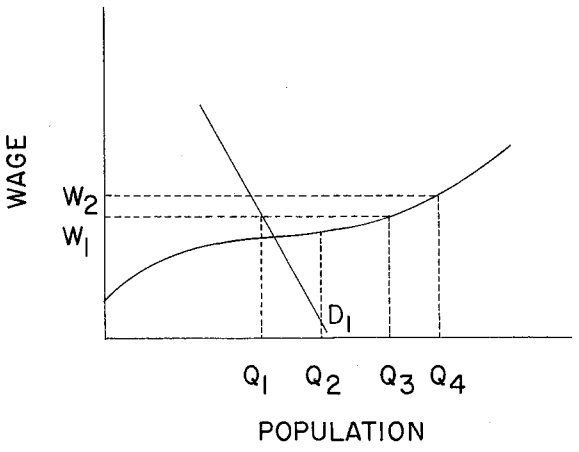
The population in Kentucky and Tennessee has a relatively low average level of developed industrial skills and receives low wages in comparison to the nation as a whole. In addition, the demand for workers is not sufficient to employ all people willing to work at locally established wage levels. This situation has prevailed for so long that standard labor force statistics apparently do not reflect actual availability of labor. Thus, the population willing to work may be divided into three categories:

(1) those who have have found employment and are working,
(2) those who have not found employment and are actively seeking work and
(3) those who are willing to work but not actively seeking employment.

The first two groups are the components of the Census of Population's labor force category; the latter is not measured at the county level by available data series. The calculated potential labor supply is an attempt to include the latter group and additional people who would work if the county wage level were equated with the national average wage (assuming a positive sloping labor supply function).

The problem may now be visualized, as shown in Figure 1, where W_1 is the locally established wage rate, Q_3 the number of people willing to work at that wage rate, and Q_1 the number actually employed. Q_1Q_2 represents those actively seeking work, while Q_2Q_3 represents those who are available for employment but are not actively seeking work, the hidden unemployed. If W_2 is the national average wage rate, then Q_4 represents the potential labor force at national wage norms, and Q_2Q_4 the potential additions to the census-defined labor force. These potential additions include both hidden unemployed at the local wage rate and additional persons who would become available for employment were local and national average wage rates equated.

Assume the nation is homogeneous regarding all social, economic and geographic characteristics which affect a person's ability to participate in the labor force. This allows estimation of labor quantity available in any section of the nation at the national price (wage), by multiplying the section's population by the national participation rate. Thus, we have the size of an expected labor force in a given subsector (area) at the national price. The difference between expected labor force and Census-defined labor force at the current price, gives an estimate of additional



D_1 = current demand for labor in county
W_1 = locally established wage
Q_1 = number of people employed at locally established wage
Q_3 = number of people willing to work at locally established wage
Q_1-Q_2 = number of people actively seeking work
Q_2-Q_3 = number of people available but not actively seeking work
W_2 = national average wage
Q_4 = number of people willing to work at national average wage
Q_3-Q_4 = additional people willing to work if national average wage were paid

FIGURE 1. COMPONENTS OF THE LABOR SUPPLY

labor available (potential additions to labor supply) in the sector. This additional labor is actually an estimate of quantity of labor not currently participating that would be available were national average wage paid in the sector. This additional labor is actually an estimate of quantity of labor not currently participating that would be available were national average wage paid and employment opportunities existing.

Although the foregoing procedure is attractively simple, it is obvious that its assumptions are rather unrealistic. Different areas of the country vary with respect to demographic as well as socioeconomic characteristics. The alternative estimating technique developed here compensates for some of these differences. Estimates have been adjusted for the population's distribution of age, race, residence and education. In order to take into account the large difference between male and female labor force participation rates, estimates of potential additions to the labor supply have been computed separately for each sex. All other characteristics of population

[1] Project S-96 and a companion project funded by the now defunct Southern Rural Development Research Council from Rural Development Act monies.

which may affect labor force participation are assumed to be homogeneous throughout the nation.

The procedure used for estimating potential additions to labor supply on a county-wide basis as as follows:

(1) The county population (age 16 and older) was divided into seven age groups for each sex. The number in each age group was multiplied by its respective national participation rate. Results were summed to give expected labor force size for each sex. To get participation rates, these numbers were then divided by county population (age 16 and older) for each sex.

(2) The same procedures as (1) above were followed with respect to residential status (rural farm, rural non-farm and urban groups by sex).

(3) Again, procedure was followed using White and "Black and other" groups by sex.

(4) Since national data on labor force participation by educational attainment were not available, regression equations were developed to predict county participation rates on the basis of median education in each of the 50 states.[2]

(5) Since no *prima facie* evidence is currently available regarding relative weights which should be assigned to each adjustor, it was decided they should be averaged and, thus, weighted equally. The population was multiplied by its respective participation rate to give expected labor force size for each sex.

(6) Potential additions to the labor supply of each sex were estimated by subtracting actual county labor force from expected labor force. A positive number indicated there was additional labor available if the national wage was paid. This also implied that current county wages were below the national average wage (a positively sloping supply curve is implicitly assumed), that there is unutilized labor at the existing county wage level, or a combination of both. Correspondingly, a negative number meant that a reduction in the labor force currently available would ensue if the national average wage were paid (and that current county wages are above the national average wage).

An example of these calculations is shown using appropriate figures for Adair County, Kentucky (Table 1A and 1B). The example is computed only for the estimate of "male potentials" additions to the labor supply. The corresponding calculations for females in Adair County resulted in 340 potential additions. When this figure and the male estimate are combined, 846 additional persons are estimated to be potentially available. Adding this estimate to the Census-defined labor force of 4,375 persons, a potential labor supply of 5,221 persons is found to exist in Adair County, Kentucky.

This measure of potential additons to the labor supply may be criticized on the grounds that some possibly important factors contributing to labor force participation are overlooked and a method of arbitrarily assigning weights to adjustors is used. Nevertheless, it still appears to be an improvement to present estimating procedures. For example, application of unadjusted national norms would yield an estimate of 993 potential additions to the labor supply. The 1970 county rate of unemployment, less 3.5 percent for normal frictional unemployment,

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[2] A regression equation was developed for each sex for the purpose of predicting labor force participation on the basis of median education in the county. The models hypothesized were:

$$P_{em} = B_o + B_1 X_1 + \epsilon$$

and

$$P_{ef} = B_o + B_2 X_2 + \epsilon$$

where

P_{em} = Male Labor Force participation rate in the state
P_{ef} = Female Labor Force participation rate in the state
X_1 = Male median education in the state
X_2 = Female median education in the state

the following results were obtained:

$$P_{em} = 46.11118 + 2.57778\ X_1 \quad [R^2 = .33]$$
$$(.52476)$$

and

$$P_{ef} = 9.60672 + 2.74540\ X_2 \quad [R^2 = .07]$$
$$(1.4826)$$

Although the R^2 are low in both of these equations, median education is significant at the $\rho = .001$ level in the equation for males and the $\rho = .10$ level for females. This suggests that median education, although affected by several other determining factors, is an important factor in labor force participation.

TABLE 1A. EXPECTED PARTICIPATION CALCULATIONS FOR ADAIR COUNTY, KENTUCKY

Characteristic	Male County Population	National Participation Rate For Males	Male Expected Participation
Age:			
16-17	235	.357	83.89
18-19	267	.598	159.67
20-24	412	.809	333.31
25-34	684	.939	642.28
35-44	637	.948	603.88
45-64	1,576	.872	1,374.27
64 & Older	806	.248	199.89
Totals	4,617		3,397.19
Race:			
White	4,424	.774	3,424.18
Black & Other	193	.702	135.49
Totals	4,617		3,559.67
Residence:			
Rural Farm	2,196	.767	1,684.33
Rural Nonfarm	1,239	.733	908.19
Urban	1,182	.776	917.23
Totals	4,617		3,509.75

TABLE 1B. PARTICIPATION RATE CALCULATIONS FOR ADAIR COUNTY, KENTUCKY

P_a = Age Standardized Participation Rate = $\frac{\text{Expected participation}}{\text{County Population}} = \frac{3,397}{4,617} = .736$

P_r = Race Standardized Participation Rate = $\frac{\text{Expected participation}}{\text{County Population}} = \frac{3,560}{4,617} = .771$

P_u = Resid. Standardized Participation Rate = $\frac{\text{Expected Participation}}{\text{County Population}} = \frac{3,510}{4,617} = .760$

P_e = Education Standardized Participation Rate = $46.11118 + 2.57778\ (8.3) = 67.5 = .675$

P = Standardized County Participation Rate = $\frac{P_a + P_r + P_u + P_e}{4} = \frac{2.942}{4} = .735$

Male Expected Labor Supply = (P) x Male County Population = $(.735)\ (4,617) = 3,394$

Male Potential Additions To The Labor Supply = Expected Labor Supply x Census-defined Labor Force

= 3,394 - 2,888

= 506

would yield an estimate of only 200. To arrive at a more comprehensive estimate of those persons available for employment, the latter number should be added to calculated potential additions to the labor supply. This would yield a total of 1,046 persons (male and female) potentially available for employment in Adair County. These are not currently employed.

This is actually a quantity estimate of additional labor available in Kentucky and Tennessee non-SMSA counties were national average wage paid and employment opportunities available. By combining this estimate with the Census-defined labor force and plotting the result against national average wage, a point on the county's labor supply curve for 1970 would be obtained. Given enough of these points for any county, the hypothesized labor supply curve for that county could be traced.

The estimate of potential additions to the labor supply is a rough measure of the quantity Q_2-Q_4 (see Figure 1). Obviously, this measure neglects many characteristics of the county population, ones that may differ from national population norms and possibly affect ability or willingness to work. However, this measure is most likely a conservative estimate of potential additions to the labor supply in any particular county of Kentucky and Tennessee, since commuting is large in virtually all counties where industrial growth has been substantial [6]. This is confirmed by preliminary results showing that commuting workers in 114 industrial plants located in Kentucky during the 1970-73 period traveled an average one-way distance of 13 miles. Workers commuting from outside the community of plant location averaged 59 percent of plant employment. Twenty-five percent commuted from outside the county [5].

Another reason this estimate is believed conservative is that it is based on national participation rates which fail to include people not actively seeking work. Thus, the inherent structure of data on which the potential labor supply estimate is based causes the estimating procedure to have a downward bias. It can best be interpreted as a conservative relative measure which allows more precise comparisons of labor supplies among counties.

Although this estimating technique has weaknesses, it provides useful data for industrial employers, program planners and program administrators. It offers a basis for improved functional estimates of available labor and also "effective unemployment" utilizing available secondary data sources at less cost than estimates derived from primary data.

Assuredly, any such estimate needs to be tested empirically to determine its actual reliability as an indicator of potential labor supplies. However, until better and/or more inexpensive techniques are developed, it is felt that this procedure represents a significant improvement over conventional estimates of labor force size and unemployment rates for purposes of cross-sectional comparisons.

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