of euphoria more conscious in a positive way to develop alternative supplies for their energy needs.

8. One may at this point rightfully raise an eyebrow and wonder why would bars of gold, a mercantilist perception of wealth, influence the conduct of policies of a socialist state in whose value system gold may simply carry an endemic nuisance value? This leads to the last point to be developed reflecting the views of powerful west German interests who in their search for profits became instrumental negotiating and financing the “Deal.” This deal may turn into own graveyard and Fin- landize Europe. It also has developed in all respects into the “Deal of the Century” to Soviet interests.

The banking sources believe “the additional Russian gas exports to the west through the Ureygoy pipeline cannot offset the declining oil export revenues of the USSR by the 1990’s should the USSR in addition suspend their gas deliveries that would cause the present $25 - Billion export revenue income in convertible currency to fall approximately $6 - 10 billion in purchasing power equivalent.” Here lies the significance of gold collateral whose value as international trade equivalent will rise for the Soviets by the end of the decade.68

In the past forty years the USSR under- wrote their satellites development by offering oil flows as friendship prices, well below world market levels. Just as it exerted considerable sacrifice to keep their satellites under eco- nomic sway, the same policy may be applica- ble to western gas deliveries. In line with the west German argument of dwindling oil sup- plies (augmented by both OECD & CIA computations) they will keep adequate gas flow to keep their economic clout felt in western Europe. It also reinforces further the argument developed in this discussion, that due to tapping off of other hydrocarbon prod- ucts, without institution of safeguards, such shortages will be used to manipulate for fur- ther economic and political gains.

What better way to summarize my conten- tions than by quoting Hayek, who claimed “we should refrain frankly to face the facts, that freedom can only be had at a price, and that as individuals we must be prepared to make material sacrifices to preserve our liber- ty, and give up a possible immediate gain for freedom.”69


Effect of the Minimum Wage on Inflation and Other Key Macroeconomic Variables

BRIGITTE SELLEKAERTS*  

Introduction

The effect of minimum wage changes on wage inflation can be seen as taking place in several stages, which are at least partly overlapping. First, there is a direct impact, caused by the legislated increase in hourly earnings of those subject workers who were previously paid less than the new minimum. Second, there may be a fairly quick adjustment in hourly wage payments to workers who already were paid in excess of the new minimum wage level prior to its enactment. This adjustment may be caused by specific contract clauses contingent on the minimum wage, or by the particular wage policy of employers designed to maintain a relative wage hierarchy (wage comparison or “ripple” effect). Third, as hourly compensation rates and, hence, unit labor costs rise, firms will attempt to raise their product prices in the short run. Fourth, firms will begin to adjust the level and mix of factor demands and production changes. The new factor mix, consistent with cost mini- maximization subject to expected demand, may lead to an increase in output per person hour, which may mitigate the ultimate inflation outcome. Fifth, the resulting new equilibrium employment combination with the new average hourly compensation to produce a new equilib- rium income level, aggregate demand and, after some lag, production. Sixth, the inflation and unemployment rates consistent with the new equilibrium levels of income, output, demand for goods, costs, factor demand and supply, may in turn again influence average hourly earnings. This effect is called the “spillover” or the “pass-through” effect. The overall wage inflation outcome will, of course, also depend on the position of the economy in a particular stage of the business cycle and on the general policy environment. The process is represented schematically in Figure 1.

A positive effect on wage changes other than the direct impact on minimum wage workers is exerted by (1) the wage comparison effect, (2) the labor substitution effect, and, (3) the inflation and inflationary expectations effect, which accompanies a negative in- fluence emanating from the unemployment effect. Prior to this study, no successful effort was made to quantify the average size of the indirect economic spillover effects of a given minimum wage change on wage inflation.

* Central Michigan University, Mount Pleasant, Michigan 48859. This paper was written while the author was Senior Economist at the Minimum Wage Study Committee. The opinions expressed in this paper are those of the author and do not necessarily reflect the official position of the Commission. Programming sup- port for the paper was provided by Peggy Chingai and Alan Hoagl, and research assistance by Gregory Gagnido and Don Lewis. Helpful comments were pro- vided by Charles Brown, Willy Sellekaurts and Robert M. Solow, who are in no way responsible for any error that may remain.
I. Measurement of the Inflation Impact of Minimum Wage Legislation in Previous Studies

Existing empirical studies of the impact of minimum wage legislation on wage inflation fall into four categories: (1) studies of the direct impact of a change in minimum wage legislation on wage distributions, (2) computation of the post-enactment wage bill in various industries, (3) augmented Phillips curve analysis and (4) assessment of the eventual wage inflation impact in a general equilibrium framework. The direct and total wage impact of a 10% rise in the minimum wage measured in these studies is presented in Table 1. Previous research studies generally focused on merely one, or at best a few, of the several steps in the transmission mechanism summarized above (e.g., Fortin 1978, DOL 1978 and 1979). Where efforts were made to focus on several or all steps (e.g., MPS 1971 and 1975, Gramlich 1976), the impact of the minimum wage was traced in a sufficiently accurate way to capture the resulting dynamic wage/price interactions and productivity effect.

Evidence on the direct impact of minimum wage changes on the wage distribution can provide some information about the existence and magnitude of the ripple effect. In a recent paper, A. McCaulland (1979) tested whether changes in minimum wage legislation set off a ripple of wage changes throughout the wage distributions of firms and industries, which would cause a bunching near the lower end of the distribution that may persist for several months. Using establishment data, McCaulland found that the wage distributions in some New England industries narrowed, despite the fact that the behavior of other economic variables would have produced a widening of the distribution. For the nation as a whole, however, the evidence was inconclusive.

The second approach, i.e., the assessment of wage/price inflation impacts of minimum wage legislation by means of the computation

\[ \text{Figure 1 Transmission of Minimum Wage Effects on Wage/Price Inflation} \]

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Single Equation</th>
<th>Single Equation</th>
<th>Direct Wage Impact (Percent)</th>
<th>Total Impact on Wages (V) or Prices (P) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPS (1971)</td>
<td>Wage Determination Relations x</td>
<td>0.078</td>
<td>8A</td>
<td></td>
</tr>
<tr>
<td>MPS (1975)</td>
<td>Wage Determination Relations x</td>
<td>0.15</td>
<td>15 (P)</td>
<td></td>
</tr>
<tr>
<td>H. Gramlich (1976)</td>
<td>Wage Determination Model</td>
<td>0.28</td>
<td>28 (P)</td>
<td></td>
</tr>
<tr>
<td>J. Carlson (1977)</td>
<td>Not Indicated</td>
<td>0.90</td>
<td>90 (P)</td>
<td></td>
</tr>
<tr>
<td>R. T. Palmer (1978)</td>
<td>Wage Determination Relations x</td>
<td>0.40</td>
<td>40 (P)</td>
<td></td>
</tr>
<tr>
<td>P. Fortin (1978)</td>
<td>Industry Wage Bills x</td>
<td>0.26</td>
<td>26 (W)1</td>
<td></td>
</tr>
<tr>
<td>U.S. DOL (ESA) (1978)</td>
<td>Wage Bill x</td>
<td>0.26</td>
<td>26 (W)</td>
<td></td>
</tr>
<tr>
<td>U.S. DOL (ESA) (1979)</td>
<td>Wage Bill x</td>
<td>0.37</td>
<td>37 (W)2</td>
<td></td>
</tr>
<tr>
<td>J. Baldin (1979)</td>
<td>Wage Determination Relations by Occupation x</td>
<td>0.60</td>
<td>60 (W)</td>
<td></td>
</tr>
<tr>
<td>E. Sallcekerts (1980)</td>
<td>Wage Determination Relations by Occupation x</td>
<td>0.80</td>
<td>80 (W)</td>
<td></td>
</tr>
<tr>
<td>R. Sallcekerts (1980)</td>
<td>Wage Determination Relations by Occupation x</td>
<td>1.80</td>
<td>180 (W)</td>
<td></td>
</tr>
</tbody>
</table>

1 Derived from U.S. Department of Labor (1978a), Table 1, p. 16.
2 Derived from U.S. Department of Labor (1979), Table 1, p. 19.
3 Impact computed for non-whites only. The total wage impact over seven years changes from -2.7% for class B typists to 3.6% for class C tile clerks.
4 Impact during the quarter in which the minimum wage increase is effective.
5 Without econometric adjustment, after four quarters, the wage comparison, or simulation effect, is thus estimated to be 35%.
6 With econometric adjustment effect, after six quarters.
7 Average impact for all occupations. For the individual occupations, the total wage impact varies from 0.05 to 35.
of the post-change wage bill in various industries, has been applied by P. Fortin (1978) for the Quebec case. Fortin computed the maximum potential addition to industry wage bills of a rise in the minimum wage, using data from the annual surveys of wages, salaries and hours worked by industry. He found that for 1978, a 10% minimum wage increase would entail a direct wage effect of 0.4%. On the basis of other studies, he estimated that the ripple effect varies across industries from 20% to 120%, averaging 60% of the direct impact, and concluded that the total wage effect was 0.6%. Since wage costs vary between 40% and 85% of industry production costs, the potential price inflation impact of a 10% minimum wage increase was estimated to be between 0.3% and 0.5%.

Fortin’s approach presumed 100% compliance, abstracted from dynamic wage-price interactions, and did not allow the possibility that employers have the option of adjusting production patterns, the level and mix of factor demand, and productivity. Furthermore, Fortin did not consider other economic factors affecting industry wages, and the eventual disemployment and inflationary expectations effects and their feedback effect on wage inflation.

Several authors have augmented wage determination relationships to estimate the direct effect of minimum wage changes on aggregate wage inflation. The theory underlying this approach stipulates that percent changes in average hourly earnings depend on cumulative changes in both lagged prices and the lagged minimum wage, on the inverse of the unemployment rate, and on a suitable indicator of cyclical activity (e.g., the change in the unemployment rate). The typical estimated relationship takes the following form:

\[ W = \left( \sum MW_{t-1} + \sum P_{t-1} + Z \right) \]

where \( W \) is the percent change in average hourly earnings, \( U \) is the unemployment rate, \( M \) is the percent change in the minimum wage rate, \( P \) is the percent change in the consumer price index, and \( Z \) denotes other variables (e.g., productivity and a variable capturing the position of the economy in a particular stage of the business cycle). In Table 1, four previous studies using this approach are identified (two versions of the wage equation in the MPS model, Falcomer, Gramlich, and Baldwin). In the aggregate single equation version of this formulation, it is generally found that minimum wage changes primarily lead to instilled changes in average hourly earnings in the impact quarter while lagged minimum wage rate changes appear to have an insignificant effect.

Five problems must be addressed if minimum wage impacts are measured by means of aggregate augmented wage determination models. First, average hourly earnings (AHE) are a weighted average of both minimum wage and other workers. Accordingly, economic relationships that relate changes in AHE as a dependent variable to changes in the minimum wage rate as an independent variable, rely on a “part” to explain the “whole,” resulting in unreliable estimates of the average effect of minimum wage changes on average hourly earnings.

Second, the variable representing the effect of inflation and inflationary expectations is colinear with the minimum wage variable. This may explain why, for example, in Gramlich’s equation, only the coefficient of MW, is statistically significant while the coefficients of the MW’s are insignificant. It is interesting to note that there is no P in the equation. In other studies (e.g. Baldwin) that exclude measures of P, lagged MW terms tend to be more significant.

Third, the remaining explanatory variables in the same relationship, i.e. the unemployment rate, productivity and the distributed lag over consumer price inflation, are subject to simultaneous equation bias, since they are themselves affected by changes in these variables are not very large and are mutually offsetting to some extent. Nevertheless, if one is to measure the total wage impact of a minimum wage increase, it is important to estimate the strength of spillover effects that occur through the additional explanatory variables, and change the wage outcome over and above the direct minimum wage impact and the wage ripple effect. Specifically, these spillover effects may operate through impacts of a minimum wage change on (1) unemployment, (2) productivity and (3) inflation and inflationary expectations. Each of these is considered in turn.

The Unemployment Rate Impact: If the aggregate unemployment rate from minimum wage increases exerts a deflationary impact on the economy and weakens the workers’ bargaining position in the labor market, the overall wage inflation outcome may be mitigated. The Productivity Impact: To the extent that minimum wage increases induce productivity improvements, their effect on overall price inflation may be mitigated. Needless to say, some of these productivity increases may contribute to future wage gains.

Minimum wage changes give rise to potential productivity boosts by the following mechanism. Entrepreneurs and managers will attempt to minimize costs of production at each level of expected output. The marginal conditions for cost minimization stipulate that fewer worker-hours will be used the higher is their cost relative to other factors of production resulting in lower expected output. Furthermore, firms will focus on labor-saving investments, which generally are not capacity-expanding. This, in turn, implies that capacity utilization and productivity will rise in the first round. In the second round, two effects may take

\[ \text{Place: first, higher unemployment and inflation may dominate and depress the economy, leading to a reduction in aggregate demand and, with a lag, output, so that some of the productivity gains are evaporated. Alternatively, the effect of the labor-saving investments in spurring output in the capital goods producing industries may be sufficient to counteract the depressing effect of higher unemployment and inflation in the first round, leading to a further rise in labor productivity. The size of the effect of minimum wage increases on productivity will also be influenced by monetary policy as it affects the cost of funds for investment and government policies designed to moderate increases in the number of persons unemployed.}

Inflation and Inflationary Expectations: The explanatory variable \( P_{t-1} \) (\( t > 0 \)) that captures inflationary expectations is affected indirectly by the minimum wage change via its impact on unit labor costs, producer prices and, with a lag, consumer prices. If policymakers announce minimum wage rate increases in periods of high inflation, when it becomes obvious that real wages of low-paid workers are jeopardized, this timing would exacerbate the inflationary shocks of minimum wage increases, since inflationary pressures from other sources are then already high. For example, the 1974 amendments that went into effect in May of that year, were announced at a time when the U.S. economy was experiencing double-digit inflation and inflationary expectations were already high. Furthermore, if inflationary expectations on the part of labor unions lead to attempts to tie contractual wage increases to the minimum wage, the wage structure will become more compressed. To measure the impact of a compressed wage structure on wage-price inflation, the disaggregation of wage determination into unionized and non-unionized sectors is crucial. Fourth, time series analysis conducted with the aid of estimated empirical wage determi
nation relationships in either a single-equation or general equilibrium framework, provides an estimate of the average minimum wage impact during the sample period. As demonstrated later, minimum wage effects may vary considerably from one time period to another. Fifth, the wage inflation impact of minimum wage legislation since its inception must be separated from other forces that may have simultaneously affected average hourly wage rates. Since the 1950s, when income tax obligations were extended to a majority of wage earners, a wedge of federal income taxes, unemployment insurance taxes and OASDHI contributions widened the gap between compensation and take home pay. On six occasions in the post World War II period, a federal minimum wage increase and a change in the unemployment insurance and/or OASDHI contribution rates were introduced in the same quarter.

Two avenues can be taken to isolate the impact of changes in tax rates and minimum wage increases on hourly earnings. The first is the introduction of a separate variable in the wage determination relationship. The second is the choice of the dependent variable. The Bureau of Labor Statistics (BLS) makes available three types of statistics on hourly wage rates. The first is average hourly compensation, which includes both the employer and employee portions of tax deductions. This measure is the appropriate one for computing unit labor costs. If it is also employed in time series analysis of wage determination, the impact of changes in the tax contribution rates must be taken into account by one or more explanatory variables. To ease the task of detecting the minimum wage impact on wage inflation, many researchers have opted to employ a second available measure, the average yearly earnings series, collected by BLS. However, it is important to note that this measure still includes the employee's portion of the various tax contributions and potentially biases the estimates of the minimum wage impact upwards.

As an alternative measure of hourly wages, it is possible to use a third data series available from BLS, namely data on spendable weekly earnings of non-supervisory workers employed in the private non-agricultural business sector. When combined with hours worked per week, this permits production of a series on average hourly spendable earnings. The spendable earnings data are derived from gross earnings, and take account of the major personal taxes for which deductions are made at nationwide standard rates. Consequently, a general drawback of "spendable earnings" data is that state and city income taxes and employee contributions for other state and city programs and union dues that tend to vary among states are not deducted. Furthermore, pay deductions for group insurance and welfare programs are generally considered as consumer expenditures and are, therefore, still included in the spendable earnings series. The deductions obviously depend on the number of dependents claimed by the employee. Accordingly, the series has been computed for both earners with one and three dependents. Unfortunately, the resulting take-home pay series is still not the ideal series to use in wage determination relationships, because of inclusion of several nonconsump-

The severity of the shortcomings of the simple wage determination model outlined above is demonstrated in Table 2, which presents various estimates of the short-run effect of a one-percent change in the minimum wage on the basis of the following simple standard model:

\[ W_t = a + b M W_t + \sum_{i=1}^{n} P_i + d \text{CONTR} + e (1/U), \]  

where CONTR represents a variable capturing OASDHI and unemployment insurance contributions, and where \( W_t \) and MW_t and \( P_i \) were previously defined. The estimated impact coefficients vary significantly according to (1) the particular measure of hourly earnings selected as the dependent variable; (2) inclusion of an explanatory variable capturing the effect of changes in old age, sickness, disability and health insurance (OASDHI) and unemployment insurance (UI) contributions and (3) the time period studied. As expected, selection of measures that express net earnings, ceteris paribus, leads to smaller estimates of the minimum wage impact coefficient, even if the wage determination relationship takes account of changes in OASDHI and UI contribution rates (Part C of Table 2).

Finally, the average impact of minimum wage legislation in the 1964-1979 period is higher than in the period starting in 1951-4. Gramlich's result is very close to that in Table 2, Part C, line 1 and is thus suspect as an accurate estimate of the aggregate wage inflation impact of minimum wage legislation.

II. The Aggregate Short-Run Wage Inflation Impact of Federal Minimum Wage Legislation

Empirical estimates presented in this section of the impact of minimum wage legisla-

The model is an adaptation of the 1973 version of the MIT-Penn-Social Science Research Council (MPS) Quarterly Econometric Model of the U.S. Economy.

| TABLE 2. Sensitivity of Estimated Short-Run Wage Impact Coefficients to Sample Period, and for Adjustment for Contribution Rates |
|---|---|---|---|
| Dependent Variable and Sample Period | Wage Determination Relationship Taken | Wage Determination Relationship Taken | Depend on Changes in OASDHI and UI Contribution Rates |
| | Impact Coefficient | Account of Changes in OASDHI and UI Contribution Rates |
| A. Average Hourly Compensation (1953-4-1979:2) | .359 | No |
| B. Average Hourly Compensation (1962-1-1979:2) | .563 | Yes |
| C. Average Hourly Compensation (1964-2-1979:3) | .446 | Yes |
| A. Average Hourly Compensation (1953-4-1979:2) | .220 | No |
| B. Average Hourly Compensation (1962-1-1979:2) | .179 | Yes |
for the private non-farm business sector. The structure of this model, with particular emphasis on the new equations, is briefly outlined in Section III.

Consistent with the theoretical foundations of aggregate wage determination, the basic equation to be estimated can be written as follows:

\[ W = a + \sum_i c_i P_{-i} + \sum_i d_i M_{-i} + \sum_i e_i X_{-i} \]

\[ + g(1/U) + h \text{ CONTR}, \quad (2.1) \]

where \( X \) denotes productivity and all other variables have been previously defined.

To break the multicollinearity between the minimum wage variable and the price expectations term, the sum of the coefficients \( e_i \) of the latter was constrained to unity. The estimated coefficients in Tables 3 and 4 show that it can no longer be claimed that the effect of minimum wage changes in other than the impact quarter is insignificant.

For the estimated relationships presented in Table 3, the minimum wage variable was fully adjusted for employee subject status as a monthly employment-weighted average of the minimum wage for previously covered and newly covered workers in eight industries, and aggregated to quarterly averages. Figure 2 illustrates the difference between the legislated minimum wage and the minimum wage variable, adjusted for subject status, that was used for the equations presented in Table 3.

This constraint resulted from a two-step estimation procedure. In the first step, the coefficients of the logged minimum wage changes were estimated by Altman's log specification for a particular group of workers and it was assumed that the estimated values, with an upper level of unity as their scale, were equal to the sum of the coefficients of the corresponding variables in the second step.

This method differs from the one derived by Kahn in Youth Supplements and Minimum Wages (1970, p. 12) since the minimum wage variable is not divided by average hourly earnings.

The estimates presented need to be interpreted with caution. First, they pertain to total wage impacts and, therefore, include the impact on both wages of minimum wage and other workers. In the same vein, the "ripple effect" is only a portion of the minimum wage coefficient. Second, the aggregate estimates combine the effects for unionized and non-unionized workers. Estimates derived by this study support the hypothesis that the average wage impact of the minimum wage is larger for the non-unionized sector than for the aggregate. Using pooled cross-section and time-series data for average hourly earnings, unemployment rates, consumer prices and aggregate productivities, covering twelve occupations in seventeen metropolitan areas, estimation of equations similar to equation (2.1), by means of generalized least squares, yields wage impacts resulting from a 10% rise in the minimum wage that average 1.8% in the non-unionized sector. Third, the table provides estimates of only the short-term minimum wage impact; the economy-wide spillover effects that operate via changes in the included explanatory variables are derived in Section III. Fourth, the estimates combine the effect of minimum wage increases and increases in coverage. Estimation of the combined impact of minimum wage and coverage increases is necessary by the fact that these two variables are generally altered in the same FLSA amendments and are therefore highly collinear. Fifth, the estimates provided include the effect of both minimum-wage legislation and of the increases in the rate of minimum-wage workers that would have taken place regardless of changes in legislation during inflationary periods.

Unless the legislative increases cause substantial gains in real minimum wages during a given time span, their effect may be not much more than a change in the timing of the increases. Accordingly, the empirical section of this paper presents estimates of the effects of minimum wage increases—rather than the effect of minimum wage legislation—on economic variables. Figure 2 illustrates the real cumulative percent changes in the minimum wage—computed as the difference in the percent changes in the minimum wage and consumer prices (indexes, 1967 = 100)—from 1955 through 1980. Although minimum wage legislation secured real wage increases for minimum wage workers in the 1950s and 1960s, the average real minimum wage increase was negative in the most recent decade.

Figure 3, part A shows the ratio of the minimum wage index and an index of average
The empirical wage relationships of prime interest for this study are contained in Table 3. Figure 1 shows that, during the 1967–1979 span, a one percent rise in the minimum wage increased total wage inflation by .055%.

The first-quarter impact was .026%, while the wage comparison effect was .039%. Productivity, with an elasticity of .316, played an important role in wage determination, even in the presence of a cyclical indicator (the prime age-males unemployment rate) in the equation.

While one can argue that labor contracts tend to be negotiated on the basis of productivity changes over a longer period than that incorporated in the estimated relationship, they are negotiated at different points in time and, in the aggregate, lead to wage responses that adjust to productivity changes with a one-quarter lag.

Equation (2) is based on the same underlying theory as equation (1), but contains multiplicative dummy variables to capture changes from one business cycle to the next. The cyclical dummy variable is defined as −1.0 for 1966 Q1–1972 Q4 and +1.0 for 1973 Q1–1979 Q2. The products of the dummy variable and each of the right-hand-side exogenous variables were included as separate explanatory variables in the equation, and carried highly significant coefficients.

The negative coefficient (−.015) for the minimum wage dummy variable in this equation shows that the average contribution of the minimum wage to wage inflation decreased from .085 in the earlier period to .055 in the most recent period (almost identical to the coefficient found in equation 1). While this finding of decreased importance of the minimum wage in the most recent business cycle is contrary to popular statements, it is explained by (1) the coverage extensions in the earlier period, which strengthened the minimum wage effect, and (2) the increased contribution of exogenous factors (i.e., world oil prices) to wage price inflation in this country.

Equation (2) further demonstrates that the average productivity elasticity decreased from .064 in 1966–1972 to .134 in the 1973–1979 time span, which is indicative of the decline in productivity growth in the non-farm business sector since the early 1970s. The positive dummy variable coefficient for the constant shows that the "Phillips Curve" has shifted upward over time.

Since the model simulations in Section III of this paper pertain to the most recent period, equation (1) of Table 3 was used. Equation (2) is useful in analyzing minimum wage effects over several business cycles.

III. Wage Inflation Impacts Including Economy-Wide Spillover Effects:

To permit estimation of the total impact of minimum wage increases on wage inflation, the equation estimated in Section II was incorporated in a large short-run quarterly econometric model that adequately describes the working of the U.S. economy during recent business cycles. Since minimum wage increases also affect the remaining explanatory variables in equation (1), notably the unemployment rate, output per manhour and consumer price inflation, their full wage impact can only be accurately measured in a simultaneous equation framework. Although it is both sufficiently detailed and best incorporates realistic spillover effects across economic sectors, the 1978 version of MIT-PennSocial Sciences Research Council Model (MPS) was ill-suited for this project in its published form, primarily because its price sector focuses on the explanation of changes in implicit deflators rather than producer and consumer prices. Several changes to the model's structure-over and beyond the simple replacement of the basic wage equation by the relationship estimated in Section II—were thus called for, to permit proper measurement of the spillover effects on productivity, prices and the unemployment rate.

The central price equation estimated for this study explains changes in aggregate producer prices (PPI) on the basis of concurrent changes in costs per unit of output, as well as a factor capturing additional pressures on prices when actual output exceeds the planned or standard rate.

Let us define the following variables:

ln(PPI) − The natural logarithm of the producer price index in the private nonfarm business sector.

GAP − The percentage gap between the volume of output in the private nonfarm business sector and capacity output.

JPON − A dummy variable capturing the various phases of the price control.

ln(UKC) − The natural logarithm of unit capital costs defined as a weighted average of materials and structures costs, relative to total non-farm business output.

ln(UCL) − The natural logarithm of unit labor costs, defined as the product of compensation per hour and employment, relative to total non-farm business output.

ln(UDEM) − The natural logarithm of unit imported materials costs, defined as the value of non-fuel imports, relative to total non-farm business output.

ln(UFMC) − Same as above, for the fuels component of imported materials.

The estimated equation for changes in the producer price index is then:

The capacity output is computed in the model from a 12-quarter distributed lag over the past values of actual output.
\[ \ln(PPL) = 4.763 + 0.556 \cdot GAP, \quad (7.17) \quad (8.42) \]
\[ -0.079 \cdot JPCON, \quad (2.57) \]
\[ \sum_{i=0}^{2} a_i \ln(UC_1) + \sum_{i=0}^{1} b_i \ln(UU_1) + \sum_{i=0}^{1} c_i \ln(UDMC_1) + \sum_{i=2}^{2} d_i \ln(UFMC_1), \quad (3.1) \]
where \( a_0 = -0.477, \sum_{i=0}^{2} b_i = 283, \sum_{i=0}^{1} c_i = -184, \) and \( \sum_{i=2}^{2} d_i = 0.82. \)
\[ \text{Sample Period} = 1966-4-1979-2 \]
\[ R^2 = 0.9976 \]
\[ D - W = 9176 \]

The individual coefficients and their \( t \)-values are listed below:

<table>
<thead>
<tr>
<th>Time Period</th>
<th>1</th>
<th>2-6</th>
<th>7-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>( a_i )</td>
<td>0.0348</td>
<td>0.0203</td>
<td>0.0466</td>
</tr>
<tr>
<td>( b_i )</td>
<td>0.0056</td>
<td>0.0141</td>
<td>0.0619</td>
</tr>
<tr>
<td>( c_i )</td>
<td>0.0094</td>
<td>0.0465</td>
<td>0.0363</td>
</tr>
<tr>
<td>( d_i )</td>
<td>0.0044</td>
<td>0.1149</td>
<td>0.0032</td>
</tr>
</tbody>
</table>

Incorporated in the full model, and the effect of change in the minimum wage was traced.11

**Simulation Results:**

The common econometric strategy to derive the impact multipliers of a minimum wage increase is to generate a dynamic control solution for the model and to compare the latter with a new model solution, generated on the basis of a change in the level of the minimum wage. The MPS model, however, is highly non-linear and the use of initial conditions that do not reflect actual historical values of the computed variables may introduce significant inaccuracies in the comparison between the disturbed and the control solution. Therefore, the control solution was derived in two steps: a residual check was performed in which all computed residuals were added to the respective endogenous variables. The result was a control solution tracking economic history exactly, apart from very minor rounding errors. The second step of this process was repeated with a policy change in the minimum wage level, and the difference between the solution values of the two simulations yielded the dynamic multipliers of interest.

Three sets of simulation results were generated, corresponding respectively to the inflation impacts of sustained changes in the minimum wage during two recent business cycles, of single-period temporary changes in the minimum wage, and of the minimum wage increases legislated by the 1974 and 1977 FLSA amendments to the Fair Labor Standards Act.

11The labor demand and supply equations of the MPS Model do not include a minimum wage rate variable and, hence, were rewritten for this project. The description of the labor market equations is contained in Bellakaras (1961).
Real Wages and Employment: Evidence From Disaggregated Data

YASH MEHRA*

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, Nefci (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 dynamic relationships at the industry level. Such a study is important 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 inelasticities. 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 inelasticities. 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.

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The Model, Data and Empirical Results

The main point of Nefci's (1978) paper is that the underlying relationship between real

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