Wage Determination under Labor-Management : Theory and Evidence from Yugoslavia

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1. Introduction

In this paper we model and test alternative explanations of income determination in participatory and labor-managed firms. In the Yugoslav context,[1] this involves distinguishing between the competing contentions that earnings differentials are related to the system of self-management *per se* or are a consequence of capital rationing by the authorities. Our initial aim is theoretical; to develop an adequate general formulation of the problem and an appropriate framework in which to embed the hypotheses. It is also felt that rigorous empirical findings in this area will be an important input in evaluating the Yugoslav labor-managed system as well as the increasing degree of worker participation in other countries.[2]

The Western labor economics literature has extensively analyzed the determinants of worker earnings in capitalist enterprises, both in the absence and presence of trade unions.[3] However, the question of wage determination for firms in which the labor force participates in the decision-making process and in which workers' objectives are at least partially maximized (see Steinherr (1977) and Svejnar (1982a, 1982c)) has not yet been fully addressed. At the same time, a large labor-management literature (e.g. Ward (1958), Vanek (1970) and Meade (1972)) views the enterprise as being exclusively concerned with the objectives of its worker-members, including earnings per head, but has concentrated on issues of comparative industrial organization and efficiency. In fact, such empirical studies as have been conducted on wage determination under labor-management (e.g. Wachtel (1972), Vanek and Jovicic (1975)) have relied on *ad hoc* postulated functional relationships rather than reduced form equations, and their findings are therefore questionable. Yet the very large inter-firm wage differentials reported for Yugoslavia (see Estrin (1981)) highlight the need for a better understanding of the phenomenon, which could form the basis for appropriate policy actions.

The deficiencies of the existing studies point to the desirability of deriving a reduced form wage equation for labor-managed firms and estimating it on Yugoslav data. The point of departure is the endogeneity of worker earnings in such firms, which implies that wages should be modelled as being determined by the same variety of factors as would cause profit differences under capitalism. This is essentially the argument of a group of economists within and outside Yugoslavia, henceforth denoted the "labor school", who view inter-firm differences in demand and cost conditions as the primary determinants of Yugoslav income differentials[4]. The argument derives from the growing theoretical literature on the behavior of a labor-managed market economy (e.g. Vanek (1970) and Ireland and Law (1982)) which predicts the emergence of income differentials because of institutional weaknesses in the operation of the markets. The essential problem is seen to be the labor immobilities associated with the fact that workers participate in and actively appropriate the residual surplus. In such a system, inter-firm income differentials will develop whenever firms face differing economic circumstances since workers' earnings must vary with the parameters of enterprise choice. Unlike under capitalism, where one can expect competitive forces to act to equalize the wages paid to a common labor type, under self-management these differentials will not be eliminated because cooperative workers control the recruitment of labor, and can restrict entry to maintain their own incomes. Entry and exit of firms is required to transfer labor between uses and reduce income differences, but the evidence suggests that this has been minimal in Yugoslavia over the period (see Sacks (1972)). Policies consistent with the labor school approach include the encouragement of labour mobility, Anti-Trust legislation, the reduction of entry barriers, and positive measures to encourage enterprise entry and exit.

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instead propose capital pricing as the sole tool to eliminate income differentials. The theoretical basis for this policy conclusion is rarely spelt out explicitly, but this group, henceforth called the "capital school"[5], points to capital immobilities and stress the scarcity of capital in Yugoslavia the inefficiencies in its rationing and the fixing of its price well below the market clearing rate. The most common capital school argument is empirical, estimating the association between earnings and capital-labor ratios (e.g. Vanek and Jovicic (1975)) but as we have argued elsewhere this formulation lacks any choice-theoretic foundation and the empirical results are open to question (Estrin, Svejnar and Mow (1982)). At the core of the capital school approach is the concept of capital rationing, with enterprises not being required to pay the full opportunity cost for capital previously allocated to them by the central planners. The capital allocation process therefore generates monopoly rents which under labor-management can be appropriated by workers as personal incomes in addition to their normal remuneration. In this view, income differentials derive solely from inter-firm differences in capital marginal products caused by a capital rationing process exogenous to the firm, which could be eliminated in the short term by appropriate capital pricing policies and in the longer run by the efficient allocation of capital.

Despite the policy implications, no one has considered the relative explanatory power of the two schools empirically. This is partly because as currently framed the hypotheses are observationally equivalent. Both schools actually predict an association between incomes and capital - labor ratios, the sole empirical test thus far applied, but in the labor school case it is non-causal; the two variables are the subject of enterprise choice and depend on a common set of parameters. Further modelling is required to formulate the hypotheses so that they can be distinguished empirically, and our approach in the next section is to build a general analytic framework

for the enterprise problem from which reduced form wage equations are derived. The hypotheses as currently framed are also non-nested; with the labor school implicitly assuming that capital demand and supply functions are equated and the capital school considering only the effects of capital rationing. The general formulation in the next section is therefore concerned to nest the two hypotheses in the reduced form wage equations. The equations are adapted into a specific estimating framework in the third section, in which the econometric techniques and actual data series to be used are also outlined. The empirical results are reported in the fourth section and general conclusions are drawn in the fifth.

II. The Models of Wage Determination

In this section we analyze the determinants of labor earnings in participatory and labor-managed firms in the absence and presence of capital rationing. We commence with labor incomes, which can be viewed as comprising a fixed wage and a variable component dependent on the current profits of the enterprise. There is, of course, no reason to assume that the latter element will always be positive. If the share of profits appropriated by the workers is treated as exogenous,[6] there is a general description of such compensation schemes in which the labor-managed or Yugoslav firm is a special case. The average worker income, denoted y, is given by

$$y = w + \gamma \frac{\pi}{L} \tag{1}$$

where w is the fixed wage[7] and the firm's net profit, $\pi = R(L,K) - wL - rK - H$, is revenue (R) minus the "fixed" labor cost (wL), capital costs (rK) and all other fixed costs (H). The number of workers in the firm is denoted by L, and γ represents the share of net profit appropriated by the labor force. In models of conventional capitalist firms, γ is assumed to be zero, and it ranges $0 \leq \gamma \leq 1$ in a traditional unionized or participatory firm. In a fully labor-managed system of the Yugoslav type, $\gamma = 1$ and equation (1) reduces to

$$y = w + \frac{\pi}{L} = \frac{R - rK - H}{L} \tag{2}$$

which is the usual maximand in the theoretical literature on self-management and, as Svejnar and Mow's (1983) results indicate, it is consistent with the data set used in this study. In fact, we impose the labor-management condition $\gamma = 1$

in the remainder of this study because our empirical attention is restricted to the Yugoslav case. But it should be stressed that this is not a requirement of the model; γ would be included in the equations if the relative bargaining power of labor and capital was a relevant parameter in our data set. Hence, the approach outlined below covers participatory as well as labor-managed firms and indeed would permit one to identify γ empirically in the more general case. The revenue function is specified in general form to maintain the assumption of imperfect competition, which is actually the dominant product market structure in Yugoslavia (see Estrin (1983)). Of course the formulation encompasses the case of perfect competition, under which product price is exogenous and explicitly enters the input demand and earnings equations.

In a labor-management model the firm is assumed to maximize (2) with respect to the available choice variables, L and K. Capital costs, r, and the elements of fixed costs, H, are assumed to be exogenous. The maximization leads to the standard first-order conditions which equate factor payments to factor marginal revenue products:

$$R_L = \frac{R - rK - H}{L}$$

$$R_K = r \,, \tag{3}$$

where R_i is the partial derivative of revenue with respect to input i. The two first-order conditions can in principle be solved for the reduced form input demand functions:

$$L^d = L^d(r,H)$$

$$K^d = K^d(r,H) \quad . \qquad (4)$$

If firms are price-takers in the product market, equations (4) would also include the product price P as an exogenous variable. The solution is slightly more complex than under capitalism because by definition factor payments must exhaust the value of total product. Following Vanek (1970) and Estrin (1983), this can be seen as imposing a constraint on the revenue function, namely that in equilibrium returns to scale must equal the ratio of output price to marginal revenue. This is not restrictive in most circumstances, but can cause problems for several classes of production and demand functions which may have empirical relevance. If the firm operates in a competitive market, the ratio of price to marginal revenue is unity and cooperatives must produce in the region of constant returns to scale. Thus if the production function is homogeneous, the firm tends towards one worker under decreasing returns, an indeterminate employment level under constant returns and an indefinitely large labor force under increasing returns. Similar problems can arise under imperfect competition when the output demand function displays constant elasticity and production technology is homogeneous. In this case, output tends towards zero, indeterminacy of infinity according to whether the degree of homogeneity of the production function exceeds, equals or is less than the ratio of price to marginal revenue. In these cases, input demand functions are not defined when $H = 0$ but with $H > 0$ well-defined maxima and input demand functions still do exist under standard concavity assumptions.[8/]

Labor income, y, is a choice variable, and therefore cannot enter the input demand functions in the conventional way. In fact, combining (2) and (4), y can be expressed as an indirect function

of the exogeneous variables:

$$y = \frac{R\left[L^d(r,H), K^d(r,H)\right] - rK^d(r,H) - H}{L^d(r,H)} = y(r,H). \qquad (5)$$

Employment is demand determined and equation (5) is the appropriate reduced form wage equation provided the supply curve of labor

$$L^s = L^s(y), \; 0 \leq L^s_y \leq \infty \qquad (6)$$

generates a non-negative excess supply of workers at y. This was the case in Yugoslavia during the period under study (see Estrin and Bartlett (1982)) but note that in principle $y = \tilde{y}(r,H)$ could also be derived if the labor supply constraint was binding.[9/]

Combining a capital supply curve

$$K^s = K^s(r), \; 0 < K^s_r \leq \infty \qquad (6')$$

with the capital demand equation by setting $K^s = K^d$ yields

$$y = f(r,H) . \qquad (7)$$

Hence, labor incomes can be expressed as a function of r, H and the relevant demand and cost parameters contained in $f(.)$.

Equation (7) says that incomes differ under labor-management because of inter-firm differences in demand and cost conditions and with appropriate formulation it therefore encompasses the ideas of the labor school. However, the framework must be extended to include explicitly the effects of capital rationing. This entails assuming that enterprises attempt to behave according to equations (1)-(6) but that a rationing rule replaces equation (6'):[10]

$$\tilde{K} = \text{Min}(K^s, K^d). \qquad (6'')$$

Setting $\tilde{K} = K^s$ yields

$$Y = g(\tilde{r}, \tilde{K}, H) \qquad (8)$$

where $\tilde{r}$ is the interest rate as determined by the authorities jointly with $\tilde{K}$ and $g(.)$ reflects the relevant demand and cost parameters.[11] Therefore, equation (8) is the general formulation of the problem, into which the labor school view embodied in equation (7) is nested according to the significance of $\tilde{K}$ in the reduced form wage equation (8). The capital school argues that variations in the rationed level of capital are the only source of systematic income differences in Yugoslavia and therefore deny the empirical relevance of r as well as the demand and cost parameters embodied in $g(.)$. This view is formalized in, for example, Vanek and Jovicic (1975), as

$$y = \alpha + \beta\tilde{K} \qquad (7')$$

where α and β are constants or, more generally, $y = h(\tilde{K})$. In the following section, we establish that with appropriate specification equation (7') is also nested in equation (8).

III. Econometric Specification

III(a) Perfect Adjustment

In this section we outline the assumptions and methods used in making equation (8) and the associated hypotheses estimable on Yugoslav data. The most important issues include the choice of functional form, the precise specification of variables and parameters and the data set to be employed.

There are three potentially fruitful approaches to parameterizing the wage equation. The first entails selecting a plausible approximation to an estimable wage equation. This approach was employed by Lewis (1963) and others who successfully used a logarithmic approximation to the labor demand and supply functions at the industry level. The second strategy relies on expressing the wage equation in a differential form and then replacing the unobservable infinitesimal changes by observable differentials. This method was adopted, for example, by Barten (1967) and Theil (1967) with time-series data and by Ashenfelter and Heckman (1974) in the cross-sectional framework. The third approach involves specifying a production function and combining the parameterized reduced form input demand equations with a plausible industry-level capital supply function.

We employ the first two approaches in our empirical work, but the restrictions on technology imposed by income maximization noted above lead to severe problems with the third. Even so, it should be noted that the first approach is closely related to the third, with a logarithmic labor demand equation being consistent with a Cobb-Douglas production function[12]. Therefore, in the spirit of Lewis (1963) we postulate the following logarithmic wage equation in the general case:

$$\ln y_{it} = a_{oi} + a_1 \ln \tilde{r}_{it} + a_2 \ln X_{it} + a_3 \ln \tilde{K}_{it}, \qquad (9)$$

where i = industry and t = time and X_{it}, proxying for $g(.)$ in (8), is a vector of variables capturing inter-industry differences, the selection of which is explained below. H is captured in the industry specific intercepts, a_{oi}.

Equation (9) reflects all the market imperfections from whatever source relevant in explaining Yugoslav income differentials. One must reject the partial explanation offered by each school if coefficients $a_1 - a_3$ are significant. The capital school view places exclusive emphasis on capital rationing, which implies that only the coefficients a_{oi} and a_3 are significant.[13/] This can be tested using an F-test on the coefficients a_1 and a_2. The labor school hypothesis assumes market clearing for capital, in which case upon substituting out H the logarithmic wage equation is of the form,

$$\ln y_{it} = a'_{oi} + a'_1 \ln r_{it} + a'_2 \ln X_{it}. \qquad (10)$$

The labor school hypothesis given by equation (10) is therefore nested in equation (9). One can simply use an F-test to see whether the coefficient a_3 in equation (9) equals zero.

To derive estimating equations using the second approach we proceed as follows. Upon total differentiation, equation (8) can be expressed in logarithmic form as

$$d\ln y_{it} = \eta_{yx}\, d\ln X_{it} + \eta_{yr}\, d\ln \tilde{r}_{it} + \eta_{yk}\, d\ln \tilde{K}_{it} \qquad (11)$$

where $\eta_{yz} = (\partial y/\partial Z)(Z/Y)$ is the labor income elasticity of any given variable Z and, as before, the vector X includes the relevant firm and industry variables defined below. The unobservable infinitesimal changes dlny, dlnX, dlnr, and $d\ln\tilde{K}$ are replaced by the first differences (annual changes) in the logarithms of these variables, $\Delta\ln y, \ldots, \Delta\ln\tilde{K}$ and the elasticities, η_{ij}, are treated as parameters in estimation to yield:

$$\Delta\ln y_{it} = \eta_{yx}\Delta\ln X_{it} + \eta_{yr}\Delta\ln r_{it} + \eta_{yK}\Delta\ln\tilde{K}_{it}. \qquad (12)$$

As before, the capital school hypothesis implies that only the coefficient on capital will be significant, while one can derive the labor school hypothesis by differentiating equation (7),

$$d\ln y_{it} = \eta_{yx} d\ln X_{it} + \eta_{yr} d\ln r_{it} \qquad (11')$$

which with annual first differences becomes

$$\Delta\ln y_{it} = \eta_{yx}\Delta\ln X_{it} + \eta_{yr}\Delta\ln r_{it}. \qquad (12')$$

Once again, both hypotheses are nested within the general formulation. It must also be noted that the second approach represents the first-difference form of the first approach. As a result, analysis of residuals can be used to determine which approach can be deemed empirically superior.

III(b) Partial Adjustment

Equations (9) - (12') reflect a perfect adjustment mechanism to the desired level of employment and, in the case of the labor school, also to the desired levels of K^d and K^s. However, it is often argued that in the short-run quantity adjustments are only partial:

$$\ln L_{it} = \delta_1 \ln L^d_{it} + (1-\delta_1)\ln L_{it-1} \qquad (13)$$

and

$$\ln K_{it} = \delta_2 \ln K^d_{it} + (1-\delta_2)\ln K_{it-1}$$

$$\ln K_{it} = \delta_3 \ln K^s_{it} + (1-\delta_3)\ln K_{it-1}, \qquad (14)$$

where δ_1 is the partial adjustment coefficient for the labor market and δ_2 and δ_3 are the coefficients for the capital market. It must be noted that while equations (13) and (14) are both applicable to the labor school hypothesis, only equation (13) may be used within the capital school framework if the concept of capital rationing is not to be lost.[14/]

Combining equation (13) with the income equations (5), (8) and (9) yields the general wage equation with partial adjustment in the first approach:

$$\ln y_{it} = b_{oi} + b_1 \ln \tilde{r}_{it} + b_2 \ln X_{it} + b_3 \ln \tilde{K}_{it} + b_4 \ln L_{it-1} \qquad (15)$$

One can test whether employment adjustment is partial in equation (15) according to the significance of the coefficient b_4 and as before the capital school view is nested in the general formulation with the relevant test being an F-test on the coefficients b_1 and b_2. However, the labor school equation with partial adjustment of capital and labor is not nested in the general formulation. The reduced form labor school wage equation is obtained by substituting equations (13) and (14) into equation (9) and the underlying labor demand as well as capital demand and supply equations:

$$\ln y_{it} = b'_{oi} + b'_1 \ln r_{it} + b'_2 \ln X_{it} + b'_4 \ln L_{it-1} + b'_5 \ln K_{it-1}. \qquad (15)$$

Equations (15) and (15') are not nested, containing $\ln K_{it}$ and $\ln K_{it-1}$ respectively, so non-nested tests along the lines suggested by Davidson and McKinnon (1981) must be used in discriminating between the general explanation and the labor school hypothesis with partial adjustment in both L and K. However, *within* each of the general and labor school formulations (equations (15) and (15')) standard tests can be used to ascertain whether the partial adjustment specification is superior to the full adjustment model, namely whether b_4, b'_4 and $b'_5 > 0$. One can therefore test separately for partial adjustment with respect to the labor input within each school according to the significance of the coefficients b_4 in equation (15) and b'_4 in equation (15'). Moreover, if one rejects partial adjustment of the capital input within the labor school specification ($b'_5 = 0$) the two schools are once again nested in equation (15) since (15') becomes

$$\ln y_{it} = b''_{oi} + b''_1 \ln r_{it} + b''_2 \ln X_{it} + b''_4 \ln L_{it-1}. \qquad (15'')$$

This result holds independently of whether there is partial adjustment of the labor input. Thus the use of non-nested tests hinges on whether there is full adjustment of the capital input in the labor school specification, namely whether the coefficient b'_5 in equation (15') differs significantly from zero. If $b'_5 = 0$ we revert to the use of standard tests in distinguishing between

the labor and capital school views along the lines discussed for perfect adjustment. One can use F-tests within the general specification (equation (15)) to determine the appropriateness of partial labor adjustment according to the coefficient b_4, and the empirical validity of the two schools according to the values of the coefficients (b_1, b_2) and b_3.

The situation is perfectly analogous within the second approach which employs the wage equations in a differential form. Partial adjustment in L generates the wage equation,

$$\Delta \ln y_{it} = \eta_{yx} \Delta \ln X_{it} + \eta_{yr} \Delta \ln r_{it} + \eta_{yk} \Delta \ln K_{it} + \eta_{yL} \Delta \ln L_{it-1} \qquad (16)$$

while within the labor school framework the partial adjustment of both L and K leads to

$$\Delta \ln y_{it} = \eta_{yx} \Delta \ln X_{it} + \eta_{yr} \Delta \ln r_{it} + \eta_{yL} \Delta \ln L_{it-1} + \eta_{yK} \Delta \ln K_{it-1}. \qquad (16')$$

Although the capital school view is nested in equation (16) depending on the significance of the coefficients η_{yx} and η_{yr}, as before the labor school hypothesis in equation (16') is not. Therefore non-nested tests may again be required to distinguish between the two approaches. However, partial adjustment in labor alone within the labor school specification yields a reduced form wage equation that is nested in (16),

$$\Delta \ln y_{it} = \eta_{yx} \Delta \ln X_{it} + \eta_{yr} \Delta \ln r_{it} + \eta_{yL} \Delta \ln L_{it-1}. \qquad (16'')$$

Simple tests can then be performed to see whether $\eta_{yK} = 0$ or $\eta_{yK} = \eta_{yL} = 0$ in equation (16') or whether non-nested tests are needed.

III(c) Data and Definitions of Variables

In applying the models we use annual data for nineteen Yugoslav industrial sectors (approximately two digit SIC level) over the period 1965-1972. The choice of data period is guided primarily by institutional factors. The Yugoslavs introduced market self-management with a series of major reforms in 1965 (see Milenkovitch (1971)), but the market mechanism was always severely regulated, and the authorities began to exert moral suasion to reduce income differentials from the early 1970s. These informal pressures were combined with an incomes policy after around 1972, which acted to disguise the profit element of workers' incomes in the published figures. Although the residual surplus continued to vary between firms and to be appropriated by the workers as income, this was no longer necessarily recorded in the official series.[15/] These measurement problems were magnified by fundamental changes in the legal definition of the enterprise around this time, which led to major inconsistencies in the pre- and post-1972 period data. In consequence, our estimation period ends in 1972 although the underlying economic phenomena continue to the present day.

In the previous sections, the models were specified in a general form to focus attention on the formalization and nesting of the two schools of thought. However for the purposes of estimation we need to specify the elements of the X_{it} vector, the diverse inter-firm and inter-industry differences in demand conditions, market structure and productive efficiency hitherto implicit in the revenue and income functions $R(.)$ and $g(.)$. Demand conditions are proxied in the estimating equations by the elasticity of demand and product price. The elasticity of demand is permitted to vary across industries and

depending on the specification, quadratically or logarithmically across time. The inclusion of product price as an independent variable covers the case of perfect competition, but is also consistent with a more general specification of the revenue function. For example, if demand curves are linear and the equation takes account of differences in the elasticity of demand, changes in product price reflects exactly the changing intercepts of the demand curves, or the relative strength of demand. The industrial organization literature also conventionally associates profitability with market power under capitalism (see Scherer (1980)) and this should map into a relationship between incomes and industrial concentration in participatory firms. In fact, such an association was identified on Yugoslav data by Wachtel(1972) and Estrin (1983). There are also strong theoretical grounds for including some measure of enterprise monopoly power in our specification of the revenue function (see Cowling and Waterson (1976)). However the most reliable measures of Yugoslav industrial concentration, published by Sacks (1972), only provide one observation per industry in our estimation period. This means that measured concentration is invariant over time and is perfectly collinear with our industry-specific fixed effects. This leads us to exclude the variable from our equations while noting that its effects are contained in the intercept coefficients and, should it vary over time, also in the polynomial in time.

The other essential elements of $\ln X_{it}$ are the various parameters of production technology. We include two terms in our equations, productive efficiency and minimum efficient scale, each of which could influence enterprise profitability under capitalism. The reasoning behind the inclusion of productive efficiency, denoted (Q/L), is quite conventional, and the term is frequently proxied in the literature by labor productivity (see, for example, Wachtel (1972)).

However, to avoid bias we have followed Brundy and Jorgenson's (1971) instrumental variables approach to construct the appropriate variable. The problem arises because labor productivity is endogenous, depending on the same variables as employment and capital in the labor school case, and employment under the capital school hypothesis. Thus one can derive labor productivity equations with the same right hand side variables as equations (9)-(12), although of course the productive efficiency element of $\ln X_{it}$ would be unobservable in both. The Brundy-Jorgenson method involves using the residual from the relevant labor productivity equation, estimated without any proxy for productive efficiency, in the appropriate wage equation. Provided that the two equations always have the same independent variables and that the errors in each are independent, the procedure generates unbiased wage though not labor productivity equations. The approach is equivalent to adjusting labor productivity to eliminate the collinearity with the other independent variables predicted by the structural model. Our findings therefore avoid the bias of Wachtel's (1972) wage equations in which unadjusted labour productivity is employed as the proxy for productive efficiency.

Formally, taking equations (9) and (10) as illustrative examples, the Brundy-Jorgenson approach amounts to estimating two productivity equations,

$$\ln(Q/L)_{it} = e_{oi} + e_1 \ln\bar{r}_{it} + e_2 \ln X_{it} + e_3 \ln\bar{K}_{it} + \mu$$

$$\ln(Q/L)_{it} = e'_{oi} + e'_1 \ln r_{it} + e'_2 \ln X_{it} + \mu'$$

whose residuals, μ and μ', are entered into equations (9) and (10)

respectively:[16]

$$\ln y_{it} = a_{oi} + a_1 \ln \tilde{r}_{it} + a_2 \ln X_{it} + a_3 \ln \tilde{K}_{it} + a_4 \mu + \varepsilon. \quad (9')$$

$$\ln y_{it} = a'_{oi} + a'_1 \ln r_{it} + a'_2 \ln X_{it} + a'_4 \mu' + \varepsilon'. \quad (10')$$

This procedure has the advantage of proxying in a theoretically rigorous way the unobservable productive efficiency parameter without bias if $Cov.(\mu,\varepsilon) = Cov.(\mu',\varepsilon') = 0$. However unless we impose $\mu = \mu'$ the labor and capital school hypotheses are no longer nested which again suggests the use of non-nested tests. Instead, we prefer to identify the relationship between μ and μ' explicitly in order to maintain a nesting of the two models.[17] Thus, realizing that

$$\mu = \mu' - \hat{e}_3 \ln \tilde{K}_{it} + (\hat{e}'_{oi} - \hat{e}_{oi}) + (\hat{e}'_1 - \hat{e}_1) \ln r_{it} + (\hat{e}'_2 - \hat{e}'_2) \ln X_{it}$$

where $\hat{e}_j$ stands for the estimated value of coefficient e_j, one can reformulate equation (9') as

$$\ln y_{it} = [\bar{a}_{oi} + a_4(\hat{e}'_{oi} - \hat{e}_{oi})] + [\bar{a}_1 + a_4(\hat{e}'_1 - \hat{e}_1)] \ln r_{it} + [\bar{a}_2 + a_4(\hat{e}'_2 - \hat{e}_2)] \ln X_{it}$$

$$+ (a_3 - a_4 \hat{e}_3) \ln \tilde{K}_{it} + a_4 \mu' + \varepsilon. \quad (17)$$

Estimating equation (17) and the two productivity equations permits the identification of all the relevant coefficients, and equation (10') is directly nested in (17).

Minimum efficient scale is less frequently included as a purely technical parameter in wage equations, although in the industrial organization literature, the variable commonly proxies for the effects of barriers to entry (see Scherer (1980)). It is also appropriate to include it in a labor-management model to capture the more stringent requirements for an interior solution to the enterprise optimization problem (see Estrin, (1983)). Competitive co-operatives always produce in the region of constant returns so optimal production is determined independently of prices at the point of minimum efficient scale when the production function displays returns to scale that monotonically diminish from an initial level exceeding unity. In this case the two constituents of residual surplus, profit per unit of output and desired production, are determined separately and since the workers appropriate the surplus as income, both sets of parameters must be included in the wage function. The determinants of output and capital-labor ratios are inter-related with imperfect competition and under different technologies, but the effects of minimum efficient scale on output and therefore incomes can still be shown to be positive.[18] Minimum efficient scale is therefore also included as an element of the X-vector, being proxied by average firm size in the industry[19] and denoted MEScale.

To obtain the most efficient parameter estimates, one would ideally like to estimate industry-specific wage equations within Zellner's (1962) seemingly unrelated regressions framework with appropriate cross-equation restrictions. Unfortunately, with only eight observations per industry it is impossible to employ this technique. An appealing alternative approach is to estimate a single regression equation with both industry and time specific intercepts. While this covariance model

has often been fruitfully used when dealing with pooled cross-section and time series data, we are unable to employ it in its pure form due to linear dependence between the interest rate and the annual dummy variable for 1968.[20] Our choice is therefore between least squares with industry-specific dummy variables and a variance components model treating the industry intercepts as random variables. While the variance components model is more parsimonious, it is also considerably more cumbersome when one wants to consider issues such as autocorrelation, which in our case is of prime importance in distinguishing the relative merits of our two approaches to parameterizing the wage equation. As a result, in order to approximate the covariance model and take into account the demand factors discussed earlier as well as the evolving trend in government's policy toward the industrial sector,[21] we use the repeated least squares with industry-specific intercepts and include either a time polynomial of the second degree or a logarithm of time in our regressions.

IV: Empirical Results

Our findings are summarized in Tables 1-3. In Table 1 we report the results of estimating the wage equations in log-linear form with partial and complete adjustment of the capital input. The regressions approximately correspond to equations (15) and (15') except that, because F-tests lead us to reject the idea that Yugoslav employment adjusts with a lag to changes in demand and supply conditions in either formulation ($b_4 = b_4' = 0$), we report equations in which complete adjustment with respect to the labor input has been imposed. The remaining estimated coefficients are not significantly affected by this exclusion. Although the evidence against partial adjustment in Yugoslavia is at first sight surprising, it is consistent with other findings in the area (see Estrin (1983)) and may be a consequence of the very rapid economic adjustment and growth in this period. The theory of labor-management would predict that co-operatives could adjust employment rapidly when there is an excess supply of labor and economic growth.

Both equations display a very good overall fit for cross-section time series wage equations ($\bar{R}^2$'s in excess of 0.9) and all the estimated coefficients except on lagged capital are significant with the theoretically predicted sign. Incomes vary positively with product price, productive efficiency and average firm size. The effect of the interest rate is negative. The time variables are significant and indicate that, *ceteris paribus*, earnings were growing at a decreasing rate between 1965 and 1972. The nineteen industry-specific intercepts which are not reported in the table reveal that considerable differences exist among individual industries.

The decision as to whether non-nested tests are required to distinguish between the labor school and general formulation hinges on the significance of the coefficient of lagged capital in equation (15'). In rejecting the hypothesis of partial adjustment at the 95% level for the capital input, we therefore eliminate the need for non-nested tests and can examine the competing claims of the two schools by the use of F-tests on the basis of equation (15). In fact, we find that both the labor and the capital school hypotheses must be

rejected in the log-linear specification in favor of the more general formulation reported in the second column of Table 1. Thus in the log-linear specification there is evidence that demand and cost conditions *and* capital rationing affect the determination of Yugoslav wages.

Table 2 presents two sets of estimates based on the second approach, the logarithmic differential approximations of equations (11) and(11'), (16), (16') and (16"). Columns (1) and (2) correspond to equations (16') and (16") with the time effect entered as a polynomial of second degree while columns (3) and (4) refer to the same equations with time entered logarithmically. The first set of estimates implies that the time polynomial enters directly in the specifications of the estimating equations (16), (16') and (16") while the second is consistent with time entering as a variable into equations (7) and (8). As the results in Table 2 indicate, the relative merits of the capital and labor school hypotheses are unaffected by this slight difference in specification.

Turning to hypothesis testing, F-tests reject the hypothesis of partial adjustment of the labor input in both the general and labor school formulations (equations (16) and (16')) with either specification of the time effect. Hence in Table 2 we report the estimates of equations (16) and (16') when $\eta_{yL} = 0$. The overall fit is fair for cross-section time series difference equations, with the $\bar{R}^2$ ranging from approximately 0.14 to 0.27. This is largely because, although almost all the coefficients display the theoretically predicted signs, relatively few are statistically significant at the 99% or even 95% level. However,

we are still able to distinguish between our competing hypotheses. Since the coefficient $\eta_{yK_{t-1}}$ is not statistically significant in either specification of the time effect in columns (1) and (3), we must reject the hypothesis of partial adjustment of the capital input which allows us to use traditional methods in testing the capital and labor school hypotheses against the general formulation of equation (16), reported in columns (2) and (4). F-tests lead us to reject the capital school hypothesis that $\eta_{yp} = \eta_{yr} = \eta_{yQ/L} = \eta_{yMEScale} = 0$ in both specifications of the effect. We must also reject the simple labor school view that capital rationing has no influence on Yugoslav wage determination. However, we are left with a rather surprising version of the general formulation in that the effect of capital rationing on incomes, though significant, is negative. This would appear to support a rather stronger version of the labor school hypothesis than even the disciples of this approach have dared to offer, namely the existence of an inverse relationship between enterprise incomes and capital stocks in Yugoslavia when demand and cost conditions have been taken into account. A similar negative effect was isolated using a different approach in Estrin, Svejnar and Mow (1983), although this tentative finding still awaits a convincing theoretical explanation. One possibility is that capital rationing really mattered for incomes from 1952-1965, and the levels of income were still influenced by the overall capital stock, itself largely determined pre-1965, in the post-1965 era. However, if planners then acted to give low income firms more capital or reinvestment is positively associated to profitability, the relatively small changes in capital would affect changes in income negatively.

The two sets of tests therefore provide strong support for the influence on earnings of the factors stressed by the labor school and in addition mixed support for the factors proposed by the capital school. The log-

linear specification suggests that earnings are determined by variables which span both schools of thought while the logarithmic difference model implies that only labor school variables are relevant and that the actual effect of the capital school variable is perverse. However, we are able to test between the two approximations as descriptions of the Yugoslav wage determining process because the second approach represents the first difference form of the first, so analysis of residuals can be used to choose the empirically superior specification. Our approach is to use the Cochrane-Orcutt iterative method with the logarithmic specification to estimate the first order autoregressive parameter, ρ, and if necessary the transformed coefficients of the wage equations. More formally, using equation (9) as an example,

$$\ln y_{it} = a_{oi} + a_1 \ln \tilde{r}_{it} + a_2 \ln X_{it} + a_3 \ln \tilde{K}_{it} + u_{it} \qquad (9)$$

suppose the error terms, u_{it}, are generated by a first order autoregressiveness process

$$u_{it} = \rho u_{it-1} + \epsilon_{it}. \qquad (18)$$

If each observation i in (9) is first differenced, multiplied through by ρ and subtracted from (9)

$$\ln y_{it} - \rho \ln y_{it-1} = a_{oi}(1-\rho) + a_1(\ln r_{it} - \rho \ln r_{it-1}) + a_2(\ln X_{it} - \rho \ln X_{it-1}) + a_3(\ln \tilde{K}_{it} - \rho \ln \tilde{K}_{it-1}) + \epsilon_t \qquad (19)$$

We can therefore discern between the logarithmic and differential approximations according to the estimated value of ρ. If $\rho = 0$, equation (19) reduces to equation (9) and the logarithmic specification dominates. If $\rho = 1$, equation (19) instead reduces to the equivalent differential specification of equation (11) and the logarithmic difference formulation can be deemed superior. If ρ lies between zero and unity, neither approach dominates and one must correct for autocorrelation using the Cochrane-Orcutt method before interpreting the findings (see Stewart and Wallis

(1981)). Similar reasoning can be applied to all the other forms of the wage equations in the two specifications, that is equations (10) and (12'), (15) and (16), (15') and (16') and (15") and (16"). The values of ρ estimated for the relevant formulations of the wage equation in log-linear specification are reported in Table 3. As in Table 1, our hypothesis testing is oriented around equations (15) and (15'), and we report the results including and excluding the lagged labor input. In fact in all four cases one must reject the hypothesis that the parameter ρ is significantly different from zero. In consequence, the four specifications of equation (19) all reduce to equation (9) and the logarithmic approximation must be taken as a superior representation of the data generating process. We have therefore deduced empirical reasons for supporting the findings in Table 1 that both labor and capital school factors influence wage determination in Yugoslavia.

V: Conclusions

The aims of this paper are twofold. At a theoretical level we seek a better understanding of the processes determining wages in participatory and labor managed firms, and particularly in the context when factor inputs are rationed. The discussion is developed to describe explicitly the Yugoslav economy but the widely noted problems that Western co-operatives face on the input supply side, and particularly with respect to capital formation, indicate the broader generality of the approach. The analysis could therefore form the basis for a more systematic treatment of how supply constraints might influence enterprise decisions under labor-management. At an empirical level, the objective is to provide firm evidence on the causes of wage differentials in Yugoslavia and in particular to sort out the conflicting claims of the capital and labor schools. As previously formulated the two hypotheses are observationally equivalent, with both predicting an association between incomes and enterprise capital stocks. Therefore in order to establish appropriate policy responses, the hypotheses have to be reformulated to ensure their testability and distinctiveness within a single theoretical framework. Our approach is to derive reduced form wage equations for participatory and labor-managed firms in the context and absence of capital rationing, into which an appropriate formalization of the competing labor and capital school hypotheses are embedded.

Wage equations are estimated in log-linear and logarithmic difference form on Yugoslav enterprise level data for the period of maximal self-management, 1965-72. Our findings in both specifications provide strong support for the contentions of the labor school, linking worker incomes to output prices, the interest rate, industrial structure, productive efficiency and minimum efficient scale. This indicates that, as labor-management models predict, wide income differentials *are* a serious problem for such economies and one that will need to be considered carefully by proponents of the system.

This is an important result for Yugoslav policy-makers as well; insufficient attention has been paid to issues of labor mobility, Anti-Trust policy and the encouragement of free enterprise entry and exist in reducing wage differentials. But there is also evidence for the distributional policy favored by the bulk of Yugoslav economists- raising the price of capital to eliminate implicit rentals. Our findings indicate that Yugoslav domestic policy-makers are correct in identifying capital rationing as a source of income dispersion, and more generally of distortions to enterprise factor input and output choices. Their error was in perceiving it as the sole source of inefficiency in the system, and thereby restricting the policy set. Our results therefore point to a balanced policy based on the proposals of both schools.

TABLE 1:

Yugoslav Income Determination, 1965-72: Log-linear Approximation with Complete Labor Adjustment and Partial (1) and Complete (2) Capital Adjustment

	(1) Partial Capital Adjustment (equation (15'))	(2) Complete Capital Adjustment (equation (15))
lnP	0.188 (6.19)	0.188 (6.69)
lnr	-0.095 (-2.19)	-0.092 (-2.16)
ln(Q/L)	0.210 (3.63)	0.219 (3.86)
ln(MEScale)	0.077 (3.26)	0.071 (3.24)
$\ln K_t$		0.114 (1.83)
$\ln K_{t-1}$	0.089 (1.42)	
t	0.085 (7.57)	0.085 (7.63)
t^2	-0.0067 (-5.55)	-0.0069 (-5.73)
Industry-specific intercepts	YES	YES
$\bar{R}^2$	0.9720	0.9724
N	133	133

The specification corresponds to equations (15) and (15') in the text with the additional assumption of complete labor adjustment. Values in parentheses are t-statistics.

TABLE 2:

Yugoslav Income Determination, 1965-72: Logarithmic Difference Approximation with Complete Labor Adjustment Partial and Complete Capital Adjustment

	(1)	(2)	(3)	(4)
$d\ln P$	0.074	0.057	0.082	0.065
	(1.98)	(1.61)	(2.15)	(1.83)
$d\ln r$	-0.042	-0.048	-0.053	-0.058
	(-1.36)	(-1.59)	(-1.72)	(-1.99)
$d\ln(Q/L)$	0.083	0.081	0.088	0.081
	(1.09)	(1.13)	(1.10)	(1.10)
$d\ln(MEScale)$	0.075	0.097	0.105	0.126
	(2.95)	(3.86)	(4.52)	(5.53)
$d\ln K_t$		-0.32		-0.34
		(-3.09)		(-3.26)
$d\ln K_{t-1}$	-0.023		0.067	
	(-0.20)		(0.59)	
t	0.027	0.030		
	(1.41)	(1.64)		
t^2	-0.0032	-0.0032		
	(-1.85)	(-1.98)		
$d\ln t$			0.115	0.069
			(2.07)	(1.30)
$\bar{R}^2$	0.1928	0.2716	0.1399	0.2286
N	114	114	114	114

Columns (1) and (3) correspond to equation (16') and columns (2) and (4) to equation (16) if one assumes complete labor adjustment. Values in parentheses are t-statistics.

TABLE 3:

Yugoslav Income Determination, 1965-72: Log-linear Approximation - Estimatesof First Order Autocorrelation Parameter (ρ)

Equation		ρ
(1)	Equation (15), RHS variables r_{it}, P_{it} $(Q/L)_{it}$, $MEScale_{it}$, K_{it}, L_{it-1}	0.026 (0.28)
(2)	Equation (15'), RHS variables r_{it}, P_{it}, $(Q/L)_{it}$, $MEScale_{it}$, K_{it-1}, L_{it-1}	0.017 (0.18)
(3)	Equation (15) *excluding* L_{it-1}	0.082 (0.88)
(4)	Equation (15') *excluding* L_{it-1}	0.050 (0.53)

Figures in parentheses are t-statistics

Footnotes

1 All Yugoslav firms are labor-managed.

2 In Western Europe, in addition to the existence of numerous labor-managed producer cooperatives in Great Britain, France and Italy, the governments of Austria, Denmark, Germany, Luxembourg, Netherlands, Norway and Sweden have all established participatory firms by law and this trend is likely to continue (see Schregle (1976), Windmuller (1977. Svejnar (1982b) and Jones and Svejnar (1982b)). Recently, participatory and labor-managed firms have become more numerous in the United States as well. Some of these participatory schemes (e.g. in Chrysler and Pan Am) have been established voluntarily by the management and the trade unions, while the establishment of others has been stimulated by the passage of various employee stock ownership plan (ESOP) bills. The founding of worker-owned firms following capitalist divestitures has become a public policy issue in the United States and in several cases the government has provided substantial financial assistance. Among the best known cases are the Farmers' Home Administration's assistance to Bates Manufacturing and the $4.6 million loan provided by the Department of Housing and Urban Development to Rath Meatpacking.

3 The most extensive survey of the union wage effects literature since Lewis' (1963) classic book can be found in Parsley (1980).

4 See in particular Horvat (1971), Dirlam and Plummer (1973), Wachtel (1972) and Estrin (1983). The differences between the labor and capital schools are examined in more detail in Estrin and Bartlett (1982).

5 Principal among these are Milenkovitch (1971), Vanek (1973), World Bank (1975) and Vanek and Jovicic (1975). Professor A.Vahcic of Ljubljana University has confirmed in private correspondence the considerable influence of the Western literature, and in particular Vanek and Jovicic (1975) on Yugoslav authors and policy makers. However, he stresses that the capital market hypothesis has a dynamic as well as a static analytic dimension.

6 Svejnar (1982c) has analyzed the determinants of this share in the context of collective bargaining.

7 The fixed wage, w, can be viewed as the workers' reservation wage.

8 This point goes some way towards identifying an analytic as well as institutional role for H. The variable was included to take account of fixed contributions to enterprise funds in Yugoslavia. However, it could also be used to proxying for non-homogeneous elements if the specification of technology is homogeneous.

9 Under labor-management, equilibrium earnings and employment are demand determined provided there is no constraint on the labor supply side, the common assumption in most of the theoretical literature and the appropriate characterization of the Yugoslav economy. However, as Domar (1966) has pointed out, we enter a different régime if the labor supply constraint binds since the implicit partial derivative of the equilibrium employment, though not earnings, function with respect to an increase in demand, an upward shift in the revenue function, will now have a different sign. Thus although the earnings function can be formulated in terms of the same determinants in both régimes, the specification must differ according to the modelling of the labor supply side.

10 Since in the period under study r was set artificially low by the authorities, it is safe to assume that Yugoslav firms were rationed on the supply side. See Dirlam and Plummer (1975), Horvat (1971), Milenkovitch (1971) and Vanek and Jovicic (1975) on this point. Of course, our analysis carries through under the alternative assumption as well.

11 To avoid misunderstanding, it is worth spelling out the difference between capital rationing and the assumption of a perfectly inelastic supply of capital. Equation (4) can be expressed as

$$d\ln L^d = \eta_{Lr}\, d\ln r + \eta_{LH}\, d\ln H$$

$$d\ln K^d = \eta_{Kr}\, d\ln r + \eta_{KH}\, d\ln H ,$$

where η_{ij} is the elasticity of i with respect to j. Inelastic capital supply implies that $d\ln K^d = d\ln K^s = 0$ but also that interest rate varies so as to allocate the available capital among users and keep the capital market in equilibrium. In contrast capital rationing implies that both r and K are fixed exogenously to the firm and that disequilibrium prevails.

12 A logarithmic labor demand equation is consistent with a Cobb-Douglas production function, $Q = AL^{\alpha}K^{\beta}$, which together with $R = PQ$ yields

$$\ln L^d = \theta_0 + \theta_1 \ln P + \theta_2 \ln r + \theta_3 \ln H,$$

where $\theta_0 = \left[-\beta/\alpha\right] \ln\beta - \frac{\ln A}{\alpha} - \left[(1-\beta)\right] \ln\frac{(1-\alpha-\beta)}{\alpha}$,

$\theta_1 = 1/\alpha$, $\theta_2 = -\beta/\alpha$, and $\theta_3 = (1-\beta)/\alpha$.

13 Capital school theorists generally impose the assumption $r = 0$ so their estimating equations contain only the capital stock and a constant (see Vanek and Jovicic (1975)). However their approach is perfectly consistent with the interest rate being positive provided that it is less than the marginal product of capital so that the rationing still generates monopoly rentals. Hence a weaker version of the capital school hypothesis would not hinge on the significance of the interest rate coefficient, a_1.

14. Consider the case when $K^s_{it} = \tilde{K}_{it}$ is the capital supply side of equation (14). This implicitly characterises the planner's process of capital rationing in Yugoslavia as partial adjustment to the market outcome. Although capital school analysts offer no formal modelling of the capital rationing process, it is clearly alien to their thinking to regard it as a delayed adjustment towards the market equilibrium. The whole justification for investment planning is to impose central planners' preferences on the development path. Hence we do not impose partial adjustment in the capital market in this description of the capital school hypothesis.

15 A major development in the 1970s was the passing on of profits to the labor force in the form of perks. For example, enterprises began to purchase group holiday homes for their employees via the collective consumption budgets.

16 The same procedure applies to equations (12) and (12'); (15) and (15") and (16) and (16"). Note that the vector X in this exposition excludes the productivity variable which is entered separately as μ and μ'.

17 In this case, the structure of the economic models themselves are nested and the non-nesting is a statistical property of the estimation procedure. We therefore doubt the appropriateness of using non-nested tests for equations (9) and (10), (12) and (12'), (15) and (15") and (16) and (16"), and do not wish to make the arbitrary assumption $\mu = \mu'$. We instead choose to identify explicitly the relationship between μ and μ' using the repeated least squares procedure in these cases. As discussed in the text, when the underlying economic hypotheses are non-nested (equations (15) and (15'), (16) and (16')), non-nested tests along the lines proposed by Davidson and McKinnon (1981) are appropriate.

18 Take the case of the cooperative optimization problem under imperfect competition when the production function is the is the variable returns to scale production function, $qe^{\theta q} = AL^{\alpha}K^{\beta}$ in which returns to scale, λ, vary with output

$$\lambda = \frac{\alpha + \beta}{1 + \theta q} .$$

We assume the firm faces a known demand curve $p = p(q)$, $p_q < 0$, and that $\alpha + \beta > 1$ to ensure the existence of an equilibrium. Therefore the firm maximises

$$y = \frac{pq - rK}{L}$$

subject to $p = p(q)$

and $qe^{\theta q} = AL^{\alpha}K^{\beta}$.

Define $M = \frac{(p+qp_q)}{p}$, and the 1st order conditions are

$$\frac{pM\alpha q}{(1+\theta q} = pq - rK \quad \text{and} \quad \frac{pMBq}{(1+\theta q)} = rK.$$

Denoting equilibrium values by $*$,

$$\lambda^* = \frac{\alpha+\beta}{(1+\theta q)} = \frac{1}{M}* \quad \text{so} \quad q^* = \frac{M(\alpha+\beta)-1}{\theta}$$

Thus equilibrium output is determined where returns to scale equal the ratio of price to marginal revenue, and is inversely related to the scale parameter, θ. Solving for desired capital yields,

$$K^* = p.r^{-1}.(M(\alpha+\beta)-1)\theta^{-1}.\frac{B}{\alpha+\beta}$$

and through the production function,

$$L^* = A^{-1/\alpha}.p^{-\beta/\alpha}.r^{\beta/\alpha}.(M(B+\alpha)-1)\frac{1-B}{\alpha}$$

$$\theta^{B-1/\alpha}.(B/\alpha+\beta)^{-\beta/\alpha}.\ e^{\frac{M(\alpha+\beta-1)}{\alpha}}.$$

Therefore the desired earnings function is

$$y^* = A^{1/\alpha}.p^{\alpha+\beta/\alpha}\ r^{-\beta/\alpha}(M(\beta+\alpha)-1)\cdot\ \frac{\alpha+\beta-1}{\alpha}\ \ e^{\frac{1-\alpha-\beta}{\alpha}}$$

$$(\frac{\alpha}{\alpha+\beta})\ .\ (\frac{\beta}{\alpha+\beta})^{\beta/\alpha}\ .\ e^{\frac{-(M(\alpha+\beta)-1}{\alpha}}\ .$$

Define minimum efficient scale, $\bar{q}$, as the output where returns to scale equals unity,

$$q = \bar{q} \quad \text{when} \quad \lambda = \frac{\alpha+\beta}{(1+\theta q)} = 1 \quad \text{or} \quad \frac{\partial \bar{q}}{\partial \theta} < 0$$

But from the earnings equation $\frac{dy}{\partial \theta} < 0$ so

$$\frac{dy}{\partial \bar{q}} > 0 .$$

19 As Sacks (1972) has shown, there are very few industrial enterprises in Yugoslavia and they are of a similar size. As a result, differences in average size can be taken to represent underlying dispersion in minimum efficient scale.

20 The interest rate was fixed at 8% throughout the period except in 1968 when it was 10%.

21 Income dispersion increased rapidly after 1965, but started to narrow again towards the end of the 1960s. In part, as Estrin (1983) shows, this was the consequence of competitive forces re-asserting themselves after the once and for all shock of the 1965 Reforms. However, the Yugoslav authorities also intervened to correct the situation, primarily using administrative rather than economic methods. Thus, considerable pressure was exerted on enterprise managers to stick to wage norms via the communist party hierarchy, the planning system and the banks. This was later formalized into a contractual system; the "Social Compacts" and "Self-Management Agreements".

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