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THE LONG-RUN EQUILIBRIUM IN THE HIRED FARM LABOR FORCE: HISTORY AND IMPLICATIONS

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This paper will use information contained in structural supply and demand relations for hired labor to examine several characteristics of the agricultural labor market. Specifically, I want (1) to examine how far out of long-run equilibrium the industry has been historically in its use of labor, and (2) to consider briefly some of the changes in labor use which result from economic forces external to the agricultural labor market.

A Brief Characterization of the Model[1/]

The structural model consists of two equations with agricultural wages and hired employment assumed to be endogenously determined subject to a set of exogenous variables. The exogenous variables include income to be earned in nonfarm employment, unemployment, the civilian labor force, "real" farm prices, and an index of technology. A Nerlove-type distributed lag model is employed in both the demand and supply equations in order to obtain both short-run and long-run relationships. This involves introducing the dependent variable lagged one period as an additional independent variable and interpreting its estimated parameter as a coefficient of adjustment.[2/]

This method of estimation gives rise to two sets of structural equations--long-run equations and short-run equations--hence two sets of reduced form equations can be derived. These reduced form equations can be used to examine

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1/ A more complete description of the model can be found in the author's doctoral dissertation, "An Econometric Investigation of the Market for Hired Labor in Agriculture," University of Chicago, 1961 and in a forthcoming article in the Journal of Farm Economics. It is especially to be noted, however, that no assumption of homogeneity between the farm and nonfarm labor forces is made. In fact, it is the very lack of homogeneity between these two groups that gives rise to a positively sloped supply curve to the agricultural industry. The structural and reduced form equations on which this analysis is based are attached as an appendix.

2/ This interpretation of the distributed lag model assumes that firms demanding labor and members of the labor force supplying labor to agriculture do not adjust immediately to changing economic conditions, but respond only with a lag. A fundamental assumption in this interpretation is that agricultural wages adjust immediately to changed conditions, but that quantity is adjusted only with a lag. The validity of this assumption must be evaluated in each case; the historical record shows that it is not an unrealistic assumption in the case of the agricultural labor market.

both the short-run and long-run impact of changes in the forces considered external to the industry.

Dynamic Disequilibrium in the Labor Force

The adjustment problem faced by agriculture typically refers to (1) the allocation of resources between the farm and nonfarm sectors and (2) the adjustment in firm organization in response to the inter-industry resource adjustments. At least part of the adjustment problem consists of adapting to long-run or equilibrium conditions.

A widely accepted concept of the long run refers to that position an individual, firm, or economy attains after complete adjustment to changed economic conditions. In a world of change, then, these economic units can be interpreted as moving through short-run adjustments to an ultimate long-run position. And of course, as long as conditions continue to change, they may never reach that long-run position they are working toward at any given point of time. But knowledge of the equilibrium levels of resource use gives some insight into the resource adjustment problem faced by the industry.

Since the distributed lag models used in this study identify the long-run relations of firms and members of the labor force, the reduced form for hired employment enables us to compute historically what the long-run equilibrium[3/] level of employment was each year. This can then be compared to the actual level of employment attained. The comparison illuminates one dimension of the labor adjustment problem and how it has changed over time (see Figure 1).

General observations. (Refer to Figure 1) Through most of the period since 1929 the actual level of employment of hired farm labor has been greater than the long-run equilbrium level of employment. Two exceptions

3/ Care must be exercised in not reading too much normative content into this equilibrium concept. It indicates only where demanders and suppliers would be if they took current information seriously and adjusted completely to it. In some cases this may not be the action they "should" take. In the farm labor market, however, where historic conditions have been such as to require essentially a continuous transfer of labor resources to nonfarm employment, there is relatively more normative content present.

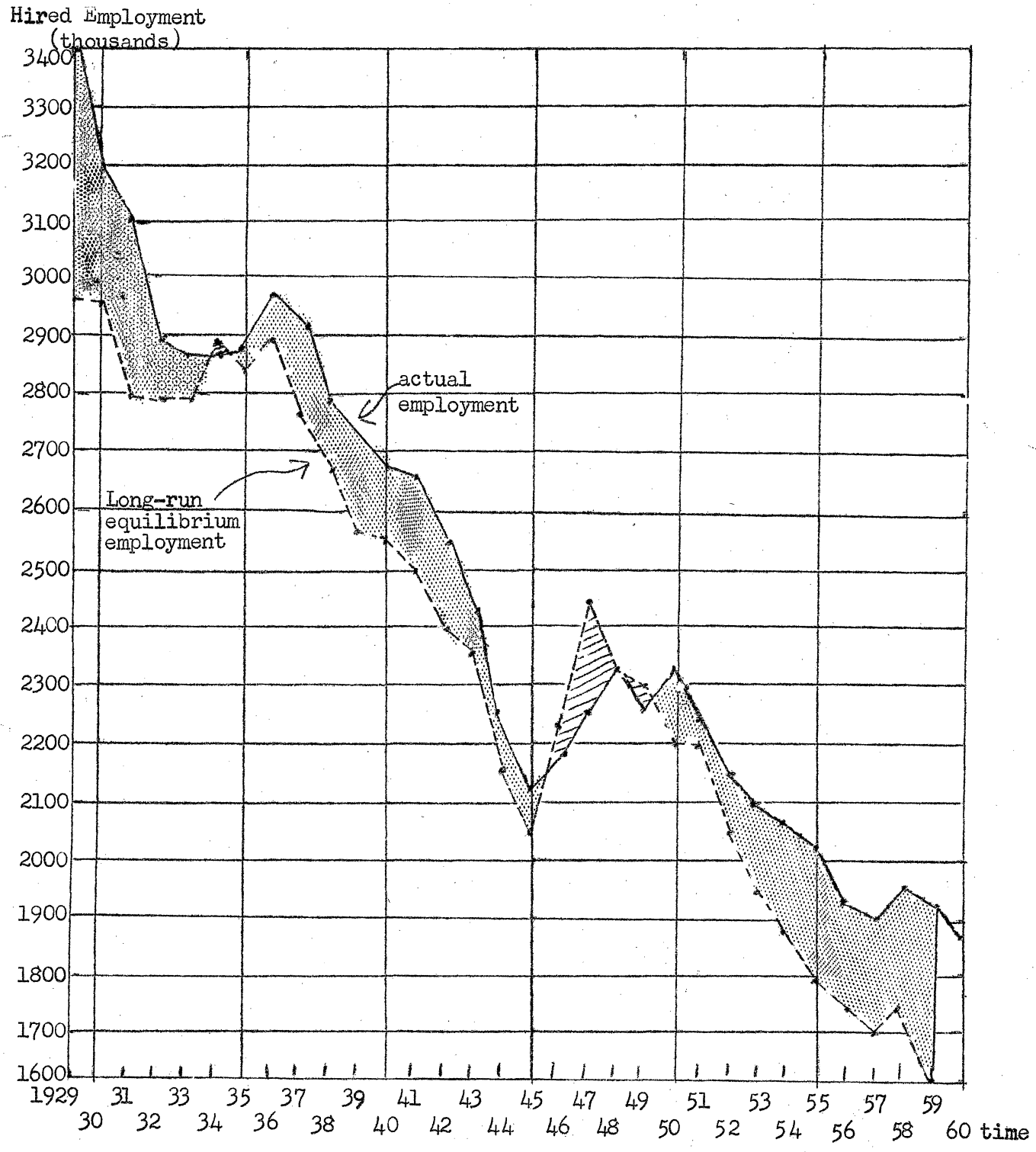

Figure 1
Actual Employment Compared to Long-run Equilibrium Employment
1929-1959.

exist. In 1934, real farm prices were roughly 10% higher than they had been in 1933. In addition, labor earnings in the nonfarm sector actually declined in 1934. As a consequence of these two factors the actual level of employment of hired farm labor was below the equilibrium level in 1934.

A second exception occurred in the years 1946 through 1949. In this period, 1946 and 1947 were years of the highest relative prices for farm products since 1929 (index values of 124 and 123 respectively). Real farm prices dropped off to an index of 115 in 1948 and 105 in 1949, still relatively high for the total period covered, but the 1948-49 recession, with its high level of unemployment, was probably the dominant factor making the equilibrium level of employment in 1949 higher than the actual level.

Historical Magnitude of Disequilibrium. During the entire period, including years when actual employment was short of the equilibrium, the average disequilibrium was 6.2% (measured as the percentage discrepancy between the equilibrium level of employment and the actual level of employment at a point of time, with equilibrium employment as the base). Considering only the years when actual employment was in excess of the equilibrium level, the average disequilibrium was 6.7%.

If attention is focused on shorter periods of time, there are roughly three periods when the agricultural labor force was seriously in excess of its equilibrium level. The first period includes the years 1929-31. The percent of disequilibrium was 14.5% in 1929, declined to 7.6% in 1930, and then rose again to 10.9% in 1931. From 1932 to 1936 the level of employment was close to its long-run equilibrium level, being less than 4% out of adjustment in any one year.

From 1937 to 1942 inclusively was a longer period in which the actual level of employment was over 5% in excess of its equilibrium level. This was a period of rapid reduction in the agricultural labor force, but not sufficiently large to move into long-run equilibrium.

The third period of sizeable discrepancy between the long run and the actual level of employment includes the period from 1952 through 1959. The percentage discrepancy in this period was larger than the 1937-42 period, and approaches the degree of disequilibrium incurred in the earlier 1929-32 period. In 6 of the 8 years in the recent period, the degree of discrepancy was roughly 10% or greater, and reached a peak of 16% in 1959. It is worth noting that, despite the fact that 1959 was a bad year for agriculture, a major portion of the decline in the equilibrium level of employment in that year is a result of the strong upsurge in the nonfarm economy and not a consequence of the decline in real farm prices.

Long-Run Equilibrium Time Lag. A second way of interpreting the same body of data is to examine the time lag involved in reaching the long-run equilibrium level of employment. The parameters of the structural and reduced form relations provide some insight into this, especially in terms of average behavior over the period.

The reduced form equation for hired employment that is computed from the short-run structural equations can be interpreted as a distributed lag model itself. On this interpretation there is in addition to the separate coefficients of adjustment for the demanders and suppliers of hired labor, an additional coefficient of adjustment for hired employment which reflects the interactions of demand and supply. This coefficient indicates, given the behavior of both the suppliers of and demanders for hired labor, what proportion of the discrepancy between actual employment and desired employment is removed in each time period for the industry as a whole.

The coefficient of adjustment for this reduced form indicates that 31% of the discrepancy between actual employment and equilibrium employment is removed in any one time period. This implies that it takes slightly over eight years to remove 95% of the discrepancy between actual and equilibrium

levels of employment, given an initial change and assuming that conditions remain at their initial changed position--that is, given sufficient time to adjust to the changed conditions.

Intuitively, eight years seems like a long time for a given disequilibrium to exist. However, the institutional characteristics of the farm labor market, viewed in the context of geographic isolation from alternative employment and the age and capabilities of members of the hired labor force make this seem more reasonable. The inference is tempered somewhat by noting that a major portion of the adjustment is made in two to three years. This is conditioned in part by the initial assumption of the distributed lag model, which postulates that the speed of adjustment is determined by the difference between actual and equilibrium levels of employment at a point of time.

Historical Time Lag. Since economic conditions do continue to change rather than remain stationary so the consequences of previous change can work themselves out, it is useful to examine historically how soon a given equilibrium level of employment has been attained. This can be done by referring to Figure 1 and examining the horizontal distance between actual and equilibrium levels of employment, recognizing that the estimates are annual averages with straight line interpolation. This means that only yearly estimates are meaningful, and not the movement within the year.

In the major portion of the cases, equilibrium levels of employment are attained in from one to two years. Exceptions are the equilibrium levels of employment for the years 1929, 1931, 1938, 1939, 1940, and 1952 to the present. And only in the period from 1954 to the present has the actual level of employment lagged the equilibrium level by more than three years. Considered in a broad historical context, the period required to reach the equilibrium levels of employment has been comparatively short--until recent years.

Conclusions. Two inferences seem to follow from this analysis. First, the persistence of the "Farm Problem" reflects the continuing need to transfer resources, rather than the failure of the adjustment to take place. Resources have moved, and they have moved quite rapidly in an absolute sense. Reorganization of the resources in agriculture has been taking place at a rapid rate. The problem arises out of the continued need to transfer resources, or to adjust to a dynamic equilibrium.

Additional evidence on this is provided by an analysis with the same structural model that is being reported in a separate paper.4/ That analysis shows that in the range in which we are presently operating, the impact of economic growth, as represented by increases in the civilian labor force, in nonfarm earnings, and in the level of technology in the period since 1950, requires a 3% per year reduction in the agricultural labor force if farm prices are held constant. If farm prices decline by 3% per year, as they did from 1950-1957, a 4.6% reduction in the hired labor force is required each year. It is important to recognize that these are not once for all shocks on the agricultural labor market, but continuous adjustments imposed by a growing and expanding economy. The prognosis, then, is for labor incomes and wage rates in agriculture to lag behind those in the nonfarm sector as long as the transfer out of agriculture of the labor resource is necessary.

The second inference pertains to the increasing disparity between actual employment and the long-run equilibrium level of employment in the period since 1953. It appears that the transfer process is becoming more difficult. In the 10 year period from 1936-1945 the equilibrium level of employment declined 30%; the actual level of employment declined 29%. In the more recent 10 year period from 1950-1959, the equilibrium level declined 26%, but the actual level of employment declined by only 17%.

4/ Some Dynamics of the Agricultural Labor Market," to be presented at the Econometric Society meetings, August 29-Sept. 1, 1961, Stillwater, Oklahoma.

Clearly the labor market is not performing as well in the latter period as it did in the former. The reasons for this are outside the confines of this paper, but additional research in this area might be quite fruitful in designing more adequate policies. It seems reasonable that the "easy" adjustment is behind us and that the selectivity of migration itself has changed the composition of the remaining labor force base in such a way as to make additional migration more difficult. This is compounded by the changing occupational or skill mix demanded by the nonfarm sector. On the demand side, previous resource commitments (Glenn Johnson's fixed-asset theory) may be reducing the rate at which the labor resource moves.

Policy Implications

The burden of the empirical evidence presented in this paper argues that much of the labor adjustment problem is of a chronic nature and will persist as long as there is a need to transfer labor out of agriculture. This suggests that policy proposals structured in the context of a short-run "solution" to the farm problem are not well taken. On the positive side the evidence lends support to those policy proposals that are designed to increase resource mobility, and particularly labor mobility. This includes improved labor market information, direct subsidies to mobility, and an expanded training program for off farm jobs.

Appendix

The structural demand and supply relations on which the analysis is based are:

$$S: \quad Y_1 = -1330.22 + \underset{(.5668)}{1.8818}Y_2 - \underset{(.1237)}{.3547}X_{10} + \underset{(.1254)}{.6792}X_4 + \underset{(.1080)}{.5311}X_5 - \underset{(12.76)}{45.023}X_9$$

$$R^2 = .9844 \qquad \text{Durbin-Watson Statistic} = 2.23$$

$$D: \quad Y_1 = 969.91 - \underset{(.4599)}{.9002}Y_2 + \underset{(1.6547)}{4.0071}X_2 + \underset{(.1083)}{.7009}X_4 - \underset{(2.2732)}{2.5578}X_6$$

$$R^2 = .9698 \qquad \text{Durbin-Watson Statistic} = 1.82$$

where:

Y_1 = hired employment in agriculture, USDA estimate

Y_2 = index of composite wage rate in agriculture, USDA, deflated by consumer price index

X_2 = index of prices received by farmers, all products, deflated by index of prices paid by farmers for items used in production, excluding labor

X_4 = Y_1 lagged one year

X_5 = civilian labor force

X_6 = Ruttan's index of technology

X_9 = linear time trend

X_{10} = "corrected" nonfarm income, measured by average annual compensation to nonfarm employees, weighted by percent of the labor force employed.

The long-run equations can be obtained by dividing the coefficients of each equation by (1 - coefficient of X_4), and the long run equations can in turn be transformed to their reduced forms. The long run reduced form for Y_1, which was used in obtaining long-run equilibrium values in this paper, is as follows:

$$Y_1 = 737.08 + 8.8543X_2 - .3749X_{10} + .5614X_5 - 5.6518X_6 - 47.5907X_9$$