The Determination of Wages and Prices in Yugoslavia

Laura D'Andrea Tyson
During the past fifteen years the Yugoslav experiment with market socialism and workers' self-management has been plagued by rapid inflation and persistent unemployment. Contrary to general price stability and full employment conditions in most socialist economies, in Yugoslavia consumer prices rose at an average annual rate of nearly 12% and the unemployment rate averaged 7.0%\(^{1}\) during the decade ending in 1972. The data presented in Table 1 reveal that inflation in retail prices and high unemployment rates were accompanied by rapid increases in the producer price index and in the average annual earnings of workers employed in social sector industry.\(^{2}\)

Two distinct theories have been developed to explain the coincidence of inflation and unemployment in Yugoslavia. During the early sixties inflation was understood to be the consequence of excess demand generated by the investment-mania of the government and fueled by an excessively expansionary monetary policy. According to this theory, unemployment was the result of structural and frictional forces reflecting the efforts of labor to move from the backward agricultural sector, which employed approximately 48% of the population during the 1960's, to the modern industrial sector. After the 1965 economic reform, which included among its goals a reduction in the aggregate investment rate and an end to overly lax credit conditions, a new theory of the Yugoslav inflation began to take shape. The new theory focused on the role of enterprise wage determination procedures in the inflationary process and bore a striking resemblance to the theories of cost-push or wage-push inflation then popular in western economic literature. According to proponents of this new
theory, workers' control over prices and wages at the enterprise level either caused or exacerbated inflationary pressures and was responsible for an adverse tradeoff between unemployment and price stability at the macroeconomic level.

Table 1
Annual Rates of Growth of Prices and Wages, 1962-1972

<table>
<thead>
<tr>
<th>Year</th>
<th>Producer Prices a</th>
<th>Retail Prices a</th>
<th>Wages a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>.4</td>
<td>7.5</td>
<td>10.7</td>
</tr>
<tr>
<td>1963</td>
<td>.8</td>
<td>3.8</td>
<td>16.6</td>
</tr>
<tr>
<td>1964</td>
<td>4.7</td>
<td>8.7</td>
<td>28.1</td>
</tr>
<tr>
<td>1965</td>
<td>14.9*</td>
<td>29.0*</td>
<td>39.4*</td>
</tr>
<tr>
<td>1966</td>
<td>11.2*</td>
<td>23.7*</td>
<td>39.0*</td>
</tr>
<tr>
<td>1967</td>
<td>1.9</td>
<td>7.0</td>
<td>12.6</td>
</tr>
<tr>
<td>1968</td>
<td>.5</td>
<td>4.5</td>
<td>9.9</td>
</tr>
<tr>
<td>1969</td>
<td>3.1</td>
<td>7.3</td>
<td>15.1</td>
</tr>
<tr>
<td>1970</td>
<td>9.4</td>
<td>9.6</td>
<td>18.3</td>
</tr>
<tr>
<td>1971</td>
<td>15.2</td>
<td>15.0</td>
<td>22.3</td>
</tr>
<tr>
<td>1972</td>
<td>11.6</td>
<td>15.3</td>
<td>17.1</td>
</tr>
</tbody>
</table>

a percent per year; for data sources, see the appendix.

At least part of the price and wage growth in 1965 and 1966 was the result of an administratively imposed adjustment of relative prices, which took the form of increasing some prices while leaving others unchanged.

Support for the wage-push explanation of the Yugoslav inflation came from a surprising variety of observers. Within Yugoslavia, the League of Communists argued that "socialist immorality" in enterprise income distribution was the villain behind aggregate price increases. 3

A number of noted Yugoslav economists expressed similar ideas in a less tendentious, more theoretical manner. For example, both Branko Horvat and Aleksander Bajt argued that nominal wage increases in excess of productivity increases spawned product price increases in the traditional wage-push fashion. 4 Empirical support for this theory was provided by J. Mencinger who estimated a simultaneous price and wage system for
Yugoslavia which showed prices to be highly responsive to wages and wages in turn to be sensitive to variations in the unemployment rate.²/

Wage-push explanations of the Yugoslav inflation also found expression in the western press. For example, the OECD argued that

The Yugoslav institutional structure which permits worker managements to establish both the prices of their products and the amount of income to be distributed to their personnel provides a built-in inflationary bias.²/

Similarly, J. Meade in a recent theoretical study of the self-managed enterprise posited that

in a co-op system workers may push up their selling prices directly and the government may then permit or engineer a rise in total money expenditures sufficient to equate supply and demand at the higher price level.²/

What is surprising about the new theories of the apparent tradeoff between inflation and unemployment in Yugoslavia are their common, but frequently unarticulated, assumptions that wage decisions in the self-managed enterprise are responsive to labor market conditions and that wages are viewed as a cost of production by such an enterprise. A subsidiary assumption is that the self-managed enterprise, like its profit-maximizing counterpart, sets prices according to some full-cost formula.

Remarkably, all of these assumptions are in direct conflict with the prevailing theoretical view of the self-managed enterprise. According to the so-called labor co-operative theory developed by Ward (1958), Domar (1966) and Vanek (1971), payments to labor in a self-managed enterprise depend solely on realized enterprise net income per worker and
are completely unaffected by conditions outside the enterprise, including labor market conditions. Moreover, because labor is a residual claimant to enterprise income remaining after payment of all non-labor production costs, wages are not considered a cost of labor use and prices are not influenced by changes in labor incomes. Consequently, the idea of wage-push inflation in an economy composed of self-managed enterprises seems ridiculous.

The apparent conflict between the labor co-op theory of enterprise behavior and the wage-push theory of the Yugoslav inflation motivates the analysis presented in this paper. Section II supposes that a simple wage-push hypothesis of the Yugoslav inflation is correct. The popular Phillips curve wage equation which reflects the workings of the labor market in modern market-capitalist economies is estimated using data from the Yugoslav social sector. The empirical results are then re-interpreted in the light of theoretical and anecdotal evidence about actual wage and employment determination in the Yugoslav firm. The discussion suggests that the power of the traditional Phillips curve equation to distinguish between widely differing theories of wage determination and labor market conditions is extremely weak. In Section III, some simple cost-markup equations are estimated for the Yugoslav economy. Again, the results are nearly indistinguishable from similar results estimated for market-capitalist economies. In this case, however, the similarity of results is not nearly as worrisome as in the wage equation case, because there is no a priori reason to expect self-managed firms operating in moderately competitive product markets to act differently than capitalist firms competing in
a similar environment. Section IV combines the wage and price equations of Sections II and III in a simultaneous equation system which identifies some of the major determinants of prices and wages in Yugoslavia during the 1962-1972 period. Finally, in Section V, some conclusions about possible links between enterprise behavior and Yugoslav macroeconomic performance are suggested, and some unanswered questions about the causes of the Yugoslav inflation are identified for future research.

II. Wage Determination in Yugoslavia: Empirical and Theoretical Evidence

1. The Theory of Wage Determination in a Market Economy

Suppose we assume that the wage-push theory of inflationary process explains the observed coincidence of inflation and unemployment in Yugoslavia. What does this theory suggest about the appropriate wage equation to model the growth of wages in the Yugoslav enterprise? The simplest equation is the Phillips equation which relates the rate of growth of money wages to the reciprocal of the unemployment rate. Underlying this equation is the notion that the price in any market rises when there is excess demand in that market, and that the inverse of the unemployment rate is a good measure of excess demand in the labor market.

Because of alleged imperfections in modern labor markets, this relationship between labor's price and labor demand has frequently been modified to include changes in the cost of living among the determinants of changes in money wages. Changes in the cost of living are assumed to influence wage determination via a pattern of real wage bargaining among enterprises demanding labor and workers supplying labor. The modified Phillips relationship gives rise to a wage equation of the following form:
(1)  \( \Delta \ln w_t = a_0 + a_1 \Delta \ln P_t + a_2 (1/U_t) \varepsilon_t \)

where \( \Delta \ln \) is the natural logarithm;
\( \Delta \) is the rate of change of nominal wages;
\( \Delta \ln P_t \) is the rate of change of the cost of living index;
and \( U_t \) is the unemployment rate.

Proponents of the wage-push theory of the Yugoslav inflation implicitly or explicitly assume that a Phillips-type relationship between the unemployment rate and the rate of growth of money wages characterizes the Yugoslav economy. As a first step towards determining whether such an assumption is reasonable, equation (1) has been estimated using quarterly data for all Yugoslav enterprises during the 1962-1972 period. The results are presented in Table 2. Before examining the results, two preliminary comments are in order. First, the wage data employed are quarterly averages of total monthly earnings of labor. Thus, the data in no way distinguish between changes in earnings due to changes in periodic wage payments, changes in bonus payments, or changes in profit shares. Because equation (1) is derived from a model of wage determination, this poses a problem in the interpretation of the results; however, Yugoslav statistics preclude an alternative approach. Second, since the rate of growth of wages is the dependent variable, it was necessary to determine the proper interval over which this variable should be measured. Until quite recently, the prevailing methodology employed in wage equation estimation favored expressing four quarter percentage changes in the aggregate wage level as a function of regressors which were themselves measured as four quarter moving averages. The basic assumptions underlying this approach were that
wage agreements are negotiated every four quarters and that one-fourth of all such adjustments take place in each quarter of a year. Neither of these assumptions seems particularly relevant to the Yugoslav case where wages and realized variable earnings depend upon worker agreements which can be negotiated at will throughout the year. Because there is no information available on just how often Yugoslav enterprises review their wage decisions, the simplest assumption is that all enterprises make at least one such adjustment each quarter of the year. This assumption seems realistic in light of the fact that enterprise financial accounts are concluded at the end of each quarter, and wage rates are likely to be adjusted on the basis of recent enterprise performance. Therefore, the proper interval for the dependent variable seems to be one quarter, and this is the interval used in the estimation procedure.\textsuperscript{8/}

The ordinary least squares estimates of equation (1) are quite good by all the standard statistical measures. All of the estimated coefficients are significant at the .05 level of significance and all have the expected sign. The equation employing current changes in the cost of living and the inverse of the current period unemployment rate explains 59\% of the variance in quarterly wage changes, a performance which is very similar to the performance of quarterly wage change models in other econometric research. The introduction of simple lags in the cost of living and unemployment rate variables does not improve the results. However, as row 2 illustrates, the use of a polynomial distributed lag to approximate the expected rate of inflation by a weighted sum of past rates of inflation, with weights declining geometrically to zero over the three previous quarters, does increase the percentage of explained variance to 66\%. In terms of explanatory power this equation performs as well as most quarterly wage change models estimated for western market economies.
Determinants of the Rate of Growth of Wages, 1962-1972 — Ordinary Least Squares Estimates

Dependent Variable: One-quarter change in logarithm of total quarterly compensation.

<table>
<thead>
<tr>
<th>Equation No.</th>
<th>c</th>
<th>1/U_t</th>
<th>P_t</th>
<th>P_{t-1}</th>
<th>P_{t-2}</th>
<th>P_{t-3}</th>
<th>R^2</th>
<th>SSE</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-.0252</td>
<td>.0040</td>
<td>.5839</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>.59</td>
<td>1.68</td>
<td>.018</td>
</tr>
<tr>
<td></td>
<td>(-1.27)</td>
<td>(2.88)</td>
<td>(6.07)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-.0278</td>
<td>.0037</td>
<td>.1436</td>
<td>.2396</td>
<td>.0978</td>
<td>.0179</td>
<td>.66</td>
<td>1.86</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>(-1.51)</td>
<td>(2.93)</td>
<td>(5.67)</td>
<td>(6.36)</td>
<td>(2.01)</td>
<td>(.435)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(The t statistic is recorded in parentheses below each coefficient estimate.)

Dependent variable: one quarter change in the logarithms of seasonally adjusted total receipts of the employed in the social sector of the economy; seasonal adjustment of the dependent and independent variables by method of the ratio of a series to its moving average.

Explanatory variables:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_t</td>
<td>One quarter change in the log of a seasonally adjusted retail price index for all goods and services.</td>
</tr>
<tr>
<td>1/U_t</td>
<td>The inverse of the seasonally adjusted unemployment rate, measured as the ratio of the number of job seekers registered at the federal employment office and the total of job seekers and the number of employed workers in the social sector of the economy.</td>
</tr>
</tbody>
</table>

All equations are fitted for the period 1962II - 1972II. (d is the Durbin-Watson statistic; SSE is the standard error of the regression.)

The coefficient estimates for the explanatory variables also appear reasonable when compared to similar estimates found in other economies.

Thus, the elasticity of wages with respect to prices is found to be less than one, though, in the distributed lag formulation, a one percent rise in the expected rate of inflation gives rise to a .8 percent rise in money wages. This elasticity estimate is clearly in line with estimates recently
found in widely differing market economies. Finally, the effect of the unemployment rate, while significant, is smaller than the effect observed in market economies. For example, a recent equation for the U.S. of the same form yielded a coefficient for the unemployment term which is about two and one-half times as large as the coefficients reported in Table 2.2

Nonetheless, what is important about the Yugoslav estimates is the fact that the unemployment term does have a significant impact in the manner predicted by the Phillips curve theory. As the discussion in the next section demonstrates, this result contradicts a priori theories of the wage determination process in an economy of self-managed enterprises.

2. Theories of Wage Determination in a Self-Managed Economy

The Phillips curve explanation of money wage changes rests on a theory of the labor market in which wages are determined by the interaction of profit-maximizing, capitalist firms which demand labor as a productive input, and wage-bargaining labor unions which control the conditions of labor supply. Such a theory has never been suggested to model the workings of the labor market in Yugoslavia. In fact, the major theoretical analyses of the Yugoslav system are in direct contradiction to the theoretical underpinnings of the Phillips curve formulation. Consequently, we are left with the question of how this apparent contradiction can be resolved. One approach is the simple acceptance of the empirical results as evidence that wage determination in the Yugoslav system is just like wage determination in other economic systems. Regardless of differences in the structure of decision-making in the self-managed and capitalist firms, the price of labor is determined by demand conditions on the labor market.
A second approach calls for a closer examination of existing theories of the self-managed enterprise to develop alternative models of wage determination which can be estimated and compared to the Phillips curve model in terms of overall explanatory power and statistical significance. The second approach is certainly more satisfying theoretically and will be adopted here.

A survey of the existing literature on the Yugoslav economy indicates that no well-developed, consistent theory of the determination of wages in the self-managed enterprise exists. There are, however, two theories which have appeared to explain the output and employment behavior of the self-managed enterprise -- the labor co-op theory developed by Ward, Domar and Vanek and the limited profit maximization theory developed by Horvat (1967). Both theories provide some testable hypotheses about the determination of labor incomes in Yugoslavia.

The labor co-op model assumes that each enterprise maximizes net income per worker where net income is defined as gross business revenues less current non-labor operating costs. The objective function which describes an enterprise behavioral rule of this type can be written as:

\[
\frac{Y}{L} = \frac{PO(K,L) - P_kK - OC}{L}
\]

where \( p \) = the market price for output \( Q \);
\( Q(K,L) \) = the production function;
\( K \) = the capital stock;
\( L \) = labor employment in manhours or number of workers;
\( P_k \) = the rental price of a unit of capital;
\( OC \) = intermediate operating costs, taxes, and other production costs;
and \( \frac{Y}{L} \) = net income per worker.
The first order condition for equilibrium labor employment with this objective function is given by

\[(3) \quad p \frac{\partial Q}{\partial L} = \frac{Y}{L} \]

indicating that in equilibrium the value of the marginal product of labor just equals realized net income per worker. A similar conclusion applies even if workers are paid a fixed wage as an advance on their share in net income as they are in most Yugoslav firms.

The essence of the labor co-op theory lies in its assumption that payments to labor are a residual, determined by some sharing arrangement among workers after payment of all non-labor production costs. In this context, the concept of a wage or a fixed payment to labor measuring the cost of the labor input in production is meaningless. In the cooperative enterprise both the equilibrium volume of labor employed and the equilibrium income received by each worker depend solely on realized enterprise net income. Thus, the co-op theory is not a theory of wage determination per se, but rather a theory of employment levels and output determination. Labor payments are simply calculated as per worker shares in net income at equilibrium output and employment levels.

A second model of the self-managed enterprise, based on interpretation of actual Yugoslav experience, has been suggested by Horvat as an alternative to the pure co-op model. Horvat argues that self-managed firms maximize total net income rather than net income per worker. Moreover, net income is defined as profits remaining after payment of all non-labor production costs and after payment of a fixed wage to each worker. The concept of a fixed wage measuring the price of the labor input in
the Horvat model is identical to the concept of the wage in the neoclassical model of the capitalist firm, and the comparative statics behavior of the self-managed firm acting according to Horvat's model is identical to the comparative statics behavior of the capitalist firm. The only difference between the two enterprises lies in the determination of the wage rate. The capitalist firm hires labor at a price determined by the conditions of aggregate labor supply and demand while the self-managed enterprise collectively decides on a fixed wage rate according to whatever criteria the workers choose to consider.

Horvat's theory alone is not a model of wage determination because it fails to specify the exact mechanism by which the fixed wage is set. In a recent contribution building on Horvat's theory, Vanek and Miovic (1971) have suggested that the workers' council decides on a target savings level per worker and distributes per worker enterprise net income in excess of this amount as the fixed wage. An alternative model formulated by Tyson (1975) assumes that the worker's council sets a target fixed wage which is a predetermined share of realized enterprise net income, the remaining share being retained by the enterprise to finance investment. Both models imply that the target fixed wage can be expressed as a linear function of realized enterprise net income per worker of the following form:

\[ w_t^* = b_o + b_1 \frac{y_t}{L_t} \]

where \( w_t^* \) is the target fixed wage per worker. This formulation is also consistent with the labor co-op theory when \( b_0 = 0 \) and \( b_1 = 1 \).
It should be emphasized that theories of wage determination based on the pure co-op and Horvat-type models are essentially theories of wage bargaining at the enterprise level. According to these models, workers in each enterprise set a single fixed wage on the basis of realized enterprise net income and collective savings decisions. For workers employed by the firm and participating in the wage bargaining process, the fixed wage is both an offer wage, indicating the amount which the firm is willing to pay for a unit of labor, and an asking wage, indicating the amount which current employees require to remain with the enterprise. For workers outside the firm, the fixed wage is an offer wage which may or may not be equal to their asking or reservation wage. If the fixed wage exceeds the current reservation wage, then the enterprise will have no incentive to modify its wage decision. Under these circumstances, each enterprise can be viewed as operating its own labor market, setting its own wage and adjusting its labor supply to the volume consistent with this wage, regardless of the implications of its actions for aggregate labor market utilization. An illuminating way to understand wage determination in this context is to view employed workers in each enterprise and unemployed workers as if they were all members of non-competing groups. In this case, even if labor of comparable training and ability was available in the unemployed pool or in other enterprises, the self-managed enterprise would never reduce its fixed offer wage to the reservation wage of the lowest job applicant, be he employed or not. If, on the other hand, the fixed offer wage falls short of the prevailing reservation wage outside the enterprise, then some adjustment will be necessary if the enterprise is to be able to compete for additional labor.
Under these circumstances the isolation of the enterprise wage setting procedure from aggregate labor market conditions breaks down, and the bargaining process underlying wage determination must respond to labor availability and job opportunities elsewhere. If all enterprises are competing for scarce labor, aggregate excess demand for labor will clearly influence both the rate of growth of wages in each enterprise and the rate of growth of wages in the entire economy.

If, as the discussion here suggests, wage determination in the self-managed enterprise is insensitive to excess labor supply but sensitive to excess labor demand, then it may be possible to model a wage determination procedure which captures this response pattern. The simplest such model is the Phillips curve model. The results presented in Table 2 suggest that such a model is consistent with observed wage behavior in Yugoslavia.

3. The Practice of Wage Determination in the Yugoslav Enterprise

Hrovat's theory and the Vanek-Movic and Tyson extensions of it claim to be "realistic" theories of the behavior of the Yugoslav enterprise. Anecdotal evidence about wage determination in Yugoslavia lends support to this claim. Worker incomes in most enterprises are comprised of several components: a fixed monthly wage which the worker receives for his regular labor service (similar to basic time payments); a bonus payment in recognition of exceptional job performance; and a variable payment representing the worker's share in the profits or net income realized by enterprise operations. Yugoslav firms usually set monthly fixed wages (akontacijska) prior to or during each quarterly accounting period so that workers are certain of the
minimum payment they will receive at the end of each month. If realized enterprise results are better than the projections on which the fixed wage schedule is set, workers will receive a variable profits payment in addition to their fixed wage. This portion of the total labor payment may be quite small in some enterprises but as high as 20-30% in others.\textsuperscript{11} Alternatively, the fixed wage may be modified during the accounting period to reflect actual business conditions. If, on the other hand, realized enterprise results are worse than predicted, fixed wage payments may be covered by bank loans or by enterprise reserve funds, held by law specifically to insure fixed wage payments against unforeseen changes in economic conditions over which workers have no control.

Apparently, fixed wage schedules are set by the workers' council according to a variety of criteria. Relative wage decisions are guided by worker and job characteristics such as the age, skill, and experience of the worker and the difficulty of the job which he performs. Decisions about the absolute level of the fixed wage are based on various indicators of enterprise performance during the previous and current quarterly accounting periods. For example, Horvat has argued that the fixed wage is influenced by (1) fixed wages paid during the past period; (2) changes in labor productivity; (3) changes in the cost of living; (4) wages paid in other enterprises; and (5) changes in taxation policy. Several other authors including Bajt (1971), Mencinger (1970, 1975), and Wachtel (1972), have suggested that fixed wages are adjusted in response to labor productivity conditions and both Bajt and Mencinger have further argued that fixed wages are responsive to changes in the cost of living.
Finally, as noted earlier, Vanek, Miovic, and Tyson have assumed that fixed wages are adjusted to achieve a target relationship with realized enterprise net income per worker.

Combining this anecdotal and descriptive evidence, two different models of wage determination in the Yugoslav enterprise can be formulated and tested. Suppose first that each enterprise sets a target fixed wage according to equation (5). Several modifications of this equation appear reasonable to make the model more realistic. First, because of significant rigidities in the hiring and firing process, cyclical variations in enterprise net income per worker are likely to exert only a minor influence on the short-run determination of the fixed wage.12/

Consequently, fixed wages are probably based on some estimate of the equilibrium level of net enterprise income per worker. Incorporating this modification into equation (5) and converting to natural logarithms yields the following expression for the target fixed wage

\[ \ln w^* = b_0 + b_1 (\ln \frac{Y_A}{L_t}) - \ln (\frac{Y^E}{L_t}) + b_2 (\ln \frac{Y^E}{L_t}) + e_t \]

where \( \frac{Y_A}{L} \) is actual enterprise net income per worker and \( \frac{Y^E}{L} \) is equilibrium enterprise net income per worker. Second, because the fixed wage is adjusted infrequently during an accounting period, the attempt to realize the target wage is likely to be only partially successful during any one period. Consequently, the relationship between the actual and target wage can be specified as

\[ \ln w_t - \ln w_{t-1} = \gamma (\ln w^* - \ln w_{t-1}) + u_t \]

where \( \gamma \) is the adjustment coefficient.
Substituting equation (6) for \( u^*_t \) into equation (7) yields the following equation for the rate of change of wages

\[
\Delta \ln w_t = \gamma b_0 + \gamma b_1 (\ln L_t^A - \ln L_t^E) + \gamma b_2 (\ln L_t^E) - \gamma \ln v_{t-1} + \gamma e_t + u_t.
\]

Finally, because of the apparent real wage setting procedure followed in most Yugoslav enterprises, equation (8) should be modified to include changes in the cost of living as an independent variable. The final wage determination equation can then be expressed as

\[
\Delta \ln w_t = \gamma b_0 + \gamma b_1 (\ln L_t^A - \ln L_t^E) + \gamma b_2 (\ln L_t^E) + b_3 \Delta \ln p_t - \gamma_1 \ln v_{t-1} + \gamma e_t + u_t
\]

A similar equation can be derived if we assume that workers set the fixed wage on the basis of average labor productivity calculations. As mentioned earlier such an assumption is consistent with most available anecdotal information about wage setting procedures and has been suggested by many Yugoslav economists. Suppose that the target fixed wage during each period is some linear function of the equilibrium value of labor's average value product during that period. Then allowing once again for probable divergences between equilibrium and actual levels of labor's average value product, the target fixed wage can be expressed as

\[
\ln u^*_t = c_0 + c_1 (\ln L_t^A - \ln L_t^E) + c_2 (\ln L_t^E) + v_t
\]

Modifying this relationship for lags in adjustment between the actual and target wage and for real wage bargaining in response to changes in the rate of inflation yields a log-linear wage equation of the form
\[(11) \Delta \ln w_t = \gamma c_0 + \gamma c_1 (\ln \frac{Q_t}{L_t}) + \gamma c_2 (\ln \frac{Q_t}{L_t}) + c_3 \Delta \ln p_t - \gamma \ln w_{t-1} + \gamma v_t + u_t\]

4. Wage Determination in Yugoslavia -- Some Further Empirical Results

The ordinary least squares estimates of the coefficients of equations (9) and (11) are presented in Table 3. As before, the variable definitions and data sources are discussed in the Table and the Appendix and will not be discussed here. However, one preliminary comment is required. Because both equations distinguish between equilibrium and actual levels of the independent variables, and because equilibrium levels are unobservable, an approximation scheme was necessary. Since the distinction between actual and equilibrium values was based on a distinction between the equilibrium labor force which the firm would like to employ and the actual labor force consistent with hiring and firing rigidities, the approximation scheme required the estimation of equilibrium labor employment. Using a simple linear regression, equilibrium labor employment was calculated using the estimated coefficients from the following labor demand equation

\[(12) \ln L_t = 1.9933 - .001159 \ln \text{TIME} + .1765 \ln (Q_{t-1}) + .6332 \ln (L_{t-1})\]

\[\begin{align*}
(2.50) & \\
(1.16) & \\
(2.01) & \\
(4.82) & \\
\end{align*}\]

\[R^2 = .91 \quad d = 1.69\]

where \(L_t\) is the number of workers employed in the social sector at time \(t\); and \(Q_{t-1}\) is the index of nonagricultural production lagged one quarter.

Equilibrium values for labor's average value productivity and enterprise net income per worker were then constructed using the estimated equilibrium labor employment series.
Table 3

Determinants of the Rate of Growth of Wages, 1962-1972 -- Ordinary Least Squares Estimates

<table>
<thead>
<tr>
<th>Equation No.</th>
<th>$c$</th>
<th>$D(L)_{t}$</th>
<th>$Y_{t}^{E}$</th>
<th>WAGE$_{t-1}$</th>
<th>$P_{t}$</th>
<th>$1/U_{t}$</th>
<th>$R^2$</th>
<th>$SSR$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.730</td>
<td>.3180</td>
<td>.0955</td>
<td>-.0989</td>
<td>.6318</td>
<td>----</td>
<td>.63</td>
<td>1.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.282)</td>
<td>(.243)</td>
<td>(.239)</td>
<td>(2.63)</td>
<td>(6.79)</td>
<td></td>
<td>(.018)</td>
</tr>
<tr>
<td>2</td>
<td>.399</td>
<td>.3652</td>
<td>.0618</td>
<td>-.0603</td>
<td>.5846</td>
<td>.0039</td>
<td>.67</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.35)</td>
<td>(2.86)</td>
<td>(1.50)</td>
<td>(6.38)</td>
<td>(2.16)</td>
<td></td>
<td>(.017)</td>
</tr>
</tbody>
</table>

$$c \quad D(E L)_{t} \quad \frac{P_{t}^{E}}{L_{t}} \quad \text{WAGE}_{t-1} \quad P_{t} \quad 1/U_{t} \quad R^2 \quad SSR$$

(The t statistic is recorded in parentheses below each coefficient estimate.)

Dependent variable: same as in Table 2

Explanatory variables:

Symbol | Definition
---|---
$\frac{P_{t}^{E}}{L_{t}}$ | Logarithm of the ratio of a seasonally adjusted index of nonagricultural production multiplied by a seasonally adjusted index of producer prices for industrial goods and the volume of equilibrium labor employment.
$D\left(\frac{P_{t}^{E}}{L_{t}}\right)$ | The difference between the log of the ratio of a seasonally adjusted nonagricultural production index multiplied by a seasonally adjusted index of producer prices for industrial goods and the actual volume of seasonally adjusted labor employment in the social sector and $\frac{Y_{t}^{E}}{L_{t}}$.  


Explanatory variables:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAGE</td>
<td>- Log of seasonally adjusted total receipts of the employed in the social sector of the economy.</td>
</tr>
<tr>
<td>$P_t$</td>
<td>- Same as in Table 2.</td>
</tr>
<tr>
<td>$1/U_t$</td>
<td>- Same as in Table 2.</td>
</tr>
<tr>
<td>$\frac{Y_t^E}{L_t}$</td>
<td>- Logarithm of the seasonally adjusted excess of total receipts of the business sector over total expenditures for material goods and services in the business sector divided by the volume of equilibrium labor employment.</td>
</tr>
<tr>
<td>$D(\frac{Y_t^E}{L_t})$</td>
<td>- The difference between the log of the ratio of the seasonally adjusted excess of total receipts of the business sector over total expenditures for material goods and services and the actual volume of seasonally adjusted labor employment in the social sector and $\frac{Y_t^E}{L_t}$.</td>
</tr>
</tbody>
</table>

The ordinary least squares estimates of equations (9) and (11) are good by all the standard statistical measures. Each of the estimated coefficients is significant at the .05 level of significance and all have the expected sign. The net income equation explains 63% of the variance in the dependent variable while the average value productivity equation explains 72% of the variance. These results are surprisingly good, given the generally acknowledged weakness of quarterly wage change equations.

The coefficient estimates seem quite reasonable as far as short-run elasticities are concerned. As might be expected, the short-run elasticities of wages with respect to equilibrium levels of labor's average value product and with respect to equilibrium levels of net income per worker are substantially less than one, indicating sticky wage adjustment procedures in the short run. Similarly, the elasticity of wages with respect to changes in the cost of living is significantly less than one, ranging from
.69 in the average value productivity calculation to .63 in the net income formulation. These results indicate that in the short run nominal wage increases do not keep pace with increases in the cost of living. A similar conclusion was obtained when the expected rate of inflation was approximated by a polynomial distributed lag on past rates of inflation. Incorporating this approximation in equations (9) and (11) yielded insignificant coefficients for the lagged price terms. Finally, the short-run elasticities of wages with respect to divergences between actual and equilibrium level's of labor's average value product and with respect to divergences between actual and equilibrium level's of net income per worker are significantly less than one, indicating, as anticipated, that cyclical variations in net income levels or average labor value productivity levels exert only minor influences on the determination of fixed wages.

Long-run elasticities of wages with respect to both net income per worker and average value productivity of labor can be calculated by dividing their coefficient estimates by the coefficient of the lagged wage variable and changing the sign. The long-run elasticities thus calculated are .9656 for net income per worker and 1.68 for average value productivity of labor. The former estimate is clearly reasonable, suggesting that the long-run fixed wage will just equal equilibrium net income per worker. The latter estimate indicates that the long-run fixed wage will be nearly two times labor's average value productivity. At first glance, this elasticity estimate may seem disturbing because constant factor shares in enterprise income imply unitary elasticity if between the wage and labor's marginal value productivity. However,
marginal value productivity exceeds labor's average value productivity by a sufficient margin, a 1.68 elasticity of wages with respect to average value productivity is consistent with a 1.00 elasticity of wages with respect to marginal value productivity. In addition, there seems no good reason to accept the hypothesis of constant factor shares in the Yugoslav case, especially during the 1962-1972 period when enterprises responded to greater autonomy in income distribution decisions by increasing the share of realized income paid out in the form of worker wages and profit payments.  

A comparison of the results in Table 3 with the results in Table 2 indicates that both the average value productivity and the net income theories of wage determination which are based on existing anecdotal and theoretical analyses of Yugoslavia perform as well as or better than the Phillips curve equations. Of course, a simple explanation for this superior performance might be the inclusion of a lagged wage term among the independent variables in equations (9) and (11). This explanation can be rejected, however, because the inclusion of the same term in the simple Phillips equation does not significantly change the results, as the coefficients in row (5) of Table 3 indicate. The question then arises as to which model, the Phillips curve model, the average value productivity model or the net income per worker model best describes the process of wage determination in Yugoslavia. 

There appears no definitive way to answer this question with the data and level of aggregation used in the estimation reported here. However, some light might be shed on the issue by examining the effects of including the unemployment rate variable in the net income and average
value productivity formulations. The results of this procedure are presented in rows (2) and (4) of Table 3. Unfortunately, these results are not conclusive. When the unemployment variable is added to the net income model, its coefficient is statistically significant and of a similar magnitude to the one obtained in the simple Phillips curve formulation. However, the estimated coefficients of the equilibrium net income per worker variable and the lagged wage variable become insignificant, suggesting that the net income model may not be the true model of wage determination. The high degree of multicollinearity between the net income per worker variable, the lagged wage variable and the unemployment rate variable make it impossible to accept or reject this conclusion with any degree of certainty. \(14\) In the average value productivity model, the unemployment term is insignificant and its inclusion does not affect the significance or magnitude of the other coefficient estimates. Given the greater explanatory power of the average value productivity formulation and the robustness of its results when the unemployment term is included, it is possible to conclude that this formulation provides a somewhat better explanation of the wage determination process in Yugoslavia than either the Phillips curve model or the net income per worker model. Furthermore, these results are consistent with the view that the unemployment term in the Phillips curve equation acts only as a proxy for the average value productivity terms in equation (11). Once these terms are correctly specified and measured, the a priori view that labor market conditions do not influence wage determination in the self-managed enterprise is supported by the empirical results.
A major purpose of this section has been to contrast the performance of a wage equation model based on a theory of wage determination for a market economy composed of capitalist firms with wage equation models based on theories and observations of the self-managed enterprise in Yugoslavia. The empirical results suggest that the models which are consistent with the current theoretical understanding of the self-managed firm and with existing anecdotal evidence perform as well as or better than the model based on assumptions about the workings of the labor market which appear in direct conflict with prevailing views on the Yugoslav economy. Naturally, these results are not conclusive but they seriously call into question the validity of overlooking genuine institutional and qualitative features of wage bargaining in the pursuit of applying a unified Phillips curve formulation to wage determination everywhere. Unless one is willing to argue that the theory underlying the Phillips curve equation fits the Yugoslav case, one is left with the worrisome doubt that there might be no economy, no matter how divergent its wage determination procedures, for which a properly modified Phillips curve would not provide a 'reasonable' fit.

III. Theories of Price Determination in the Yugoslav Enterprise

The labor co-op and Horvat-type models underlying equation (5) imply that the usual theory of full-cost pricing, modified to reflect the impact of differing product market conditions, does not apply to the pricing behavior of the Yugoslav firm in the long run when labor incomes are calculated as a residual after payment of all non-labor variable and fixed factors of production. In the short run, however, when the enterprise
operates with a fixed minimum wage, the full-cost pricing model is appropriate, because the fixed wage, like the prevailing wage rate in a capitalist system, measures both the minimum fixed cost of labor and the minimum price at which additional labor can be purchased during a production period. Evidence of an anecdotal nature suggests that Yugoslav enterprises view the fixed wage in this fashion and include unit labor costs evaluated at this wage in production costs. In fact, many firms apparently set short-run product prices by applying a markup to the total of intra-enterprise transfer prices which are themselves based on material input costs and fixed wages in each production subdivision. Enterprise pricing behavior of this nature is clearly consistent with the traditional full-cost pricing model underlying most empirical studies of price determination.

According to this model, prices in the long run are determined by unit costs, which in turn depend on production conditions and the input prices of variable factors of production. In the short run this relationship is frequently modified to allow demand conditions in the product markets to influence the markup of prices over costs. In particular, most price determination models assume a positive correlation between a representative firm's markup and some index of general business conditions. The simplest price equation based on a model of this form can be expressed as

\[ \Delta \ln p_t = d_0 + d_1 \Delta \ln ULC_t + d_2 \Delta \ln RMC_t + d_3 f(ED) + \epsilon_t \]

where \( ULC_t \) is a measure of unit labor costs;
\( RMC_t \) is a measure of unit material costs;
and \( f(ED) \) is some measure of the level of excess demand.
In this equation, the unit labor cost variable is assumed to refer to
equilibrium or normal values, under the presumption that enterprises do not
adjust prices to transient changes in labor costs induced by transient,
cyclical changes in labor's productivity.

Equation (13) has been estimated using quarterly data for the
Yugoslav social sector for the 1962II-1972II period, and the statistical
results are presented in Table 4. The data sources and variable definitions
are discussed in the footnotes to the Table and in the Appendix, but a
number of data limitations should be noted here so that the results can be
properly interpreted. First, because a quarterly series on total material
prices (both domestic and foreign) was not available, a variable measuring
changes in the costs of raw material and equipment imports was used as an
approximation for $\Delta \text{lnRMC}$. Second, because Yugoslav inventory figures
seemed unreliable and because there was no series on unfilled orders, the
excess demand variable was defined in terms of an existing series on
capacity utilization, calculated by J. Mencinger, using the Klein method
of comparing actual to trend production.\footnote{16} Experiments indicated that the
best excess demand variable, as judged by overall statistical performance,
was a lagged non-linear capacity utilization variable of the following form:

\begin{equation}
\text{NLCCU}_{t-1} = \frac{1}{(\text{CU})_{t-1} - \text{r}}
\end{equation}

where $r$ is some critical maximum limit on capacity utilization and $\text{CU}$ is
actual seasonally adjusted capacity utilization. Because there is no
a priori way to determine the "true" critical value of capacity utilization,
a number of different values for $r$ were tried. Table 3 presents the
results for those values which minimized the sum of squared residuals in
the price equations.\footnote{17}
Third, after a number of experiments, standard unit labor costs were measured using trend values of labor productivity obtained from the following equation

\[
(15) \quad \text{LP} = .0679 + .0012\text{Time} \\
R^2 = .97 \\
d = .80
\]

Fourth, equation (13) assumes that prices are equally responsive to changes in wages and to changes in labor productivity. Because this assumption is not necessarily applicable in Yugoslavia where a change in nominal wages may represent a change in supplementary profit payments which is not a change in labor costs, both equations were also estimated decomposing the single unit labor cost variable into separate labor productivity and wage variables.

Table 4

Determinants of the Rate of Growth of Prices, 1962-1972
Ordinary Least Squares Estimates

<table>
<thead>
<tr>
<th>Equation No.</th>
<th>(C)</th>
<th>(ULC_t)</th>
<th>(\nu_t)</th>
<th>(LP_t)</th>
<th>(RMC_t)</th>
<th>(1/(r-CU)_t-1)</th>
<th>(R^2)</th>
<th>(SSE)</th>
<th>(d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.046</td>
<td>.3790</td>
<td>----</td>
<td>----</td>
<td>.0325</td>
<td>.003999</td>
<td>.62</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.36)</td>
<td>(5.07)</td>
<td></td>
<td>(2.12)</td>
<td>(3.21)</td>
<td>(.012)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.0229</td>
<td>----</td>
<td>.4292</td>
<td>-2.768</td>
<td>.0320</td>
<td>.0008(A)</td>
<td>.66</td>
<td>1.92</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.62)</td>
<td></td>
<td>(6.05)</td>
<td>(-2.28)(2.13)</td>
<td>(2.56)</td>
<td>(.012)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(The t statistic is recorded in parentheses below each parameter).

Dependent variable: one quarter change in the logarithm of a seasonally adjusted producer price index for industrial goods; seasonal adjustment of the dependent and independent variables by method of the ratio of a series to its moving average.
Explanatory variables:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULC</td>
<td>One quarter change in the log of the ratio of seasonally adjusted total receipts of workers employed in the social sector of the economy and seasonally adjusted standard labor productivity which is generated from the estimates of equation (15) in the text.</td>
</tr>
<tr>
<td>( w_t )</td>
<td>Same as in Tables 2 and 3.</td>
</tr>
<tr>
<td>( LP_t )</td>
<td>One quarter change in the log of seasonally adjusted standard labor productivity generated from the estimates of equation (15) in the text.</td>
</tr>
<tr>
<td>( RMC_t )</td>
<td>One quarter change in the log of a seasonally adjusted index of import prices.</td>
</tr>
</tbody>
</table>
| \( 1/(\tau-CU)_{t-1} \) | A nonlinear capacity utilization index defined as the reciprocal of the difference between some critical maximum level of capacity utilization and the actual seasonally adjusted level of capacity utilization. In the table the letter in parentheses next to the estimated coefficients for this variable identifies the different values of \( r \) used to construct it. 
\[ B = 1/9.70-CU \] where 9.70 represents a capacity utilization rate of 97%. 
\[ N = 1/9.68-CU \] 
\[ A = 1/9.65-CU \] 
\[ V = 1/10.00-CU \] |

All equations are fitted for the period 1962II-1972II.

An examination of the statistical results in Table 4 indicates that equation (13) provides a reasonably good explanation of changes in producer prices in the Yugoslav social sector. The coefficients are significant and of predicted sign and reasonable magnitude, the model explains 62-66% of the variance in the rate of change of prices, and the Durbin-Watson statistic suggests that the underlying errors are serially uncorrelated. Such results are quite outstanding in view of the fact that a number of temporary price controls and price freezes distorted the pattern of price change during the 1962-1972 period.
The best results of equation (13) are obtained when allowance is made for separate effects of labor productivity changes and wage changes on price determination. The estimated coefficients indicate that a 1% increase in the rate of growth of wages gives rise to a .4% increase in the rate of growth of prices, while a 1% increase in the rate of growth of standard labor productivity leads to a 2.8% decline in the rate of growth of prices. The wide divergence between the effect of changes in wage growth and changes in labor productivity, while surprising, can be explained by the fact that the wage term is influenced by changes in payments to labor which are not changes in fixed accounting wages and by the fact that factor shares varied during the estimation period. Only under the assumption of constant factor shares would the estimated coefficients of both the wage and the standard labor productivity variables be expected to equal one.

A final point clearly illustrated by the results is the increasingly steep tradeoff between inflation and capacity utilization as higher levels of excess product demand are reached. As constructed, the nonlinear capacity utilization variable models a product market in which prices become more and more responsive to demand pressures as the level of excess demand increases. Thus, a one percentage point increase in the level of capacity utilization from 93.5% to 94.5% yields an increase in the rate of inflation of only .0013 percentage points, while a one percentage point increase in the level of capacity utilization from 95.2% to 96.2% yields an increase in the rate of inflation of approximately .021 percentage points. Clearly, incremental increases in product demand have a much more powerful effect on the rate of inflation when they occur in already tight conditions of product supply.
Two-Stage Estimates

The statistical results presented in Tables 3 and 4 suffer from the well-known bias introduced by using ordinary least squares estimation when simultaneous equation estimation is required. To get a rough idea of the extent of the bias and its effects on the qualitative and quantitative conclusions derived above, the best equations were re-estimated using two-stage least squares. In the estimation one-quarter changes in prices and wages were assumed to be endogenous variables while all real sector variables, such as the rate of growth of labor productivity and the nonlinear capacity utilization variable, were assumed to be exogenous. Although these assumptions are dubious at best, they provide the only way to examine the extent of simultaneous equation bias short of the specification of a full macro model.

The two-stage estimates reported in Table 5 support most of the conclusions derived from the ordinary least squares results. In particular, all of the explanatory variables except the rate of growth of import prices remain of predicted sign and are statistically significant in each equation. Moreover, the coefficient estimates do not differ importantly in the two-stage and ordinary least squares results. Only in the case of the import price variable in the price determination equation do the two stage results indicate the need for further testing to ascertain what, if any, are the effects of changing import prices on domestic prices. In the two stage results, the coefficient of the import price term, although of correct sign and reasonable magnitude, is insignificant.
### Table 5
Determinants of the Rate of Growth of Prices and Wages, 1962-1972
Two Stage Least Squares

<table>
<thead>
<tr>
<th>No.</th>
<th>Equation</th>
<th>Coefficients</th>
<th>t-values</th>
<th>(SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( \frac{Y}{U} )</td>
<td>(-0.0257)</td>
<td>(-1.29)</td>
<td>((0.89))</td>
</tr>
<tr>
<td></td>
<td>( P_t )</td>
<td>(0.0041)</td>
<td>(2.69)</td>
<td>(0.906)</td>
</tr>
</tbody>
</table>

Instrumental Variables: \( P_t^A \), \(1/(9.65-CU)_{t-1} \), \(LP_t \), \(RMC_t \), \(1/U_t \), \(C\).

| 2   | \( \frac{Y}{L} \) | \(0.6972\) | \(0.3194\) | \(0.0906\) | \(-0.0946\) | \(0.7560\) | \(1.69\) | \(0.018\) |
|     | \( \frac{Y}{L} \) | \(0.6972\) | \(0.3194\) | \(0.0906\) | \(-0.0946\) | \(0.7560\) | \(1.69\) | \(0.018\) |

Instrumental Variables: \( \frac{Y}{L} \), \(\frac{Y}{L}^E \), \(WAGE_{t-1} \), \(P_t^A \), \(1/(9.65-CU)_{t-1} \), \(LP_t \), \(RMC_t \), \(C\).

| 3   | \( \frac{Y}{L} \) | \(0.5282\) | \(0.4709\) | \(0.2363\) | \(-0.1394\) | \(0.7589\) | \(1.59\) | \(0.016\) |
|     | \( \frac{Y}{L} \) | \(0.5282\) | \(0.4709\) | \(0.2363\) | \(-0.1394\) | \(0.7589\) | \(1.59\) | \(0.016\) |

Instrumental Variables: \( \frac{Y}{L} \), \(\frac{Y}{L}^E \), \(WAGE_{t-1} \), \(P_t^A \), \(1/(9.65-CU)_{t-1} \), \(LP_t \), \(RMC_t \), \(C\).

II. Dependent Variable: One-quarter change in logarithm of producer price index.

| 4   | \( Y_t \) | \(0.0296\) | \(0.938\) | \(-3.595\) | \(0.0264\) | \(0.00069\) | \(1.98\) | \(0.012\) |
|     | \( LP_t \) | \(0.0296\) | \(0.938\) | \(-3.595\) | \(0.0264\) | \(0.00069\) | \(1.98\) | \(0.012\) |

Instrumental Variables: \( LP_t \), \(1/(9.65-CU)_{t-1} \), \(WAGE_{t-1} \), \(\frac{Y}{L} \), \(\frac{Y}{L}^E \), \(\frac{Y}{L}^E \), \(P_t^A \), \(RMC_t \), \(C\).
Equation No.

5  \( c \quad v_t \quad L_Pt \quad RMC_t \quad 1/(9.65-CU)_{t-1} \quad d \) (SEE)

\[
\begin{array}{ccccc}
0.0298 & 0.5823 & -3.960 & 0.0211 & 0.00062 & 1.92 \\
(1.97) & (4.58) & (-2.86) & (1.25) & (1.93) & (.012)
\end{array}
\]

Instrumental Variables: \( LP_t, 1/(9.65-CU)_{t-1}, 1/U_t, P^A_t, RMC_t, C. \)

6  \( c \quad v_t \quad L_Pt \quad RMC_t \quad 1/(9.65-CU)_{t-1} \quad d \) (SEE)

\[
\begin{array}{ccccc}
0.0297 & 0.5478 & -3.816 & 0.0232 & 0.00065 & 1.95 \\
(2.01) & (5.53) & (-2.89) & (1.47) & (2.11) & (.012)
\end{array}
\]

Instrumental Variables: \( LP_t, 1/(9.65-CU)_{t-1}, WAGE_{t-1}, \frac{Y}{L} E, D\frac{Y}{L}, P^A_t, \\
RMC_t, C. \)

(The t statistic is recorded in parentheses below each parameter.)

Additional variables are:

- \( \frac{Y_E}{L_t} \) - the one quarter change in the log of a seasonally adjusted producer price index for agricultural goods.

- \( \frac{Q}{L_t} \) - the log of equilibrium labor productivity defined as the ratio between a seasonally adjusted index of nonagricultural production and the volume of equilibrium labor demand generated from equation (12) in the text.

- \( D\frac{Q}{L_t} \) - the difference between actual labor productivity and \( \frac{Q}{L_t} \).

IV. Summary and Conclusions

The empirical results in this paper are germane to recent discussions about the determinants of the Yugoslav inflation. Several participants in these discussions have argued that the coincidence of inflation and unemployment in Yugoslavia is the consequence of wage-push pressures at the enterprise level. A simple Phillips curve model of wage determination is used to test this assumption and the results lend support to the wage-push hypothesis. Despite its empirical success, however, the Phillips curve
explanation is not theoretically satisfying because it directly conflicts with existing models of the behavior of the self-managed enterprise and with current anecdotal evidence on the wage-setting process in the Yugoslav firm. Both the models and the evidence suggest that wages are set by the workers' council according to the realized profitability of enterprise operations, irrespective of conditions in the labor market. Taking this view of the wage-setting process as a starting point, two one-equation wage models are developed, one of which explains wage changes in terms of changes in labor's average value productivity and the cost of living index and the other of which explains wage changes in terms of changes in enterprise net income and the cost of living index. Both equations perform as well as or better than the Phillips curve equation and both are more satisfying from a theoretical point of view. Overall, the results seem to favor the average value productivity equation as the most powerful explanation of wage changes. In keeping with a priori expectations, the unemployment rate does not influence wage changes in the framework of this model. Undeniably, the wage equation results indicate the need for future empirical research on wage setting practices in the Yugoslav enterprise, preferably with enterprise data.

To complete the picture of the Yugoslav inflationary process, a price equation is developed. Theory and available information about the actual pricing practices of the Yugoslav firm suggest a modified cost-markup formulation and the empirical results are consistent with this view. Perhaps the most important conclusions supported by the price equation concern the role of excess demand, the rate of growth of labor productivity
and the rate of growth of material (import) prices in the determination of the rate of growth of prices. In recent debates about the Yugoslav inflation, product demand factors have been largely overlooked. Yet, if the results presented here are to be believed, such factors have played a significant role in inflationary pressure. Moreover, the apparent nonlinear response of prices to excess demand suggests that product markets may also be responsible for the observed downward rigidity of prices during periods of decelerating or falling aggregate demand. Under such circumstances, policy makers might focus on potential causes of excess demand, such as exorbitantly high rates of growth of the money supply (33.4% in 1972 and 43.0% in 1973) and on institutional barriers to price reductions. Since prices appear to be highly responsive to changes in labor productivity, another approach in the fight against inflation appears to lie in the direction of new policy measures to stimulate increases in labor productivity. Policy efforts to cool down domestic demand and stimulate domestic supply will also have an impact on import cost pressures, which have intensified in the past as a result of forced devaluations of the dinar. Clearly, the development of an effective policy program to combat the Yugoslav inflation requires further research into the exact causes of excess demand and productive supply and the role these factors play in the generation of price increases.

Finally, a word should be said about the necessity of an incomes policy approach to the control of inflation in an economy based on the principle of enterprise self-management. Such an approach has recently been adopted by the Yugoslav government. Yet the theory and empirical results presented here indicate that this approach may be misguided and unnecessary. The institutional fact that the self-managed firm is free to determine its own
prices and wages does not mean that such an enterprise is absolved from the requirement of choosing between employment levels and wage rates. This requirement, coupled with the natural interest of workers in job security, should act as an effective deterrent against excessive wage increases and against the consequent development of wage-push pressures on prices. Under these circumstances, an incomes policy does not seem warranted. Instead, the government should focus on those factors which inflate levels of product demand and retard increases in product supply, thereby creating an environment in which each enterprise can afford to grant substantial pay increases while maintaining or even increasing its employment of labor.


Footnotes

1. The unemployment rate is measured as the ratio between the number of workers seeking jobs at government employment offices and the total of the number of workers employed in the social sector and the number of job seekers. Employment in the social sector accounts for approximately 40% of the total labor force engaged in both private and social sector economic activity. Therefore, the Yugoslav unemployment rate is best understood as a measure of the unemployment rate in the industrial sector, since that sector is nearly coterminous with the so-called social sector.

2. The social sector includes all enterprises operating in the nationalized sector of the economy according to the rules of workers' self-management.


5. Mencinger's results are reported in his Simulaciom Model Inflacije, February, 1972 (Ljubljana, Ekonomski Institut, Faznve Fakultete).


8. Even if Yugoslav workers made wage agreements once a year and even if one-fourth of all such agreements occurred in each quarter of the year, there would still be no reason for using overlapping four quarter percentage changes as the dependent variable. As Black and Kelegian (1972) and Ashenfelter and Pencavel (1974) have noted under such circumstances, a wage equation based on one-quarter changes and a wage equation based on annual changes are observationally equivalent, except that the disturbance term in the quarterly change equation is serially independent.

10. The distinction between the offer and the asking wage was pointed out to the author by John Pencavel (Stanford University).


12. Because hiring and firing decisions are based on collective agreements among workers interested in protecting their job security, labor is difficult to discharge in the short run. Consequently, the enterprise is reluctant to employ new workers in response to what might turn out to be a transitory increase in labor's average value productivity or labor's net income.

13. The share of labor payments in total discretionary enterprise net income rose steadily from approximately 61% in 1962 to approximately 68% in 1972.

14. The partial correlation coefficient between \( \frac{X}{L} \) and \( (1/U) \) is -.5210 while the partial correlation coefficient between \( \frac{X}{L} \) and \( v_t \) is .1530. Similarly, the partial correlation coefficient between \( WAGE_t \) and \( \frac{1}{U} \) is -.5856 while the partial correlation coefficient between \( WAGE_t \) and \( v_t \) is -.194.

15. If the markup variable is assumed to be a function of the current level of excess demand then the rate of change of prices is a function of the rate of change of demand. If instead the markup variable is assumed to be a function of cumulated past rates of excess demand, then the rate of change of prices is a function of the current level of demand. See G. de Menil, "Aggregate Price Dynamics," Review of Economics and Statistics, Vol. LV, No. 2, May, 1974, pp. 129-130.

16. Mencinger's capacity utilization series and the methodology used to construct it are discussed in Gospodarska Gibanja, September, 1972 (Ljubljana: Ekonomski Institut Pravne Fakultete).

17. The only proper way to find the "true" critical value for r is to employ maximum likelihood estimation. Time and financial constraints dictated an alternative approach of examining several reasonable values for r and choosing the ones which minimized the sum of squared residuals from the price equation.
APPENDIX: Data Sources

Wages

The basic wage rate series used is average net receipts (prosecni neti licni dohoci) per worker employed in the economy (zaposlenih u privredi) during each quarter. The series is calculated by summing the monthly observations on nominal receipts to get quarterly receipts. This procedure is followed because certain components of worker quarterly income vary from month to month. For example, bonus payments are likely to be added to incomes at the end of the quarter rather than to be spread out evenly across the three months of the quarter. The monthly observations are taken from Indeks, the monthly statistical bulletin of the Yugoslav Federal Statistical Office (SzS). The wage measure includes both basic wages and all other receipts of the worker during each quarter, including fringe benefits, profit shares, bonus payments, etc. The series covers only workers employed in the so-called "economic sector" which includes industry and mining, agriculture, forestry, trade, transportation and communications, construction and crafts. This sector covers about 83% of the total labor force employed in the social sector (nationalized) which is subject to the rules and regulations of self-management legislation.

Unemployment

The average number of registered job seekers and the average number of workers employed in the social sector during each quarter are taken from Indeks.
Prices

The retail price index (1967 = 100) and the producer price index for all industrial goods (1967 = 100) are taken from Indeks. The agricultural price index (1967 = 100) is calculated from the producer price index for agricultural goods reported in the OECD, Main Economic Indicators.

Capacity Utilization

The index of capacity utilization is taken from worksheets provided to me by J. Mencinger of the Ekonomski Institut in Ljubljana.

Nonagricultural Production

The index of total nonagricultural production (1967 = 100) is taken from Indeks.

Total Business Receipts and Material Expenditures

Total business receipts and expenditures are taken from the Statisticki Bilten of the Social Accounting Service (Sluzba Drustvenog Knjigovodstva).

Import Price Index