Quantification of Capital-Labour Relationships — Kvantifikacija odnosa kapital-rad — *Jose-Luis Montero de Burgos* 119

Notes on Economic and Institutional Characteristics of the Self-Management (Ownership) Model — O ekonomskim i institucionalnim karakteristikama društvene svojine samoupravnog tipa (modela) — *Ivan Maksimović* 141

Property Rights and the Labour-Managed Firm in the Long Run — Svojinska prava i samoupravno preduzeće u dugom roku — *Frank Stephen* 149

Self-Management, Efficiency and Neoclassical Economics — Samoupravljanje, efikasnost i neoklasična ekonomika — *Branko Horvat* 167

EMPIRICAL RESEARCH — EMPIRIJSKA ISTRAŽIVANJA

An Explanation of Earnings' Variation in the Yugoslav Self-Managed Economy — Razlike u zaradama u jugoslovenskoj samoupravnoj privredi — *Saul Estrin* 175

Wage and Price Expectations — Case Study of Yugoslavia — Očekivane promene zarada i cena: Primer Jugoslavije — *Emile Primorac, P. A. Della Valle & Mate Babić* 201

Worker Management, Administered Prices, and World Inflation — Radničko upravljanje, kontrolisane cene i svetska inflacija — *George Macesich* 213

The Role of Cost in the Price Policy of Self-Managed Enterprises — Uloga troškova u formiranju cena u samoupravnom preduzeću — *Stjepan Gjurinek* 237

Theoretical and Actual Performance of the Worker-Managed Economy — Teorijsko i stvarno funkcionisanje samoupravne privrede — *Jože Mencinger* 253

Savez republičkih i pokrajinskih samoupravnih interesnih zajednica za naučne delatnosti u SFRJ učestvuje u troškovima izdavanja ovog ačsopisa.

THE WORKER MANAGED FIRM

SAMOUPRAVNO PREDUZEĆE

THEORY — TEORIJA

SHORT RUN DYNAMICS OF THE LABOUR-MANAGED FIRM

Michael A. CONTE*

INTRODUCTION

In 1958, Benjamin Ward proposed a neo-classical model of "market syndicallism", based upon maximizing behaviour. The model was prompted by then-recent reforms in the economic system of Yugoslavia, which made labour-management almost universal for a certain category of decisions in enterprises (referred to here as firms). Ward's central purpose was to provide for the labour-managed firm a positive theory, similar in kind to the neo-classical theory of the profit-maximizing firm (PMF). He wished to compare the results of this new theory with the well-established results for the PMF. To this end, certain simplifying assumptions were made about the nature of labour-management. According to Ward:

> ... the means of production are nationalized and the factories turned over to the general management of elected committees of workers who are free to set price and output policy in their own material self-interest.[1])

Similar assumptions are made in this paper. Rather than refer to a committee of elected workers, however, the term "manager" will be used to signify the person or group that is charged with setting the control variables in the best interests of the workers.

Ward's paper remained the only one on the subject in Western literature for a period of eight years. In 1966, Evsey Domar proposed a model of the labour-managed firm (LMF) with strikingly different results from Ward's. One year later, Branko Horvat proposed yet a different model, with an altogether different set of results.

*) University of New Hampshire, Durham, USA.

[1]) Ward (1958), p. 566.

Since that time, no fundamentally new models of the LMF in the short run have been proposed.[2])

This paper is devoted to a study of short run dynamics in the Illyrian labour-managed firm. The model of the firm is described as "Illyrian" because it is based upon assumptions similar to Ward's.[3])

Section I is a short synopsis of the three central theories of the LMF in the short run. While each of these theories is primarily oriented towards comparative statics, each has an implicit set of adjustment dynamics.

Short run dynamics are of particular concern in the theory of the labour-managed firm because of the absence of a labour market. Not only must firm size change in response to price changes to attain a new equilibrium; wages must change also. Moving from one short-run equilibrium to another involves changes in two variables as opposed to one for the profit-maximizing firm. As a result, it is important to ask whether the adjustment process in the LMF is stable, and whether convergence occurs in such a manner as to ensure the viability of the firm. If the process of convergence is unwieldy, the firm may generate deficits sufficient to put it in jeopardy.

In Section II, it is shown that short run adjustments in the LMF may not be monotonic. They are stable, however, and will not pose serious liquidity problems for most specifications of the production and internal labour supply functions.

I THREE NEO-CLASSICAL ANALYSES OF THE SHORT RUN

Ward's (1958) anlysis is based on the proposition that members in the LMF seek to maximize their incomes. Following is a set of assumptions which more or less characterize those used in his short run model. The list is quite close to those given by Domar in his paper on the subject:

[2]) Although an extensive elaboration of the theory was provided by Jaroslav Vanek, and numerous refinements have been made by others (e. g.; Maurice and Ferguson (1972), Dubravčić (1970), Jan Vanek (1970), Montias (1970).

[3]) Ward's »market syndicalist« firm was situated in »Illyria« because several of his assumptions did not correspond precisely to what was true in Yugoslavia at the time. Among these are several implicit assumptions of great importance. Ward and his successors, for instance, assume that the »hiring« and »firing« of workers in the LMF can take place without difficulty; or, at least, without any greater difficulty than in the PMF. A second implicit assumption is that workers' attitudes and behaviour are unaffected by changes in their status (i. e., being in positions of power). Neither of these assumptions, among others, is particularly realistic in light of recent evidence. The theory that results from making these assumptions is useful for answering certain types of questions, and not others. Comparative static and dynamic results may well be deducible in such a setting. Questions of comparative efficiency, however, are probably not answerable in this setting because psychological and behavioural factors, which are not accounted for, may have significant impact on the production function of the LMF. See Robinson (1967), Melman (1970), and Montias (1970) for detailed discussions of these matters.

(1) the firm produces only one output. All non-labour inputs are bought and the output is sold at given (parametric) prices.
(2) the production function of the LMF, if possessed by a profit-maximizing firm, would have all necessary and sufficient properties for a stable equilibrium under perfect competition.
(3) the LMF pays a fixed rent $R>0$ per year.
(4) the LMF divides all (or a constant fraction) of its income net of all other costs and rent equally among homogeneous labour units.
(5) the objective of members of the LMF is the maximization of their individual incomes.
(6) decisions are made on the basis of certainty and perfect knowledge.
(7) the LMF is actually able to employ the optimum number of labour units maximizing per-member income.
(8) there exists a profit-maximizing firm, the "profit-maximizing twin", with the same production function and prices as the LMF, and with a wage rate initially equal to members' hourly income.

The problem of maximizing the income of each member:

$$y = \frac{pq - \sum_{i=1}^{n} p_i x_i}{1}$$

subject to the production function:

$$f(q, 1, x_1, x_2, \ldots, x_n) = 0, \tag{1.2}$$

where 1 = number of members in the firm,[4])
y = per-member income,
x_i = amount of input i,
p_i = price of input i,
p = price of the output, and
q = amount of the output.

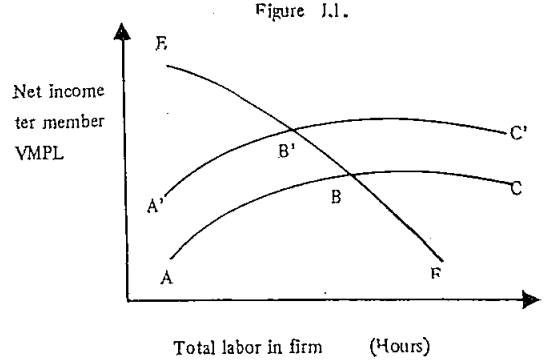
In the simplest case, presented here, there is a fixed coefficients technology in variable inputs $1, x_1, x_2, \ldots, x_{j-1}$, enabling one to write:

$$f(q, 1, x_j, x_{j+1}, \ldots, x_n) = 0\,. \tag{1.2a}$$

The short run situation is as depicted in Figure I. 1.
EBF represents the value of the marginal product of labour (vmpl), and ABC the income of each member. Per-member income is maxi-

[4]) The maximum per-member income hypothesis implicitely assumes that hours worked per member are fixed. Hence, 1 is a proxy for total hours worked in the firm. This follows from Ward's assumption that workers in the firm have identical preferences. Each member will thus choose to work the same number of hours as his or her colleagues.

Figure I.1.



mized at the intersection of these two schedules. Hence, if the wage in the profit-maximizing twin equals the per-member income in the LMF, both will employ the same number of workers and produce the same output. With a rise in the price of the product, however, the LMF's per-member income schedule shifts upward to A' B' C', with a concomitant contraction in both employment and output. A rise in the rental on the fixed input induces the opposite reaction. In short, whenever the vmpl is less (greater) than labour's average value product (vapl), the firm will contract (expand). Branko Horvat has verified this as a general operating principle for labour-managed firms in Yugoslavia.

Horvat's analysis

Branko Horvat (1967) has proposed what may be regarded as a "behavioural" model of the LMF. According to Horvat's observations of business practice in Yugoslav self-managed enterprises, managers treat members' incomes as "book-keeping costs." As the relations of production in Yugoslav enterprises are socialist not communist, workers are compensated "according to their work." Some component of their incomes is in the form of a wage payment. The practice in Yugoslav enterprises is to announce a wage at the beginning of a period of time (perhaps six months or a year), and pay at that rate for that period of time. The manager, therefore, is under some pressure to meet a certain wage bill, and actually treats the wage bill as a cost of production.

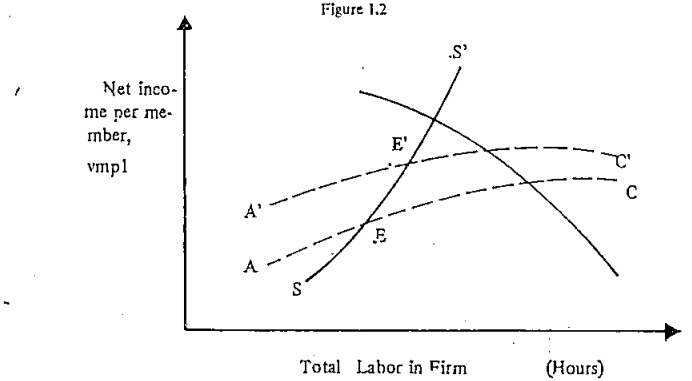
Once wage rates are set, according to Horvat's scenario, the manager then seeks to cover the book-keeping costs by maximizing profit. This is accomplished by changing firm size according to the profit-maximizing rule: hire when the marginal value product of labour is greater than the current wage, and fire when the marginal value product is less than the wage. This is different from the rule implicit in Ward's analysis, except of course, when the wage happens to coincide wth the average value product of labour.

Domar's analysis

Evsey Domar's most important contribution to the literature on the LMF consisted in removing the hours constraint on members of the LMF through the introduction of what he called a supply of labour curve for members (the curve he refers to is actually a price-consumption curve for labour, but his terminology will be adopted here for the sake of consistency). According to Domar, "the introduction of this innocent-looking supply curve of labour produces a drastic difference in the reactions of the co-op to changes in prices and in rent as compared with the (Ward) model".[5])

Domar's supply curve for labour can be interpreted as a feasibility condition for the firm: the implicit wage offer in the LMF must be such as to elicit a labour supply consistent with the wage offer. According to Domar's diagram (Figure I. 2), therefore, a feasible equilibrium for the LMF will be at a point such as E. At point E, the labour supply curve, SS', crosses the per-member income curve (AEC). An income-hours offer represented by point e (on the labour supply curve) will be accepted, and will yield income sufficient to meet the offer.

Figure I.2



On the basis of this model, Domar argues that the short-run supply curve for the LMF will always have the same slope as the labour supply curve of members (if membership is held constant). For instance, if the price of the output rises, a new per-member income curve (A' E' C') is generated above the old one. The intersection of this curve with the (old) labour supply schedule is forward sloping; to the left if the labour supply schedule is backward bending.

Domar's analysis involves an implicit adjustment mechanism for wages in the LMF: raise wages when the average value product of labour is greater than the current wage, and lower them when the vapl is lower.

[5]) Domar (1966), p. 742.

A MODEL OF WAGE AND SIZE ADJUSTMENTS IN THE LMF

As suggested above, two adjustment processes proceed simultaneously as the LMF moves from one equilibrium to another. In this section, each of these processes is shown to be stable, when taken separately, and wage convergence is shown to take place in a manner that permits the firm to meet its financial obligations. For purposes of distinguishing these two concerns, let us use the terms "stable" and "dynamically feasible". A feasible wage or firm size will be called "stable" if the current wage or firm size tends to adjust in its direction. The wage adjustment process is called "dynamically feasible" if the firm's indebtedness throughout the process does not rise, above some ceiling, which is taken, in the short run, to be exogenous. Let us first look at the dynamic process which achieves wage feasibility.

Stability of Feasible Wage Equilibria

Domar's wage adjustment rule will be adopted here, and can be interpreted as follows: if the firm experiences a surplus of net income over wage payments in any period, the wage is adjusted upward. If, on the other hand, a deficit is experienced, the wage is lowered in the following period.[6]) As a simple approximation, let us assume that the wage is raised (lowered) enough so that, if it had been paid in period t, the total wage bill would have equalled net revenues. Let us refer to this as decision rule (D1). Formally then, we can write:

$$W_t = \frac{f(L_{t-1})}{L_{t-1}} \qquad \text{(D1)}$$

W_t, therefore, equals the average value added in period t—1. According to decision rule (D1), a surplus in any period will signal a wage raise while a deficit will signal a cut.

Our stability condition can be formalized a follows:

Condition (i) $|w_t - \underline{w}| < |w_{t-1} - \underline{w}|$.

where $\underline{w}$ equals the feasible age for the current firm size and capital endowment. Condition (i) is equivalent to the Lyapunov condition for dynamic stability of the solution to a system of equations. The Lyapunov condition may be stated as follows:

[6]) According to Horvat's scenario, the wage in period t (W_t) equals the wage in the previous period (W_{t-1}) plus an add-on (δ w). Horvat does not specify how the magnitude of δ w is determined in his model, but it will presumably depend on the performance of the firm in period t—1. This is compatible with the Domar rule.

Lyapunov's Fundamental Theorem for Stability

Let z' denote an equilibrium solution of the equations H (z), where H (z') = 0. The equilibrium z' is globally stable if there exists a distance function D (z — z') such that

$$\frac{dD\,(z-z')}{dT} < 0 \text{ for any } z \neq z'$$

or there exists a distance function D'(H(z)) such that

$$\frac{dD'\,(F\,(z))}{dt} < 0 \text{ for any } z = z'$$

Only one assumption, in addition to those made above, need be invoked to guarantee satisfaction of the Lyapunov condition, and that is that the inverse labour supply schedule, w(L), be everywhere "steeper" than the net hourly earnings schedule,

$$\frac{dw}{dL} > \frac{d\left\{\dfrac{f(L)}{L}\right\}}{dL} \qquad (2.1)$$ [7])

Under this assumption, the wage adjustment process described above always satisfies the Lyapunov condition, and, so, we can say that all feasible wage equilibria are stable.

For convenience, let us define a surplus (deficit) function, representing the surplus (deficit) on current account, as follows:

$$S_t = f(L_t) - W_t L_t \qquad (2.2)$$

To generate the system of equations H, we will use the net income function given in equation (2. 1), appropriately subscripted;

$$f_t = f(L_t)\,. \qquad (2.3)$$

as well as the labour supply relation;

$$L_t = L(w_t)\,. \qquad (2.4)$$

and payment relation;

$$Y_t = L_t w_t\,. \qquad (2.5)$$

The system is closed by adding the constraint:

[7]) This steepness condition performs the same function in this model as the relative steepness condition proposed by Walras in his model for equilibration in a partial equilibrium supply and demand system. In the Walrasian system, the demand curve must »rise faster« or »fall slower« than the supply curve, or else the supply-demand equilibrium is an unstable one. The steepness condition in this model governs the sign of the B term in equation (2. 17) below.

$$pf_t = Y_t . \tag{2.6}$$

This system can be reduced to

$$pf(L(w_t)) = Y(w_t) . \tag{2.7}$$

The solution to this system is unique, and is given by

$$\underline{w}_t = \frac{pf(L_t)}{L_t} \tag{2.8}$$

We can now define a distance function, D (w_t) as follows:

$$D = (w_t - \underline{w}_t)^2 . \tag{2.9}$$

By inspection, D is a distance-like function, taking on larger positive values for values of $\underline{w}_t$ farther in either direction from w_t. If the average net labour product ($\tilde{f}(L)/L$) is symbolized by f (L), the time derivative of D can be written:

$$\frac{dD}{dt} = \{2\,(w_t - \underline{pf}_t)\} * \{\frac{dw}{dL} \mid w = w_t - \frac{d\underline{pf}}{dL} \mid L = L_t\} *$$

$$* \{\frac{dL}{dt} \mid L = L_t\} \tag{2.10}$$

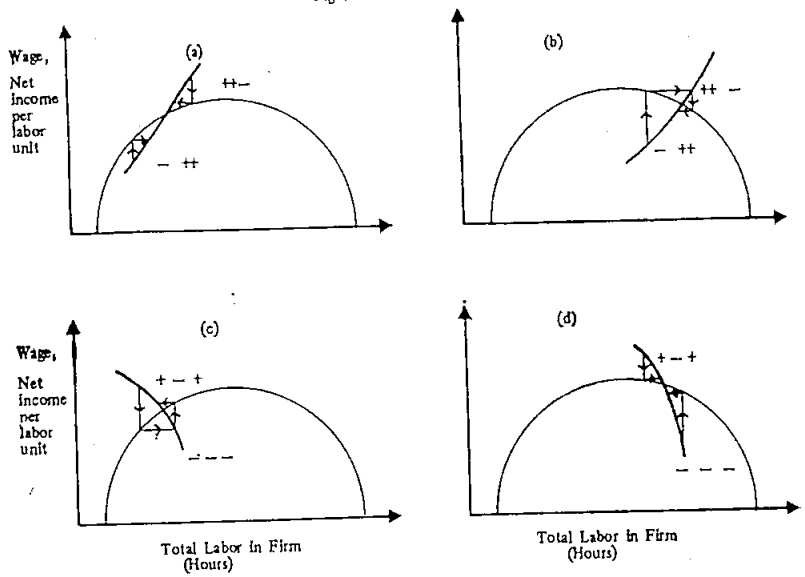
$$= 2\,(A)\,(B)\,(C) .$$

There are four possible diagrams, Figures II. 2a, II. 2b, II. 2c, and II. 2d. Each diagram represents a juxtaposition of a possible individual labour supply curve with a possible net revenue per member curve. The signs of the terms, A, B and C are given in connection with each case, two cases per diagram depending on whether A (which equals S_t, the difference between the wage and average labour product in period t) is positive or negative. The B term in equation (2. 16) represents the difference between the slope of the individual labour supply curve and the slope of the average value added product curve in period t, and is governed by the relative steepness assumption introduced above (equation 2. 7). The C term represents the rate of change of the individual labour supply. The sign of the C term, therefore, depends upon the shape of the individual labour supply curve (whether it is forward rising or backward bending) and the direction of change of w in period t. The latter, of course, is governed by the sign of S_{t-1}.

In all, there are four combinations of values of A, B, and C; and all are possible. The signs in each case yield a negative result. The fundamental condition for stability is therefore satisfied. The wage

in each period is closer to the feasible wage (for the current firm size) than the wage in the previous period. As a result, we can say that all feasible short-run equilibrium wages in the LMF are stable.

Figure II.1



Dynamic Feasibility of the Wage Adjustment Process

It remains to be shown that the wage convergence process is dynamically feasible. If convergence to a feasible equilibrium involves a lengthy sequence of deficits, the firm may be unable to raise the required amount of financial capital.

Suppose that the LMF has a total short term debt ceiling equal to D. Dynamic feasibility over T periods therefore, requires that

$$\sum_{t=1}^{\tau} S_t = \sum_{t=1}^{\tau} (F(L_t) - W_t L_t) > -D \tag{2.11}$$

for all τ in (1,2, . . . T) .

If convergence to a feasible equilibrium is rapid, then there is no problem. If, on the other hand, convergence is slow, deficits will have to be counterbalanced by surpluses on a regular basis. In the case where convergence is slow, therefore, the following conditions, taken together are sufficient to ensure dynamic feasibility:

(ia) $|s_t| < |s_{t-1}|$ for all t in $(1,2,\ldots,T)$.

(ii) $|s_t| > -D$,

(iii) either s_t alternates in sign for all t in $(1,2,\ldots,T)$, or s_t is positive for some successive values and alternates in sign for the remaining values.

It can be shown that, for the relevant range of production, the steepness condition given in equation (2.1) above guarantees the equivalence of conditions (i) and (ia).[8] (ia) may, therefore, be considered to be fulfilled. Let us assume that condition (iii) is fulfilled as well.[9] For each of the situations depicted in Figure II. 3, there are specifications of the labour supply and/or production schedules for which condition (iii) will not be fulfilled. In three of these cases however, these specifications are extreme. A proof that condition (iii) holds in most cases is presented in the Appendix. In those cases where condition (iii) is violated, discretionary behaviour on the part of the manager, or a temporary lapse of labour-managing rights, will restore the firm to a feasible path.

Consider the situation in Figure II. 3a. A backward bending aggregate labour supply schedule (SS') crosses the production function in the region of increasing average labour product. The wage in period t—1, equal to the slope of OD exceeds the average labour product in period t—1. The wage is therefore lowered to OF period t. This generates a new, higher, labour supply and a net surplus in period t (in the amount E'B').

Figure II. 3b represents the result of a deficit in period t—1. These two cases, taken together, indicate that s_t will alternate between + and — throughout the sequence, if SS' is backward bending.

Figures II. 3c and II. 3d represent the reactions to surpluses and deficits in period t—when the aggregate labour supply curve is forward sloping. As demonstrated, surpluses remain surpluses, and deficits remain deficits. The latter case — depicted in II. 3c — is a clear violation of dynamic feasibility condition (iii). As noted above, however, should a wage ever be announced which brought forth a surplus, surpluses would be observed in all succeeding periods. Discretionary behaviour (in violation of the »rules«) on the part of the manager, or the imposition of an »artificially« low wage by a financial agent in a single period will accomplish this.

[8]) Because the individual production possibilities curve and the individual labour supply curve are assumed to be invertible over the relevant domain, if the individual supply of labour schedule is always more steeply sloped, there is a one-to-one correspondence between the difference of the current wage from the feasible wage and the value of the current period surplus or deficit.

[9]) Even a potentially profitable firm may not fulfill condition (iii) in its first period of operations, as the manager may not have correctly estimated the production and aggregate labour supply functions. Also, violent dislocations in the industry may lead to non-fulfillment of condition (iii). If the firm does not receive emergency assistance, it will be forced out of business. It is assumed that labour's decision-making rights may be curtailed by any emergency lender until such time as the accrued deficit is less than D. Thus, assuming fulfillment of condition (ii) involves no loss of generality.

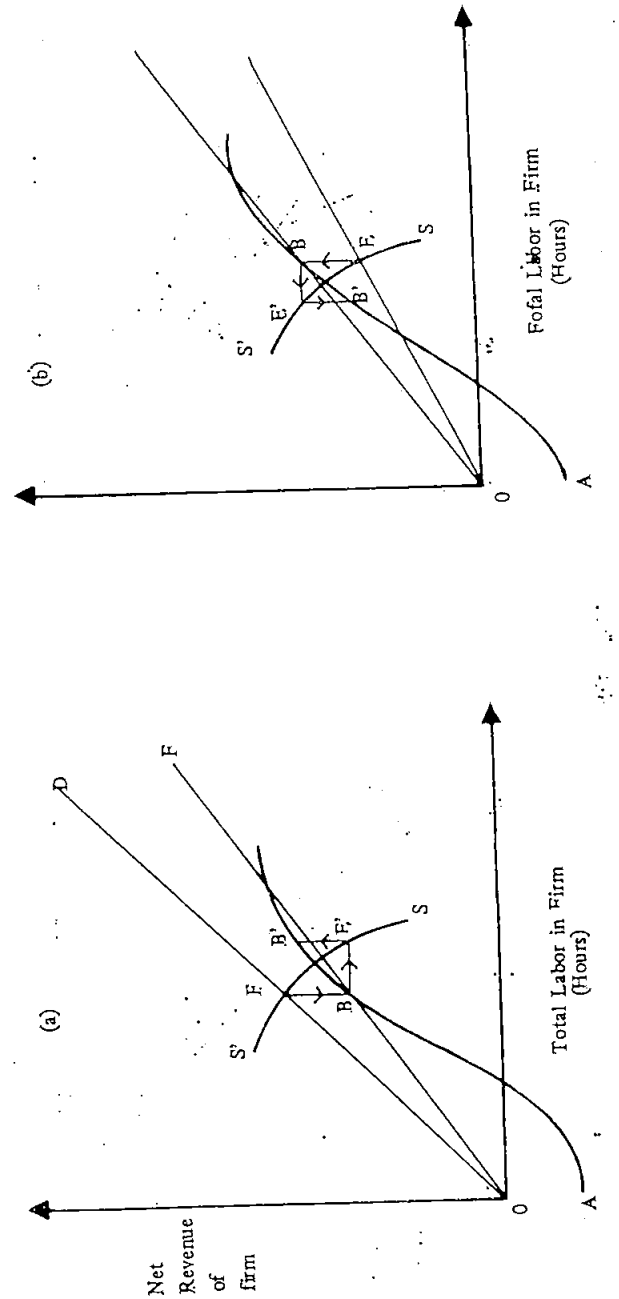


Figure II.2.

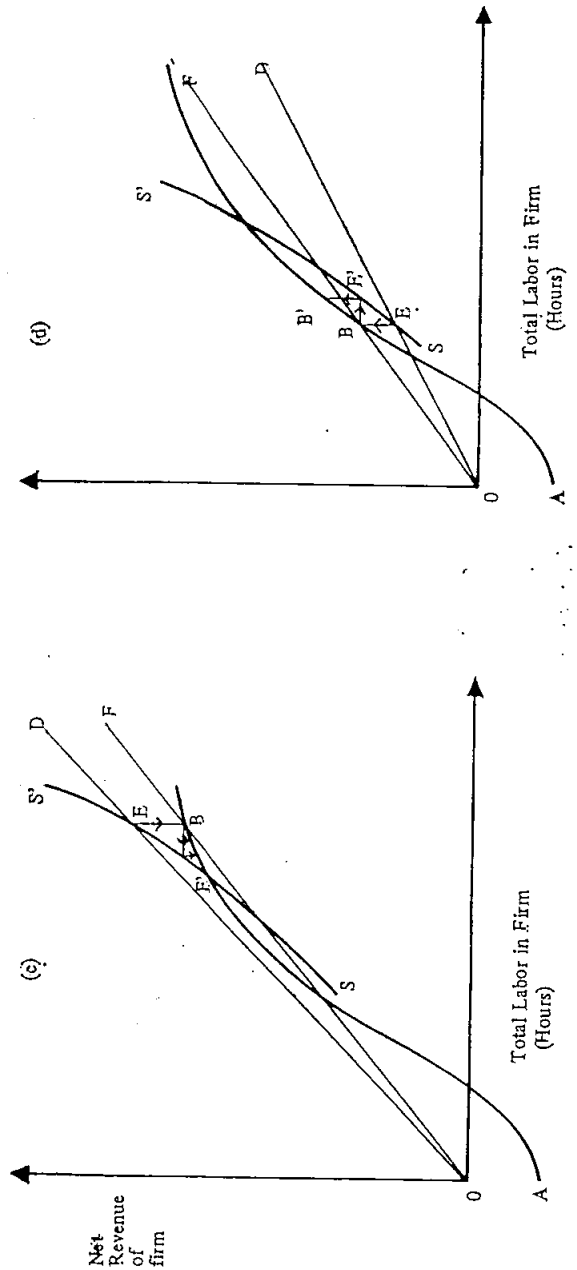


Figure II.2.

Short Run Size Adjustments

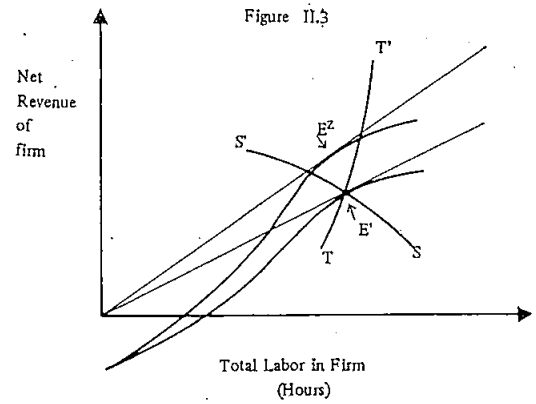
The wage adjustment process in the LMF, even if convergent, can insure only feasibility of the production plan in the short run, and not optimality. Optimality is achieved through a combination of wage and size adjustments. When should size adjustments be made, and in what direction? Will some reasonable decision rule, which answers these two questions, cause convergence to an optimal firm size?

Horvat's firm size adjustment rule will be adopted here. This rule may be formalized as follows:

(D2) Admit members when the value of labour's marginal product is greater than the current wage, and allow the firm to shrink in size if the value of the marginal product is less than the current wage.

Note first that this is precisely the same adjustment rule for firm size as in the profit-maximizing firm, and, so, has well known stability properties. Interesting questions arise, however, when firm size and age adjustments are interspersed. While each process is stable when permitted to converge *ceteris paribus*, what would happen if firm size were changed before wages equilibrated, or *vice-versa?*

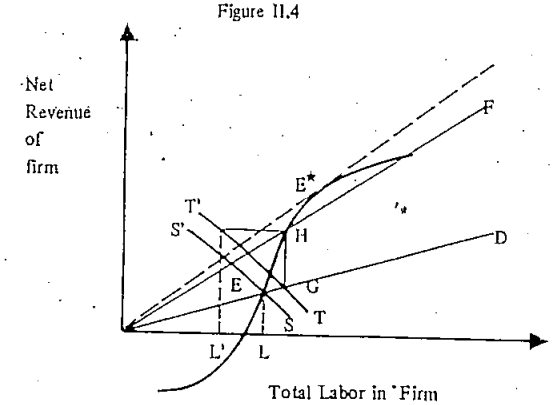
Figure II.3



Size and Wage Adjustments Considered Simultaneously

It has been shown elsewhere (see Conte (1979)) that the optimal equilibrium for the LMF will always be at a point such as E^1 in Figure II. 4. AE^1B^1 represents the net revenues of the firm as a function of total labour inputs before a price increase, while AE^2B^2 represents the net revenue function after the price increase. SS' and TT' represent possible labour supply functions, in the sense that Domar used the term, and E^2 is the new optimal equilibrium after the price change.

Figure II.4



Suppose the firm is at E^1, and there is a price increase, shifting the net revenue function up to AE^2B^2. If size adjustment comes before wage adjustment, application of rule (D2) will always cause the firm to expand in size, thus increasing output. If wage adjustment occurs first, however, and the relevant labour supply curve is SS', the total labour committment in the firm will shrink initially, and output will decrease. The initial reaction of the firm to price changes, therefore, depends upon which dynamic adjustment mechanism is employed first. This is an empirical question, and so theory cannot say what the short-run supply curve of the labour-managed firm will actually look like. If either wages of firm size change relatively slowly, the short run response of the LMF to price changes will be dominated by the dynamic response of the other.

If wage and firm size changes happen with approximately equal frequency, then short run adjustment process might be unstable. Consider the situation in Figure II. 5:

Assume that the current wage in the LMF is feasible, but not optimal, and is represented by the slope of OD. Note that the optimal equilibrium is at E*. At point E, there is neither a surplus or deficit on current account, and so there is no impetus to change the wage level in the firm. Decision rule (D2), however, indicates that firm size should be increased. This increase in membership shifts the aggregate labour supply schedule, SS', rightward to TT'. Notice now that a surplus is generated in the amount GH. Invocation of decision rule (D1) now would raise the wage level in the firm. The new wage is represented by the slope of OF. Because the labour supply schedule is backward bending, however, the new labour supply is equal to L', which is less than the initial labour supply L, even though there are now more members in the firm. This is an example of the destabilizing effect of mixing wage and firm size adjustments in response to price changes in the short run. The instability illustrated here is due, of course, to the rather extreme specification of the labour supply schedule in Figure II. 5.

CONCLUSIONS

In this analysis, there have been three central points. First, the dynamic processes that occur in the LMF are generally stable. These equilibria are achievable under a reasonable set of assumptions about decision making by a representative, or representatives, who act in the interests of the collective. Finally, a set of decision rules which seems to correspond to actual practice in Yugoslav labour-managed enterprises will typically serve to avoid liquidity problems as the firm adjusts from a previous to a new equilibrium.

APPENDIX

This appendix presents the conditions under which dynamic feasibility Condition (iii) will, and will not, be fulfilled. Recall Condition (iii). which states that, either, s_t alternates in sign, or it remains positive.

Also recall that

$$s_t = f(L_t) - w_t L_t \tag{2.2}$$

and

$$W_t = f(L_{t-1}) \cdot L_t \tag{D1}$$

Hence

$$w_t L_t = f(L_{t-1}) * \frac{L_t}{L_{t-1}} \tag{A.1}$$

A Taylor expansion can be used to express $F(L_t)$ as follows:

$$f(L_t) \cong (L_{t-1}) + f'(L_{t-1})(\delta L) + (1/2) f''(L^*)(\delta L)^2 \tag{A.2}$$

$$for\ L_t > L^* > L_{t-1}$$

$$for\ L_t < L^* < L_{t-1}$$

Combining (2.2), (A.1) , and (A.2) , we obtain

$$f(L_t) - w_t L_t = f'(L_{t-1}) - f(L_{t-1}) / L_{t-1} + (1/2) f''(L^*)(\delta L)^2. \tag{A.3}$$

Note that the bracketed expression equals $MNRP_{t-1} - ANRP_{t-1}$. If this expression, symbolized henceforth by { }, is positive, observe that (A.3) will always be negative when δL is negative. If { } is negative, however. (A.3) will be negative whenever δL is negative. We have so far accounted for four cases. (δL negative, { } positive, and δL positive, { } negative; each of these occuring two ways). In the remaining cases, the relation-

ship between the sign of (δL) and the sign of (S_t) depends upon the specifications of the production and labour supply schedules. Let us examine the situation when is { } positive and δL is positive. Then we wish to show that (A.3) is positive. This will be so when

$$(-1/2)f''(L^*)(\delta) < f'(L_{t-1}) - \frac{f(L_{t-1})}{L_{t-1}} \qquad (A.4)$$

If $F'(L_t) \approx F'(L_{t-1})$, we can rewrite (A.4) as

$$(-1/2)\int_{L_{t-1}}^{L_t} f''(L)dL < f'(L_{t-1}) - \frac{f(L_{t-1})}{L_{t-1}} \qquad (A.5)$$

or

$$(1/2)\{f'(L_{t-1}) - f'(L_t)\} < f'(L_{t-1}) - \frac{f(_{t-1})}{L_{t-1}} \qquad (A.6)$$

By inspection (A.II.6) will hold if $f'(L_t) \approx f(L_{t-1})/L_{t-1}$, and the approximation need not be particularly close. Application of decision rule (D2) will insure fulfillment if labour supply is inelastic. A similar argument holds when { } is negative.

We may conclude as follows: in half the cases, the conclusions given in the text will always follow. In the remaining cases, if either f''(L*) (for some L_t between L_t and L_{t-1}) is particularly large (so that the integral approximation made above does not hold) or if the aggregate labour supply schedule is particularly flat, then the decision rules (D1) and (D2), alone, are not sufficient to insure dynamic feasibility. Some emergency procedure, as explained in the text, will have to be invoked to guarantee the solvency of the firm. As convergence to a final short run equilibrium proceeds, however, the likelihood of having to resort to such emergency procedures becomes small.

REFERENCES

Adizes, I. *Industrial Democracy: Yugoslav Style — The Effect of Decentralization on Organizational Behaviour.* New York: The Free Press, 1971.

Atkinson, A. B. "Worker Management and the Modern Industrial Enterprise." *Quarterly Journal of Economics* 87 (August, 1973): 375—392.

Bergson, A. "Market Socialism Revisited." *Journal of Political Economy* 75 (October, 1967): 655—673.

Berman, K. V. "Comparative Productivity in Worker-Managed Cooperative Plywood Plants and Conventionally Run Plants." mimeo 1976.

———, *Worker-Owned Plywood Companies; An Economic Analysis.* Pullman, Washington: Washington State University Press, 1967.

Blumberg, Paul. *Industrial Democracy.* New York: Schocken Books, 1969.

Conte, M. A. *The Theory of the Labour-Managed Firm,* unpublished doctoral dissertation University of Michigan, 1979.

Domar, E. D. "The Soviet Collective Farm as a Producer Cooperative." *American Economic Review* 56 (March, 1976): 734—757.

Dubravčić, D. "Labour as an Enterpreneurial Input: An Essay in the Theory of the Producer Co-operative Economy." *Economica* 37 (August, 1970): 297—310.

Dunlop, J. T. *Wage Determination under Trade Unions.* New York: The Macmillan Co., 1944.

Furubotn, E. G. "The Long-Run Analysis of the Labour-Managed Firm: An Alternative Interpretation." *American Economic Review* 66 (March, 1976): 104—123.

Horvat, Branko. "Prilog Zasnivanu Teorije Jugoslovenskog Poduzeća." *Ekonomska Analiza* 1 (1967): 7—28.

Liebenstein, H. "Allocative Efficiency vs. 'X-Efficiency'." *American Economic Review* 56 (June, 1966): 392—413.

Likert, Rensis. *New Patterns of Management.* New York: McGraw Hill, 1961.

Mahony, D. D. *Four Models of the Enterprise in Yugoslavia.* Unpublished doctoral dissertation, Cornell University, 1971.

Marschak, T. A. "Centralized vs. Decentralized Resource Allocation: The Yugoslav 'Laboratory'." *Quarterly Journal of Economics* 82 (November, 1968): 561—587.

Maurice, S. C., and Ferguson, C. E. "Factor Usage by a Labour-Managed Firm in a Socialist Economy." *Economica 39 (February, 1972): 18—32.*

Melman, S. "Industrial Efficiency Under Managerial vs. Cooperative Decision-Making: A Comparative Study of Manufacturing Enterprises in Israel." *Review of Radical Political Economics* 2 (Spring, 1970): 9—34.

Milenković, D. D. *Plan and Market in Yugoslav Economic Thought.* New Haven: Yale University Press, 1971.

Monsen, R. J., Chiu, J. S., and Cooley, D. E. "The Effect of Ownership and Control on the Performance of the Large Firm." *Quarterly Journal of Economics* 82 (August, 1968): 435—451.

Montias, J. M. "Market and Price Mechanism: Discussion." *American Economic Review* 60 (May, 1970): 321—323.

Robinson, J. "The Soviet Collective Farm as a Producer Cooperative: Comment." *American Economic Review* 57 (March, 1967): 222—223.

Sen, A. K. "Labour Allocation in a Cooperative Enterprise." *Review of Economic Studies* 33 (October, 1966): 361—371.

[illegible]

———, "Peasants and Dualism With or Without Surplus Labour." *Journal of Political Economy* 74 (October, 1966): 424—449.

Solow, R. A. "Technical Change and the Aggregate Production Function." *Review of Economics and Statistics* 39 (August, 1957): 312—320.

[illegible]

Vanek, Jan, *The Economics of Workers' Management: A Yugoslav Case Study.* London: George Allen and Unwin, Ltd., 1972.

Vanek, Jaroslav. *The General Theory of Labour-Managed Market Economies.* Ithaca, 1971.

Ward, B. "The Firm in Illyria: Market Syndicalism:" *American Economic Review* 47 (September, 1958): 566—589.

————, *The Socialist Economy: A Study of Organizational Alternatives.* Berkeley, 1967.

Zukin, Sharon. *Beyond Marx and Tito: Theory and Practice in Yugoslav Socialism.* Clinton, Mass: The Colonial Press, 1975.

KRATKOROCNA DINAMIKA SAMOUPRAVNOG PREDUZEĆA

Michael A. CONTE

Rezime

Glavna svrha ovog članka jeste da se identifikuje i analizira dinamika prilagođavanja samoupravnog preduzeća u kratkom roku. Svaka od nekoliko ranijih analiza (Wardova (1958), Domarova (1966) i Horvatova (1967) predlaže jedinstveni model samoupravnog preduzeća sa sopstvenom implicitnom dinamikom. Razlike u tim modelima potiču od razlika u autorovim pretpostavkama o varijablama izbora koje su dostupne donosiocima odluka u preduzeću.

Komparativna statička analiza, kada se primeni na samoupravno preduzeće, pretpostavlja da donosioci odluka znaju listu ponude rada članova kolektiva. U odsustvu tog znanja mora se primeniti neko jednostavno pravilo da bi se regulisale plate, koje potom determinišu radne obaveze članova. Ovo se pravilo nalazi pored pravila o veličini preduzeća. S obzirom da ova dva pravila mogu imati različite inicijalne efekte na proizvodnju preduzeća, inicijalna proizvodna reakcija preduzeća zavisi od toga koje je od ova dva pravila prvo primenjeno. Sledi da zaključke o kratkoročnom ponašanju samoupravnog preduzeća nije moguće donositi samo na osnovu komparativne statike.

Ova analiza predlaže dva posebna pravila odlučivanja koja, čini se, nalikuju stvarnoj praksi u samoupravnim preduzećima. Pravilo odlučivanja D_1 kazuje da će plate u bilo kom periodu biti jednake prosečnom (neto) vrednosnom proizvodu rada iz prethodnog perioda. Tako će, kad god preduzeće ostvari višak, povisiti plate u sledećem periodu; ako je, pak, ostvaren deficit, plate će biti snižene. Drugo pravilo odlučivanja D_2, koje se odnosi na broj članova preduzeća, kazuje da će se novi članovi primati kad god je marginalni vrednosni proizvod rada veći od tekuće plate, a da će nekim od postojećih članova biti dopušteno da odu bez zamene kad god je marginalni vrednosni proizvod rada manji od tekuće plate. Pokazano je da su kratkoročne ravnoteže dinamički stabilne pod tim pretpostavkama — iako prilagođenja ne moraju biti monotona — ukoliko se krive proizvodnje i ponude rada više ili manje dobro ponašaju. Kratkoročne reakcije na promene cena mogu se izvesti na osnovu alternativnih pretpostavki o tome koje je od tih pravila odlučivanja prvo primenjeno u reagovanju na promene cena. Ako je prvo primenjeno pravilo D_1, model daje Domarove zaključke; ako je, pak, pravilo D_2 prvo primenjeno, slede Horvatovi zaključci.

Dinamički model, koji pokazuje da su kratkoročni optimumi stabilne ravnoteže, takođe postavlja pitanje u pogledu izvedivosti samog procesa prilagođavanja. Prema pravilu odlučivanja D_1, plate će biti jednake prosečnom vrednosnom proizvodu rada iz prethodnog perioda. Ako je ponuda rada u tekućem periodu manja ili veća nego u prethodnom periodu, prosečni vrednosni proizvod rada biće, respektivno, veći ili manji. Tako će, ako je pravilo odlučivanja D_1 konzistentno primenjeno, najverovatnije postojati niz viškova i (ili) deficita pre nego što se dostigne ma koja nova kratkoročna ravnoteža. U tim je okolnostima razumno postaviti pitanje da li proces dinamičkog prilagođavanja u samoupravnom preduzeću može prouzrokovati seriju deficita koja će preduzeće dovesti pod stečaj pre nego što je ravnotežu moguće dostići.

Dva su osnovna zaključka ove analize. Prvo, iako kratkoročni proces prilagođavanja ne mora da bude monoton u odnosu na veličinu preduzeća, plate ili proizvodnja kratkoročne ravnoteže su njčešće stabilne, i one predstavljaju optimume sa stanovišta članova preduzeća. Drugo ,neravnotežni viškovi i deficiti težiće da se međusobno potru; tako će samoupravno preduzeće moći da podnese uobičajena kratkoročna finansijska ograničenja.