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In several earlier studies, including those of Kuh (1966), Bodkin (1969) and Modigliani (1977), the observed positive contemporaneous correlation between real wages and employment in the U.S. economy has puzzled macroeconomists. These empirical findings have, to some extent, motivated several theoretical papers which have implications consistent with the procyclical behaviour of the real wages. [Lucas (1970). Barro and Grossman (1971, 1976), Sargent and Wallace (1974).]

Recently, Neffcy (1978) pointed out that the earlier empirical work on the relationship between real wages and employment is deficient because it ignores the dynamics of the underlying relationship. The relationship between real wages and employment involves distributed lags, and once these are allowed for, the long run relationship between aggregate real wages and employment is negative and statistically significant. Thus, the "puzzling" positive correlation between real wages and employment reported in many earlier studies results from ignoring the dynamics of the underlying relationship.

The purpose of this paper is to provide some more empirical evidence on this issue by examining the dynamics of relationships at the industry-level. Such a study is important for at least two reasons. First, it is of interest to see if the dynamic negative relation discovered at the aggregate level is also present at the disaggregated industry level. Second, and more important, it is quite reasonable to argue that these lagged relationships are, in general, generated by adjustment costs to labor input and/or by short-run wage and price inflexibilities. If so, the shape of the distributed lag relationship would be expected to be influenced by the nature of these adjustment costs and/or by wage-price inflexibilities. But the latter depends upon the labor and product market structure in which an industry is operating. Hence a priori, we do expect the nature of the dynamic relationship between industry real wages and employment to be shaped partly by the underlying industry market structure. It is the intent of this paper to identify empirically at the two-digit level of manufacturing industries, whether such an influence is present.

The plan of this paper is as follows. Section I describes the model used to analyse the above issues and presents the main empirical results. Section II provides a rationalization for some of the empirical results reported in Section I. Section III contains the concluding remarks.

The Model, Data and Empirical Results

The main point of Neffcy's (1978) paper is that the underlying relationship between real
wages and employment is dynamic and, therefore, the statistical inferences about its nature should be based not on simple correlations between these variables but on the distributed lag regressions of real wages and employment.\(^1\) Hence the approach followed in this paper is to estimate the distributed lag regressions of real wages on employment at the industry level and derive inferences from them.

Since the main focus of this paper is on the industry level, we have used quarterly time-series data for the two-digit level U.S. manufacturing industries spanning the time-period 1956–IV 1970.\(^3\) For employment (L), data on the "production worker in industry manufacturing" are used. The time-series data on industry real wages were constructed by dividing the "average-hourly earnings excluding overtime" by the consumer-price index (W/P). It should be pointed out that, at the industry level, the appropriate real wages should be defined as (W'/P') when P' is the appropriate industry product price index. The main problem here is, of course, the non-availability of reliable and comparable quarterly time-series data at the two-digit level of industry disaggregation. However, under the reasonable assumption that the non-deterministic components in an aggregate price index and in an industry product price index are likely to be highly correlated with each other, it may be appropriate to use an aggregate price index such as CPI as a proxy for the product price index. Therefore, industry real wages were calculated as the industry nominal money wage (W') divided by the consumer price index (P'). All the underlying data used are seasonally adjusted.

Estimates of the distributed lag regressions of real wages on employment are presented in Table 1. The underlying regressions are of the form

\[
\begin{align*}
\ln w_t - \ln a_0 & = \sum_{i=1}^{n} b_i \ln L_{t-i} + \sum_{i=0}^{n} \delta_i D_{it} + \beta L_t + \varepsilon_t \\
& = \ln L_t - 1, 2, \ldots, N (1)
\end{align*}
\]

whence \(W_t\) is the ith industry real wage, \(L_t\) is the ith industry employment, \(D_t\) and \(L_t\) are seasonal dummies and the linear trend, and \(\varepsilon_t\) is the industry specific stochastic disturbance term. These equations are estimated by the generalized least squares estimation procedure\(^4\) and under our assumptions, this procedure will generate consistent and asymptotically efficient estimates of the regression parameters.\(^5\)

As long as employment is strictly congruent, industry least squares will generate consistent (though inefficient) estimates of the parameters. Since our primary concern is with the statistical significance of the regression parameters, we have used the generalized least squares estimation procedure. For this, it was assumed that the stochastic disturbance term in each industry equation follow a second-order auto-regressive structure of the form \(1 - \beta_1 L + \beta_2 L^2 \varepsilon_t \). It was also assumed that the hypothesis to be tested was that \(\beta_1 = \beta_2 = 0\). This procedure has asymptotic justification, though its small sample properties have not been investigated thoroughly as yet.\(^6\)

The consistency property of the OLSE or GLS estimated regression parameters in equation (1) depends upon the adequacy of the employment variables. A formal test of the congruency was first developed by Sims (1972) and used, among others, by Neftci (1978). This test measure is based on the hypothesis that includes past, current and future values of the industry employment, the coefficients of which, if they are consistent, will be statistically significant. Such a test was carried out for each industry.

Our primary interest is in testing the nature of the relationship between real wages and employment at the industry level. If this relationship is dynamic, then, one should look at the signs of the sum of the estimated distributed lag coefficients like \(\Sigma b_i\), to make inferences about the nature of the relationship. However, it is plausible that for some industries this relationship may not be dynamic but contemporaneous. One needs to examine both the possibilities for each industry. Table 1 presents the estimates of equation (1) for \(n = 0\) as well as for \(n = 8\). The F-

\(^{1}\) Whether such inferences are derived from distributed lag regressions of real wages on employment or employment on real wages, depends upon the nature of the two-sided distributed lag regressions in the stochastic representation of these two time-series. In the case of U.S. Manufacturing, Neftci (1978) noted that distributed lag regressions of real wage on employment or employment on real wages were consistent with the inference that longer run relationship between real wages and employment is inverse. For more, see Neftci (1978).

\(^{2}\) The choice of this sample period stemmed from the desire to exclude the questionable wage-price control period starting in mid 1971.

\(^{3}\) A test of the null hypothesis that the eight past values are zero is included to determine whether the relationship is dynamic. The F statistic (F) is obtained from comparing the restricted equation with the unrestricted equation. If the F statistic is significant, then the distributed lag is significant.

\(^{4}\) These are the generalized least squares estimates of the coefficients of real wages on employment for each industry.

\(^{5}\) This is a test of the null hypothesis that the eight past values are zero. It is distributed with (8, 60) degrees of freedom. A test of the null hypothesis that real wages are not affected by the current value of employment. It is in fact the square of the relevant t-values in the contemporaneous real wage regressions (Run 1).

\(^{6}\) Statistics, F1 and F2, are also shown in Table 1. F1 is the test of the null hypothesis that the coefficient of the current value of the employment in the relevant industry real wage regression is zero. A significant F1 (which is in fact the square of the t-value) is consistent with a significant relationship between real wages and employment. The t-value for the employment level in the industry real wage regressions is zero. A significant F2 will indicate the presence of a significant lag distribution between real wages and employment. The t-values associated with the three significant lags for the third and fourth highest lags would be regarded as significant. This implies that the GLS procedure as employed in the paper does generate consistent estimates of the parameters.
are the basis for exploring the adequacy of contemporaneous relations. They reveal that the contemporaneous regressions yield very mixed results about the nature of relationship between real wages and employment. For the contemporaneous relation between real wages and employment is negative and statistically significant for only four out of seventeen industries; for the remaining industries, the relationship is positive but significant only in five cases. (See the relevant t-values or Fiso for Run 1 in Table 1.)

When we consider the dynamic version of these regressions (n = 8), the number of industries showing a negative long-run relationship between real wages and employment increases from four to twelve; though it is only for ten out of twelve that the sum of coefficients on the current and/or past values of employment in the various industry real wage regressions is statistically significant. (See the relevant t-values for Run 2 in Table 1.) The tobacco industry is included in this count. Comparing F1 and F2 suggests that there is no long lag distribution, and that the contemporaneous relationship between real wages and employment for this industry is inverse and statistically significant.

For the remaining industries, textiles, apparel, leather, lumber, and furniture, the sum of distributed lag coefficients is positive and statistically significant for all except leather (see t values for the sum of coefficients). F1 and F2 for these industries suggest that logged values of employment are statistically significant for only two industries (Apparel and Furniture). Together these statistics suggest that the relationship between real wages and employment is positive, and statistically significant while evidence of a lagged response seems mixed for this group of industries.

Industry patterns of the relationship observed are of interest. Industries like textiles, apparel, leather, lumber, and furniture, which show a positive long-run relationship between real wages and employment, are low wage, highly competitive and least unionized. The remaining industries showing a negative relationship between real wages and employment falls into the high wage, least competitive and highly unionized groups. These results then suggest that the industry market structure does have some influence in shaping the nature of the dynamic relationship between real wages and employment.

II

The results presented in the previous section raise a very interesting question. Why do the firms and workers need not always be on their respective demands and supply curves. The (effective) demand for labor might differ from the conventional (or 'notional') demand for labor. Consider Fig. 1 in the context of a particular industry. L* and L respectively are the conventional or 'notional' demand and supply curves for labor facing this industry. This 'notional' demand for labor is to be distinguished from the 'effective' demand for labor denoted by L. Suppose that the commodity market is in equilibrium. The demand determined output (P) equals the supply of output which clears the labor market (F) and the notional demand for labor (L*) equals the effective demand for labor (L). The equilibrium real wage is w. The labor market is thus in equilibrium at A which may well be denoted as full employment general equilibrium. Now suppose that, due to an exogenous shock, the commodity demand is lower so that y < y* and L < L*. At the real wage w, we have excess supply of labor, in an amount given by 48. There are two possible responses of w (real wages) to this excess supply of labor. If the real wages decline in response to this excess supply, we will find a fall in real wages towards w, accompany the decline in employment. If, at point C or at some intermediate point between B and C, some action is taken to restore effective commodity demand, excess demand for labor will result. In that case, we may find a rising real wage accompanying the recovery of output and employment. This scenario then will generate a negative relation between real wages and employment. On the other hand, if real wages w increase in response to excess supply of labor, then, the movement of real wages toward w, will accompany the decline in employment and this scenario will generate a negative relation between real wages and employment.

The above framework then implies that the cyclical or the counter-cyclical behavior of real wages depends upon whether industry real wages fall or rise in response to excess supply of labor in the market. But the later is influenced in part by the nature of the product and labor market in which an industry is operating. Consider an industry which is highly competitive and least unionized so that the wages and prices it faces are relatively flexible in response to excess demand and supply conditions in the labor and product markets. In that case, it is reasonable to expect that real wages may decline as excess supply of labor emerges and the real wages may increase as excess demand increases in the short run. On the other hand, consider the industries which are highly non-competitive and highly unionized so that wages and prices facing these industries are rather not very sensitive to short-run excess supply and
demand pressures. For these industries, it is very plausible that even when we have excess supply conditions in the labor market, the average real wage may move up.

Mehra (1976) already had provided empirical evidence which is consistent with the above-described behavior of real wages with respect to excess supply of labor in the economy. For the same historical time period and for the same data as the one underlying this paper, Mehra (1976) estimated industry money wage equations which show that when unemployment (a measure of excess supply of labor in the economy) rises in the economy, the real wages fall in industries which are low wage, highly competitive and least unionized. However, real wages in fact rise in industries which can be characterized as high wage, highly noncompetitive and strongly unionized.

III

Concluding Remarks

The general conclusion which emerges from the empirical evidence reported in this paper is that industry real wages and employment are dynamically related. However, clear cut evidence of an inverse long run relationship between real wages and employment does not emerge. For several U.S. industries, real wages and employment are positively correlated. There is some evidence supporting the contention that industry structure has a role in shaping the nature of this dynamic relationship. For an industry which faces more competitive product and labor markets, we do find a tendency for this relationship to be relatively contemporaneous and for real wages to move procyclically.

References


For details see Mehra (1976, Table 1).

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The Influence of Children on the Wage Rates of Married Women

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I. Introduction

The relationship between children and the earnings of married women is not well established in the labor force literature. Human capital theorists, in general, argue that the presence of children may reduce the amount of training and work experience acquired by married women and hence the level of their current wage rates. In the most rigorous formulation of this argument, Minier and Polacheck (28) found that adding the number of children to their general women's earnings equation, after accounting for experience, education, and depreciation of human capital, failed to enhance the explanatory power of the model. This result has been widely interpreted to mean that children only influence mothers' earnings indirectly, through the depreciation of their stock of human capital during the time they are out of the labor force and through the foregoing accumulation of additional human capital, especially work experience. In a number of studies, age and experience variables have been presumed to capture the children factor (see: Cohen (11), Blinder (5), and Struyk (32)), and Oaxaca (26) recently used the number of children as a proxy for the number of years of lost work experience.

Despite this interpretation, the relationship between children and the earnings of mothers has not been absolutely determined. Minier and Polacheck also reported that the number of children variable may have some influence on earnings for sub-groups of highly educated women and women with stronger labor force attachments. In addition, Moore (25) recently showed that the number of children has a small but significant negative influence on the wage rates of mature married women, holding actual work experience, level of education, and a number of other factors constant. He also showed that the number of children may influence the earnings of women through their occupational distribution.

Polacheck (28) also used a human capital approach within a family decision-making framework, to examine the effect of children on wage rates. His model explained different labor force and investment patterns between husbands and wives, but three of the ideas expressed are applicable to the different patterns between childless women and mothers. First, as mentioned above, the presence of children could truncate the educational and the work experience levels of mothers causing differences in wage levels and in market versus non-market uses of time between them and childless wives. Second, if the existence of children increases the non-market productiv-