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WAGE LEADERSHIP IN CONSTRUCTION

Wage leadership is the theory that wage increases in one sector lead to imitative increases elsewhere. In this paper we test this theory in a large industry where wage leadership is supposed to be dominant--construction. Alternate theories of wage determination (excess demand, real wage bargaining) are also tested, along with the efficacy of the 1971-73 wage controls.

BACKGROUND

The theory of wage leadership is an important part of the theory of wage controls. A major difficulty with wage controls is that, with competitive markets, these controls create shortages. Under a less competitive theory, this problem is diminished. Thus, wage and price controls are usually offered in conjunction with a theory in which prices and wages have large arbitrary components. One such theory is wage leadership.

The idea that workers try "catch up" to wage increases received by other workers has a long history. Hall [4] refers to work done by Dunlop in 1944, which argues that a whole series of wage increases can be set off by an increase in a single wage.

The theory of wage leadership is a special case of a widespread, even if not well developed, theory of inflation: that inflation results from a series of "special" problems, rather than a continuing stimulus, such as monetary growth. The special problem is sometimes a rapid increase in oil prices and other times an exceedingly high increase in the wages of an important sector. Wage leadership has become a popular special problem. For theories of inflation in which wage leadership plays an important part, see Hicks [5], Scitovski [12], Piore [11], and Tobin [14].

Even in theories where wage leadership does not create inflation, it is said to be a rigidity which makes it harder to reduce the rapid increase in prices. For example, Gordon [3] writes:

> "The principal sources of inertia in the U.S. inflation process, which make inflation so difficult to decelerate and cause monetary tightness to be translated into higher unemployment rather than a slowdown in inflation, are the institutions of three-year overlapping wage contracts in the unionized part of the economy and pattern-setting and emulation in much of the remainder of the economy."

THE TWO THEORIES OF WAGE LEADERSHIP

In evaluating the theory of wage leadership against alternative hypotheses, it is important to distinguish between two versions, one noncontroversial and not very important. The other is controversial and, if true, quite important.

The first version is that wage leadership aids in the process of adjustment from one equilibrium to another. Workers use the wages of similar workers to help estimate their own equilibrium wage. Wage leadership does not change the equilibrium but is merely a means of getting to it by providing relevant information.

The stronger version of the theory is that wage leadership actually raises the equilibrium wage. There is a general "leapfrogging" effect which leads to all wages being higher. It is this second version that has relevance for wage determination and, therefore, inflation.[1]

To determine whether even this version is relevant, we next discuss other theories of wage determination and then test their comparative strength in wage rate regressions.

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[1]The customary caveat is required here, that the monetary authorities must accommodate the price increases.

The Alternative Hypotheses

We start with the standard, modified Phillip's curve:

$$\frac{\dot{W}}{W} = a + bU^{-1} + cP^{e}$$

where

$\frac{\dot{W}}{W}$ = the percentage change in wages
U = the unemployment rate
P^{e} = the expected rate of inflation.

This equation embodies two theories. The first, excess demand, is represented by the inverse of the unemployment rate (see Lipsey [7]). The second, real wage bargaining holds that markets determine relative, not absolute, prices. Hence, the appropriate dependent variable is the change in the wage relative to the change in other prices, the latter usually measured by the general rate of inflation. Unfortunately, the rate of inflation that matters is not the actual rate, which can be observed, but the anticipated rate, which can not. Thus, P^{e} appears as an explanatory variable. The coefficient on P^{e} is unity in the so-called "accelerationist" model and less than unity in a model with a long-run tradeoff between inflation and unemployment.

We might expect wage leadership and real wage bargaining to, perhaps, be most directly related. The theory put forth by the accelerationists (e.g., Phelps [10], Mortensen [9], and Friedman [2]) includes imperfect information as a reason why Phillips's curves shift or become nearly vertical. Workers may be fooled in the short run, but over time, expectations catch up to reality. They do this by obtainng better information. To the extent that construction workers observe related workers' wages, they, too, obtain better information. Wage leadership only represents this process.

<u>Wage Leadership in Construction</u>

The only paper we know which tests wage leadership in its strong form is D. Quinn Mills's study of the construction industry [8]. Mills relates aggregate construction wages to a wage leadership variable. This variable, termed intertrade variation, is based on the variation in wage gains among trades in a particular city.

Here is how the variable is calculated. Within each city and trade, the percentage increase over three years in compensation (wages and fringe benefits) is calculated. For each city, the variance around the city average is calculated. This provides a variance for each city. A weighted average of these variances is taken to provide a national time series (where employment is used for the weights).[1]

The Mills study is important for two reasons. First, in contrast to other studies which purport to tests of the wage leadership hypothesis, Mills formulates a variable that predicts the changes in aggregate construction wages over time. Other studies, e.g., Shulenberger [13], test the weaker version.

Second, the fact that Mills supported the theory gives it more than purely academic significance. Mills was a leading figure on the federal Construction Industry Stabilization Committee, the committee empowered to control union wages. This special control was designed to prevent another round of large wage increases like the one from 1967 to 1971.

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[1] The intuitive connection between this variable and the concept to be measured, wage leadership, is discussed in [8].

Surprisingly, the CISC was quite sympathetic to wage increases generated by leadership. A major stated policy was to allow increases to reestablish "parity" between unions. A possible consequence of this policy is that wage leadership, even if normally irrelevant to the determination of construction wages, may well have significance during the period when the CISC was in operation.

Data Sources

We estimated the equation for construction wages on annual, time-series data 1953-1975. Data sources are listed in table 1, but two variables require more detailed discussion. The first is the measure of intertrade variation. This variable is available from Mills only through 1972; it was necessary to extend it. From data in Engineering News Record on compensation of construction union labor, we formed a measure of intertrade variation based on seven trades in thirteen major cities. (The Mills version used 22 trades in 57 cities.) We then regressed the Mills measure on three lags in our measure. We used this regression to extend the Mills variable for 1973 on. The R^2 of the regression was .91. Explanatory variables other than our measure of variance added virtually nothing to the regression and were excluded.

The second is the increase in compensation. Our measure of wage increase is based on average hourly earnings, which excludes fringe benefits. To include fringe benefits, we multiplied average hourly earnings by the ratio of compensation to earnings. The ratio is from the GNP accounts. The GNP data refer to all workers in construction, not just production workers. Hence, we are assuming that the ratio of fringe benefits to earnings is the same for production and nonproduction workers.

TABLE 1

DATA SOURCES

Variable	Source
Intertrade Variation	Mills [8] extended as described in the text
Average Hourly Earnings	Bureau of Labor Statistics
Adjustment for Fringe Benefits	GNP Accounts
Unemployment Rate	Bureau of Labor Statistics
Expected Rate of Inflation	Livingston survey.[a]

[a] Forecasts based on a survey of business economists by Joseph H. Livingston of the Philadelphia Inquirer. We used the data as adjusted by Carlson [1] to remove some inconsistencies.

Empirical Results

Our goal is to test the strong version of the wage leadership theory, that wage leadership in the construction industry can raise the national average level of wages in construction. For this purpose, time series are appropriate. In cross-section data, there is no variation in the national average.

The test is made in the context of a modified Phillips curve. The percentage change in wages is expressed as a function of excess demand (measured as the reciprocal of the unemployment rate), the expected rate of price change, the Mills variable for intertrade variation, and a dummy variable for wage controls. Several versions of the results are presented, embodying differing assumptions and time periods.

Table 2 is the summary of results using the Mills formulation. The first regression uses data ending in 1972, when the data for the Mills study ended. The second regression runs through 1975. In the first regression both Z(t), intertrade variation, and the wage control variable have the expected sign and are significant. In the second, the coefficients and significance level on Z(t) and the dummy are about halved. The R^2 falls from .88 to .55, very low for time series data.

TABLE 2

ESTIMATES OF MILLS'S EQUATIONS:

DEPENDENT VARIABLE $\left(\frac{\dot{W}}{W}\right)$

Explanatory Variable	Coefficient	
U(t-1) - U(t-2)	-.4 (-4.56)	-.22 (-2.55)
M(t): Percent Change in Manufacturing Wage	.77 (5.05)	.44 (2.43)
z(t): Extended Version of Mills's Variable	.66 (6.05)	.32 (2.83)
D: Dummy Variable Representing Wage and Price Controls, 1 in 1971, 1972, and 1973 --0 otherwise	-3.22 (-3.5)	-1.53 (-1.50)
Constant	.08 (.12)	2.32 (1.94)
Range:	1953-1972	1953-1975
R^2	.88	.55
D.W.	1.40	1.41
	--	.69

The model does not seem to fit the more recent data very well. One possibility could be our extension of Z(t), the intertrade variation variable. However, there are reasons for supposing that the problem lies elsewhere: first, the equation predicting Z(t) from which the extension was made had a good fit; second, the t-values of all the variables, not just Z(t), dropped sharply; third, other specifications, discussed later, work well.

The second set of results, a more standard Phillips curve equation, is presented in table 3. The three regressions in table 3 vary by length of period and by inclusion or exclusion of the wage leadership variable. Results based on data through 1972 (the left column) provide support for the hypothesis that wages depend on the intertrade variation and modest support for the hypothesis that the CISC depressed wages. Results from the full period (the center column) show a weakening of the effect of Z(t) (it is no longer significant) and a disappearance of the effect of the wage and price controls. Results from the full period, omitting Z(t), are presented in the third column. Note that omitting Z(t) causes the price control dummy to come in with a positive sign. The interpretation is that during the period of wage controls, wages actually grew more rapidly than would have been predicted from expected

TABLE 3

ESTIMATES OF EQUATION (2):

DEPENDENT VARIABLE $\left(\frac{\dot{W}}{W}\right)$

(Including Dummy for Wage and Price Controls)

Explanatory Variable	Coefficient		
$U^{-1}(t-1)$	38.4 (6.96)	43.2 (6.14)	45.2 (6.46)
$P^{e}(t-1)$	.55 (4.02)	.36 (2.60)	.46 (3.92)
Z(t)	.27 (2.80)	.13 (1.29)	-- --
D: Dummy for Wage and Price Controls	-.97 (-1.02)	-.05 (-.06)	.68 (1.06)
Constant	-.07 (-.13)	-.02 (-.02)	.11 (.15)
Range	1953-1972	1953-1975	1953-1975
R^2	.88	.82	.80
D.W.	2.28	1.86	1.99
	-.28	--	--

prices and the unemployment rate. Only if a positive effect is attributed to Z(t) is there a negative effect left over for wage controls.

If it is accepted that price controls had, at most, very limited effect, it is reasonable to inquire why. One possibility is that the committee's power was so limited as to be unable to suppress price increases. This, however, does not accord with Mills's own statements that the committee did determine which wage increases to allow and did, in fact, disallow many. What does seem to have occurred is that the committee bottled up the pressure for wage increases in 1971-72 and that these took effect in 1973.

The final burst of wage increases may have been the inevitable result of pent-up excess demand, or it could have been a consequence of the committees stated adherence to the principles of wage leadership. In fact, maintaining parity was one of the few acceptable reasons for approving a wage increase. This exception is curious. If the first wage increase sneaks through, the others must be allowed too and it is the others that are not justified by market forces.

Multi-Year Contracts

Observed wage changes come from both current wage bargains and those left over from the recent past. They depend partly on recent economic conditions. One reason for taking this dependence into account is that Z(t), the intertrade variation, is the only variable based on data from three years. This may artificially enhance the explanatory power of Z(t) relative to other variables.

To incorporate bargaining periods, we begin with table 4 which describes the time pattern of bargaining. This table accounts for union sector with a 3-year bargaining period and a nonunion sector (40 percent of the industry [4]), whose bargains are always current.

TABLE 4

TIME PATTERN OF BARGAINING

Nonunion bargaining currently	40%
Union - bargaining currently	20
Union - bargaining 1 year earlier	20
Union - bargaining 2 years earlier	20

We form a weighted average of the right-hand side of equation 7 by using weights from table 4, i.e., current variables receive a weight of 60 percent and the preceding periods weights of 20 percent each.

We do not form a weighted average of the wage leadership variable, for this variable is already constructed from data over a 3-year period. Also, we do not form a weighted average of the dependent variable; it is still the percentage change in compensation as in the previous equations. We are still explaining the same variable. The equation is given by:

$$(8) \qquad \frac{\dot{W}}{W} = a + b[.6U^{-1}(t-1) + .2U^{-1}(t-2) + .2U^{-2}(t-3)] + c[.6P^{e}(t-1) + .2P^{e}(t-2) + .2P^{e}(t-3)] + dZ(t) \ .$$

Since equation (8) is derived as a weighted average, the error term will necessarily be a second-order moving average process.

$$e(t) = e^{*}(t) - \rho_1 e(t-1) - \rho_2 e^{*}(t-2)$$

Values of ρ_1 and ρ_2 were chosen from a 10x10 grid with calculations performed on the TROLL system. Results are given in the following equation

$$\frac{\dot{W}}{W} = \underset{(8.37)}{43.32} \; [.6U^{-1}(t-1) + .2U^{-1}(t-2) + .2U^{-1}(t-3)$$

$$+ \underset{(9.15)}{.70} \; [.6P^{e}(t-1) + .2P^{e}(t-2) + .2P^{e}(t-3)]$$

$$- \underset{(-.67)}{.04} \; Z(t)$$

Range: 1953-75
R^2: .77
D.W.: 1.91
ρ_1: .33
ρ_2: .67

The weighted average version has a lower R^2 but smaller standard errors on the coefficients. The higher R^2 of the initial regression does not rule out the validity of the present regression; the sources of spurious correlation discussed earlier can artificially raise the R^2. The coefficients on unemployment and expectations are larger in the weighted version and have higher t-values. By this measure, about 70 percent of expected price increases are passed on to wage increases. The intertrade variation has the wrong sign and is insignificant.

The results support the hypotheses that the intertrade variation actually measures the adjustment to higher expected rates of inflation rather than wage leadership. The results also support the hypotheses that the intertrade measure is weakened when competing variables are also defined as 3-year averages.

CONCLUSIONS

Our findings can readily be summarized:

1. The standard variables (unemployment and expected prices) do well in predicting construction wages.

2. Over the full period of estimation, the variable representing wage leadership does not achieve customary levels of significance. This is especially true when all right-hand side variables are defined to cover 3 years.

3. There is no evidence that the wage controls lowered wages.

4. Given points 1 - 3 above, it appears that wage controls are neither harmless (as they might be if wage determination were an arbitary, follow-the-leader process) nor are they effective.

REFERENCES

[1] Carlson, John A. "A Study of the Price Forecasts," Annals of Economic and Social Measurement, 6/1 (1977), pp. 27-56.

[2] Friedman, Milton. "Nobel Lecture: Inflation and Unemployment," Journal of Political Economy 85, No. 3 (June, 1977), pp. 451-472.

[3] Gordon, Robert J. "Comments" on Lawrence Seidman, "Tax Based Income Policies," in Arthur M. Okun and George Perry, eds., Curing Chronic Inflation, Brookings, 1978, pp. 114.

[4] Hall, Robert E. "The Process of Inflation in the Labor Market," Brookings Papers on Economic Activity, 1974:2, pp. 343-393.

[5] Hicks, J.R. The Crisis in Keynesian Economics (3rd Essay), Oxford:Basil Blackwell, 1974.

[6] Jondrow, James and Levy, Robert. "A Time Series Analysis of Wage Changes on the Contract Construction Industry," Center for Naval Analysis, Memorandum PRI 79-13, July 1979.

[7] Lipsey, R.G. "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom," 1862-1957: A Further Analysis," Economica Feb. 1960, (XXVII), pp. 1-31.

[8] Mills, Daniel Quinn. "Explaining Pay Increases in Construction: 1953-1972," Industrial Relations, May 1974 (Vol. 13, #4), pp. 196-201.

[9] Mortensen, Dale T. "A Theory of Wage and Employment Dynamics," in Edmund Phelps, ed., Microeconomic Foundations of Employment and Inflation Theory, 1970, pp. 167-211 (paperback).

[10] Phelps, Edmund. "Money Wage Dynamics and Lbor Market Equilibrium," in Edmund Phelps, ed., Microeconomic Foundations of Employment and Inflation Theory, 1970, pp. 124-166 (paperback).

[11] Piore, Michael J. "Unemployment and Inflation: An Alternate View," Challenge, May/June 1978 (Vol. 21, #2), pp. 24-32.

[12] Scitovsky, Tibor. "Market Power and Inflation," Economica, August 1978, pp. 221-234.

[13] Shulenberger, David E. "A Contour Theoretic Approach to the Determination of Negotiated Wage Change in the Building Construction Industry," Economic Inquiry, July 1978, pp. 395-410.

[14] Tobin, James. "Inflation and Unemployment," American Economic Review, March 1972, pp. 1-18.

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