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Simulating Codetermination in a Cooperative Economy

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European University Institute, Florence

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Simulating Codetermination in a Cooperative Economy

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Abstract

The received theory of wage-maximising labour-managed or cooperative firms (LMFs) cites three fundamental deficiences caused by their short-run behaviour: the failure of the labour market to clear; the inefficient utilisation of employed labour; a high unemployment-inflation trade off due to firms' nonpositive employment response to price changes. The paper proposes an automatic transfer mechanism, coupled with the auctioneer organisation of the labour market, that transforms the LMF's equilibrium into a convex combination of equilibria of the uncontrolled cooperative and of the conventional profit-maximising firm, with their weights being freely determined by appropriate specification of a transfer function. The scheme is thus able to significantly improve allocative efficiency, ensuring altogether labour market clearance and the strictly positive employment reaction by wage-maximising cooperatives.

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1. Introduction

The traditional Illyrian theory of labour-management (Ward, 1958; Domar, 1966; 1970; Vanek, 1970; Meade, 1972) identifies the labour-managed or cooperative firm (LMF) with an enterprise run by its workers who equally share in firm's income and collectively set firm's policies so as to maximise income per unit of employed labour, which may also be labelled full wage or dividend.

It is well understood that such a maximisation strategy will have negative implications for the functioning of a labour-managed economy, which appears to markedly differ from that of a system composed of entrepreneurial profit-maximising firms. Three problems, linked to a firm's short-run behaviour are usually considered to deserve most attention: the non-zero excess demand equilibrium in the labour market (Ward, 1958; Vanek, 1970); the suboptimal allocation of employed social labour (Domar, 1966; Bergson, 1967), and the firms' zero (Steinherr and Thisse, 1979) if not negative (Ward, 1958; Domar, 1966; Bonin and Fukuda, 1986) employment reaction to price changes, with unfavourable impact on the economy's unemployment-inflation trade off (Bonin, 1981) and, due to the consequential sluggish or even negative output response, on the LMFs' chances to survive in competition against flexibly adapting profit-maximising firms (Montias, 1986)[1].

Due to the basic character of issues involved, the short-run behaviour of a cooperative provided the focus for much of the subsequent analysis of labour-management and several recipes how to correct the detected anomalies emerged.

One group consists of proposals that, in one way or another, modify the initially defined principles of worker-management (Meade, 1972; Ireland and Law, 1978; Bonin, 1981; Sertel, 1982; Miyazaki and Neary, 1983). Another class comprises corrective schemes that fully retain the original institutional design of the labour-managed enterprise (Thomson, 1982; Guesnerie and Laffont, 1984).

It is the aim of this paper to propose an incentive mechanism that would combine two desirable properties of some of the existing solutions: the principle of automatic control of a firm's behaviour, inherent to the Ireland-Law model, and the institutionally non-distortive character of the Thomson and the Guesnerie-Laffont proposals.

The outline of the paper is as follows. The presentation of the mechanism appears in part 2. Its impact on the allocation of labour and risk is analysed in part 3. In parts 4 and 5 a firm's comparative statics is studied and some implications for the functioning of cooperative markets are outlined. A discussion of the model is left for part 6.

2. The Transfer Mechanism

The firm uses a fixed non-depreciating capital stock of value K and a homogeneous labour L to produce output X *via* production function $X = X(L)$, characterised with U-shaped average variable costs schedule. It sells competitively at a price p and pays parametric rental rK, where r is the current rate of interest. The firm's income is $Y = (pX - rK)$, with $y = Y/L$ being the income per worker. It is the maximisation of y that is responsible for the listed deficiencies of worker-management.

Suppose now that, in responding to the anomalies observed, the state establishes an allocation fund. The Fund defines the calculated wage or the tax exemption w, setting at the same time its minimum value w_0. The (calculated) profits emerging from this procedure amount to $\Pi = (Y - wL)$, with $\pi = (y - w)$ being the profit per worker.

The Fund then levies an allocation tax on profitable firms, subsidising at the same time those that are making losses, where the transfer rate t depends on a firm's rate of profits, $\rho = \Pi/K$. The complete schedule of transfer rates is defined by the following continiously twice differentiable function in ρ:

$$t = t(\rho) \ ; \qquad t \in (0,\ 1) \ ; \qquad \rho \in [\rho_s,\ \rho_m)\backslash\{0\} \tag{1}$$

$$\frac{dt}{d\rho} \in (-\infty,\ +\infty) \ ; \qquad \frac{\rho}{1 - t}\frac{d(1 - t)}{d\rho} = e \geq 0 \tag{2}$$

In (1) ρ_s is the profit rate that corresponds to the shut down locus P_s, specified by the Fund and displayed in (4) below. For any given employment level the locus defines the lowest price at which a firm may still operate, i.e., at which its equilibrium rule of (8) still applies. Also in (1), ρ_m is the highest profit rate attainable by any *profit*-maximising firm in a specified time period. In (2) e represents a parameter of the t function, identified with the elasticity of transfer complement with respect to a firm's rate of profit, and hereafter referred to as the allocation parameter.

The implementation of the above mechanism makes the (after transfer) dividend the following continiously twice differentiable function in L:

$$z = w + \pi(1 - t) \; ; \qquad L \in [L_s, L_m)\setminus\{L_\rho, L_o\} \tag{3}$$

$$L_s = \arg\min_L p_s \; ; \qquad p_s = \frac{wL}{X} \tag{4}$$

$$L_m = \arg\min_L p_m \; ; \qquad p_m = \frac{wL + (r + \rho_m)K}{X} \tag{5}$$

$$L_\rho = \arg\max_L \rho \tag{6}$$

$$L_o = \arg \rho_o \; ; \qquad \rho_o = \rho(L_o) = 0 \tag{7}$$

In (3) the points L_ρ and L_o are excluded from the function's domain since in their vicinity z need not necessarily be differentiable. Such a procedure is permisible as L_ρ will actually never be reached by the firm - see section 3.1 below - while at L_o the firm behaves like an ordinary profit maximiser. The price locus p_m of (5) is consistent with the already defined maximum profit rate ρ_m. Note that the minimum of p_m corresponds to ρ_m attained by the profit-maximising firm which, in the short run, also maximises profit per unit of capital.

In what follows we shall call z simply the dividend, and will reserve the term "income per worker" to denote the before transfer magnitude y.

Now, the first and second order conditions for the maximum of z respectively reduce to[2]:

$$pX' = w + \frac{\pi}{1 + e} \tag{8}$$

$$pLX''(1 + e)^2 + \pi e < 0 \tag{9}$$

where X' and X'' are the first and the second derivative of $X(L)$.

We shall sometimes refer to the automatically controlled labour-managed firm that follows the allocation rule of (8) as to the J-LMF, or simply LMF, and will associate the term "Illyrian firm", I-LMF, with the "uncontrolled" behaviour of an untaxed or neutrally taxed cooperative.

3. The Allocation of Labour and Risk

We assume throughout that J-LMF and I-LMF sell at a same price and face same unit costs of labour and capital as the entrepreneurial firm. Also, following (1), we only consider non-zero profit states.

3.1 *Moving a Firm's Equilibrium*

By differentiating (8) with respect to e, we first examine the sensitivity of the LMF equilibrium to changes in the allocation parameter:

$$\frac{dL}{de} = \frac{-\Pi}{pLX''(1 + e)^2 + \pi e} \tag{10}$$

Applying (9) to (10), the following proposition is obtained:

P1. *A change in the e parameter to the LMF leads to a change in its demand for labour in the same (opposite) direction when profits are positive (negative)*

To determine the limiting cases of a firm's equilibrium, we first assume $e = 0$, when (8) immediately reduces to the well-known Illyrian rule:

$$pX' = w + \pi \tag{11}$$

In examining the second limiting case, we first consider the state of positive profits. As (11) defines a maximum of π, which is strictly concave in L, P1 indicates that for any positive e the LMF employment level is greater than that of the Illyrian firm, falling into the interval where π is decreasing in L. By letting e to tend to infinity it then follows that the variable part of (8) will be converging to zero so that, in the limit, the LMF equilibrium will reduce to that of the profit-maximising firm.

According to P1, in the case of negative profits a rise in e increases the arithmetic value of π in (8), so that the result on convergence is not immediately at hand. We therefore differentiate the left-hand side of (8) with respect to e and determine the algebraic sign of the derivative using P1:

$$\frac{d(pX')}{de} = pX'' \frac{dL}{de} \lessgtr 0 \quad \Leftarrow \quad \pi \gtrless 0 \tag{12}$$

Thus, the arithmetic value of $\pi/(1 + e)$ of (8) is strictly decreasing in e, while the denominator of this fraction approaches infinity when e tends to infinity. But this implies that the above expression must be converging to zero when e approches infinity. Hence, in the case of negative profits the equilibrium of the entrepreneurial firm also represents the limiting case of the LMF equilibrium:

$$pX' = w \tag{13}$$

After defining the limiting cases, we finally represent (8) in the form:

$$pX' = \frac{e}{1 + e} w + \frac{1}{1 + e} y \tag{8a}$$

This shows the LMF equilibrium to have the allocation properties formally identical with that of a codetermined firm (see, for example, Svejnar, 1982), i. e., to be a convex combination of equilibria of the entrepreneural and of the Illyrian firm. Since in the present model their weights may freely be determined, there is a reason to expect that the centre will exploit this advantage in coping with the Illyrian deficiences of worker-management.

3.2 *Allocative Efficiency*

To identify the impact of the mechanism on allocative efficiency, we first define the index of misallocation of labour by the I-LMF:

$$\beta_I = |(pX'_I/w) - 1| \tag{14}$$

where w is the value marginal product of labour of the entrepreneurial firm of (13), which allocates labour optimally, pX'_I being the corresponding Illyrian magnitude of (11). We then take β_I as a base for generally defining the measure of a firm's allocative efficiency as:

$$\alpha = |(\beta/\beta_I) - 1| \tag{15}$$

where $\alpha_I = 0$ and $\alpha_E = 1$ will be the respective Illyrian and entrepreneurial indices.

We now introduce the LMF indices $\beta_J = |(pX'_J/w) - 1|$ and $\alpha_J = |(\beta_J/\beta_I) - 1|$, where pX'_J denotes the LMF value marginal product of labour that appears in (8) and (12). The latter relation indicates that β_J is decreasing in e. Hence α_J is increasing in e and is strictly positive, which means that the LMF allocates labour better than the Illyrian firm.

To see how much better the LMF allocation is, we represent β_J and β_I with the right hand sides of (8) and and (11), respectively, to calculate:

$$\alpha_J = \frac{|\mu - 1 - e|}{1 + e} \quad ; \quad \mu = \left|\frac{\pi_J}{\pi_I}\right| \tag{16}$$

where π_J and π_I denote the respective values of π in (8) and (11). By the strict concavity of π and by definition of π_I as the maximum of π in L, we have from (16): $\mu \gtrless 1 \Leftarrow \pi \lessgtr 0$; $\alpha_J \gtrless e/(1 + e) \Leftarrow \pi \gtrless 0$, i.e., for profitable firms the efficiency index will be somewhat greater than $e/(1 + e)$, while for unsuccesful ones the opposite will be the case. This makes it meaningful to hypothesise $\mu = 1$ in (16), and to interpret the resulting value of α_J, denoted $\bar{\alpha}_J$, as an "average" efficiency level achieved for a given value of e:

$$\bar{\alpha}_J = \frac{e}{1 + e} \qquad (17)$$

We may therefore state the following allocation property of the LMF:

P2. *Faced with the e parameter of value e^* the LMF achieves an average efficiency level $e^*/(1 + e^*)$, when the Illyrian and the entrepreneurial firm achieve 0 and 1, respectively*

In the case of a mixed labour-managed economy P2 implies that by *ex ante* postulating e for all LMFs, the centre will create within the cooperative sector an average efficiency gain of $e/(1 + e)$. By increasing e the centre will thus be able to systematically reduce output losses caused by the principle of dividend maximisation.

To establish the limit of the scheme in improving allocative efficiency, we choose some arbitrarily small positive finite h and define $\alpha_J^h = (1 - h)$ as the value of α_J in (16) that denotes the state of an "almost" optimal allocation of labour. As in (16) α_J converges from below to unity as e tends to infinity, it follows that there always must exist some sufficiently large finite e for which $\alpha_J = \alpha_J^h$. We therefore obtain the following proposition on the LMF limit allocative efficiency:

P3. *The LMF can achieve an almost optimal allocation of labour*

3.3 *Risk Shifting*

To identify the limit impact of the mechanism on the allocation of risk, we temporarily introduce in the model uncertainty, assuming altogether risk aversion on the part of workers. We then choose some arbitrarily small positive finite g to define the transfer rate $t_g = (1 - g)$ as the state of an "almost" optimal allocation of risk. We then solve (3) for t:

$$t = 1 + \frac{\rho}{e}\frac{dt}{d\rho} \qquad (18)$$

As, due to the specification of $dt/d\rho$ in (2), t converges from below to unity when e tends to infinity, it follows that there always must exist some sufficiently large finite e for which $t = t_g$. Hence, the following proposition on the risk shifting by a cooperative may be established:

P4. *The LMF can achieve an almost optimal allocation of risk*

4. The Effects of a Change in Calculated Wage

It is a well-known property of the Illyrian firm that it is insensitive to variations in the institutionally imposed labour cost or the calculated wage. This leaves the centre without an instrument that would be naturally suited to cope with the rigidities of the Illyrian labour market. It is therefore of interest to establish whether or how the controlled LMF will react to changes in the w parameter.

4.1 *The Wage-Employment Response and the Collection of Demand for Labour Schedules*

To examine the LMF employment reaction to a change in the calculated wage, we replace π with $(y - w)$ in (8) and differentiate the equation with respect to w to obtain:

$$\frac{dL}{dw} = \frac{e}{(1 + e)[pLX''(1 + e)^2 + \pi e]} \qquad (19)$$

which, in the limits, displays the Illyrian zero reaction ($e = 0$) and the entrepreneurial positive response ($e \to \infty$). Within these limits, applying (9) to (19), it appears that the following proposition on the LMF sensitivity to variations in the standard labour costs holds:

P5. *A change in the calculated wage to the LMF leads to a change in its demand for labour in the opposite direction*

Thus P5, which describes movements along a demand for labour curve generated by a given value of the e parameter, shows this curve to be negatively sloped in w.

At the same time P1, combined with P5, indicates that by increasing e from zero to infinity one obtains an infinite number of negatively sloped demand curves for labour. Some of these curves, bordered by the (vertical) Illyrian (D_I) and entrepreneurial (VMP_L) schedules, are depicted in figure 1, where VMP_L (= pX'), $VNAP_L$ (= y), and VAP_L (= pX/L) denote the value marginal, the value net average, and the value average product of labour, respectively.

[*Figure 1 about here*]

4.2 *Clearing the Labour Market under Worker-Management*

It now appears that the defined mechanism makes calculated wage the instrument for clearing the labour market in a cooperative economy, provided the same occurs in the twin entrepreneurial system.

Thus, in the case of a fixed aggregate labour supply, the centre will gradually increase e until it generates the aggregate demand curve for labour which intersects the aggregate labour supply schedule at least at the point of the minimum calculated wage w_0, defined in section 2.1.

It emerges however that the centre will be able to clear the cooperative market for labour in the case of elastic aggregate labour supply as well.

If the information on the current value of the dividend is public[3], the aggregate labour supply will be increasing in z of (3). It follows that for the proper employment equilibrium to be ensured, the labour supply should not be a decreasing function of the calculated wage w, since the demand for labour has already been established to be decreasing in that parameter. But the differentiation of (3) with respect to w gives:

$$\frac{dz}{dw} = t \tag{20}$$

This indicates that the following proposition on the sensitivity of labour supply holds:

P6. *A change in the calculated wage in an economy populated with LMFs leads to a change in the aggregate labour supply in the same direction*

At the same time, changes in the allocation parameter will have no impact on the labour supply schedule as a function of *w*, since the differentiation of (3) with respect to *e* exactly yields:

$$\frac{dz}{de} = 0 \tag{21}$$

It follows that, similar to the case of a fixed labour supply, the centre will start the adjustment process by gradually increasing the allocation parameter. This will lead to anti-clockwise "rotation" of the aggregate demand curve for labour until it intersects the aggregate labour supply schedule at the point equal to or greater than the minimum calculated wage.

In summary, we conclude that by manipulating the allocation parameter and acting as an auctioneer in the labour market the centre will, both in the case of a fixed and elastic labour supply, eventually find the market clearing calculated wage which, at the same time, will not fall short of its critical magnitude, determined by the minimum tax exemption.

5. The Effects of a Change in Product Price

Finally, we come to the probably most debated issue raised by the short-run behaviour of the Illyrian firm - to the cooperative's negative employment response to a change in the product price and to the resulting negative output reaction. How does the controlled LMF behave in this situation?

To calculate the LMF response to price variations, we differentate (8) with respect to *p* to obtain:

$$\frac{dL}{dp} = \frac{X\left(\frac{LX'}{-X} + \frac{1}{1+e}\right)}{pLX''(1+e)^2 + \pi e} \tag{22}$$

which, in the limits, displays the Illyrian negative response ($e = 0$) and the entrepreneurial positive reaction ($e \to \infty$).

As, due to (9), the denominator of (22) is negative, the (desirable) positive employment (and output) response by the LMF would be consistent with the negativity of the numerator of this expression. By calculating LX'/X from (8) and substituting it into (22) the latter requirement eventually reduces to:

$$e > \alpha \; ; \qquad \alpha = \frac{rK}{wL} \tag{23}$$

To ensure the positive employment (and ouput) response in the whole range of relevant prices, and thus also the positive slope of the entire product supply curve, we determine e so that:

$$e > \frac{rK}{wL_s} \tag{24}$$

where L_s is that of (4), defining the minimum of the p_s locus.

Suppose now that, faced with the e parameter of (24), the firm finds itself at some point (p_s^*, L_*) of p_s, where $L_* \neq L_s$. Since at such point profit is negative, P1 implies that L_* is greater than the corresponding employment level of the entrepreneurial firm, and thus necessarily greater than L_s of (24). Hence at $L = L_*$ (23) holds, and dL/dp is positive. We then differentiate α of (23) with respect to p, to obtain:

$$\frac{d\alpha}{dp} = \left(\frac{-rK}{wL^2}\right)\frac{dL}{dp} \tag{25}$$

This shows α to be decreasing in p in the vicinity of p_s^*. Furthermore, since α is continiously differentiable in p there always must exist some interval $[p_s^*, p_s^1)$ where (23) holds, and where, due to the consequential positiveness of dL/dp, α is monotonically decreasing in p. Suppose now that α reaches the minimum at p_s^1. But it is seen from (25) that this can only happen if dL/dp is equal to zero. However, at p_s^1 (23) holds, and dL/dp is strictly positive. Hence, α does not have a minimum at p_s^1. The infinite repetition of the argument reveals that (23) holds in the entire relevant price region $[p_s^*, p_m^*)$, where $p_m^* = p_m(L_m)$, with L_m being defined in (5). We therefore conclude that the following proposition on the LMF's response to price variations generally holds:

P7. *A change in the product price to the LMF leads to a change in its employment and output in the same direction*

Thus P7, which describes movements along the product supply curve generated by a selected value of the *e* parameter, shows this curve to be positively sloped in *p*.

[*Figure 2 about here*]

At the same time P1, combined with P7, indicates that by letting *e* to tend from its critical value of (24) to infinity, one obtains an infinite number of positively sloped supply schedules. Some of these schedules, bordered by the coresponding Illyrian (S_I) and entrepreneurial (MC) curves, are depicted in figure 2, where MC ($= w/X'$), ATC [$= (wL + rK)/X$] and AVC ($= wL/X$) denote the marginal, the average total, and the average variable costs, respectively[4].

6. Discussion

In this paper we have defined a simple mechanism of incentive transfers, coupled with an auctioneer mechanism in the labour market, that improves the short-run performance of competitive labour-managed firms and economies without modifying their institutional arrangements.

The basic effects created by its operation may be summarised as follows. First, it makes both the users and the suppliers of labour to react to variations in the institutionally imposed labour cost or the calculated wage in the qualitatively same way as they would respond to changes in the market wage in an entrepreneurial system. The calculated wage thus becomes an instrument which secures, through the auctioneer procedure, the clearing of the labour market under worker-management. Second, the mechanism can maintain an almost optimal allocation of labour - i. e, it can keep the efficiency losses at some arbitrarily small finite level - completely automatically. Finally, in the same way it also ensures firms' proper employment and output response to changes in the product price, thus lowering the unemployment-inflation trade off in the cooperative economy and enhancing the product markets stability. The role of the centre in the process is that of financial control and reduces, at the end of the accounting period, to the enforcement of correct information on the profitability level achieved by a firm.

Not unlike most other proposals, the developed scheme can be seen in two ways - as a theoretical solution to the inefficiency problem of labour-management, and as a potential policy prescription.

However, if the latter view of the scheme is adopted, aside from having to upgrade it in order to deal with the problems such as adjustment costs, the labour heterogeneity or monopolistic distortions, one would also have to address an additional issue raised by the operation of the mechanism itself. According to Proposition 3 an almost optimal allocation of labour is achieved by sticking to the large finite values of the *e* parameter. On the other hand, Proposition 4 states that with such *e*s the transfer rates will almost be equal to unity, which means that a firm will practically be shifting all of its risk - a situation similar to that of the Miyazaki-Neary, Guessnerie-Laffont, and Thomson solutions, which assume an exactly complete risk shifting.

Though favourable from the viewpoint of risk averse workers, the problem with such an outcome is that it would almost certainly raise the issue of incentives and is thus unlikely to be feasible in practice. If one therefore opts for some more than a negligible amount of risk to be allotted to the cooperative, this will be achieved by replacing the large finite *e*s of P3 and P4 with the reasonably large ones, greater than the higher of critical values of the *e* parameter, discussed in parts 4 and 5. This will create an environment that might still be acceptable for the risk averse workers but will also allow for certain dispersion of earnings across firms. However, it would altogether bring a lower allocative efficiency and more sluggish output responses to price changes than with an almost optimal risk shifting. Thus, to a certain extent, the LMF will lag behind the entrepreneurial firm, both in its allocation performance and in the intensity of its output reactions[5].

The latter issue, though not necessarily the former, might be of practical interest to the proponents of worker-management. As forcefully stated in Montias (1986), a single most important advantage of entrepreneurial firms over worker cooperatives precisely reduces to a greater ability of the former to flexibly adapt to demand signals, which in the longer run would result in the insignificant share of cooperative sector in the total output of a society - a situation which does not contradict that of the actual organisationally open environments.

Of course, one may argue that the flexibility lag of controlled LMFs, in contrast with that of uncontrolled cooperatives, is unlikely to give a decisive advantage to entrepreneurial firms. Nevertheless, from the policy perspective it might still be interesting to investigate whether institutionally non-distortive mechanisms could be designed which, perhaps by scaling down the quest for allocative efficiency, will enable the risk bearing LMFs to respond to demand signals with exactly equal or maybe greater intensity than the flexibly adapting profit maximisers. A discussion of this theme, somewhat neglected by the existing literature on labour-management, would however go beyond what has been set to explore on the present occasion and will be pursued in a separate paper.

REFERENCES

Bergson, A. (1967). Market Socialism Revisited. J. Polit. Econ., **75**, 655-73

Bonin, J. (1981). The Theory of the Labor-Managed Firm from the Membership's Perspective with the Implications for Marshallian Industry Supply. J. Comp. Econ., **5**, 337-51

Bonin, J. and W. Fukuda (1986). The Multi-Factor Illyrian Firm Revisited. J. Comp. Econ., **10**, 171-80

Bonin, J., and L. Putterman (1987). Economics of Cooperation and the Labor-Managed Economy. New York: Harwood Academic Publishers

Domar, E. (1966). The Soviet Collective Farm as a Producer Cooperative. Amer. Econ. Rev., **56**, 734-57

Guesnerie, R., and J. J. Laffont (1984). Indirect Public Control of Self-Managed Monopolies. J. Comp. Econ., **8**, 139-58

Ireland, N., and P. Law, (1978). An Enterprise Incentive Fund for Labour Mobility in a Cooperative Economy. Economica, **45**, 143-51

______ (1982). The Economics of Labor-Managed Enterprises. New York: St. Martin's Press

Meade, J. E., (1972). The Theory of Labour-Managed Firms and of Profit Sharing. Econ. J., **82**, 402-28

Miyazaki, H., and, H. Neary (1983). The Illyrian Firm Revisited. Bell J. Econ., **14**, 259-70

Montias, J. M., (1986). On the Labor-Managed Firm in a Competitive Environment. J. Comp. Econ., **10**, 2-8

Sertel, M. (1982). Workers and Incentives. Amsterdam: North-Holland

Steinherr, A. and J.-F. Thisse, (1979). Are Labour-Managers Really Perverse?. Econ. Letters, **2**, 137-42

Svejnar, J. (1982). On the Theory of a Participatory Firm. J. Econ. Theory, **27**, 313-30

Thomson, W. (1982). Information and Incentives in Labor-Managed Economies. J. Comp. Econ., **6**, 248-68

Vanek, J. (1970). The General Theory of Labor-Managed Market Economies. Ithaca: Cornell Univ. Press

Ward, B. (1958). The Firm in Illyria: Market Syndicalism. Amer. Econ. Rev., **68**, 566-89

NOTES

1. A comprehensive survey of the worker-management literature, which covers a discussion of the quoted Illyrian deficiencies, can be found in Bonin and Putterman (1987). A useful textbook source is Ireland and Law (1982).

2. The derivation of any equation is available on request.

3. In the presence of asymmetric information on the profit component of dividend the argument presented below will hold *a fortiori*.

4. The Illyrian supply curve, determined from (8), is defined by: $p(X) = (rK/X)[\eta/(\eta - 1)]$, where η = MC/AVC.

5. The relative efficiency lag can be approximated using Proposition 2.

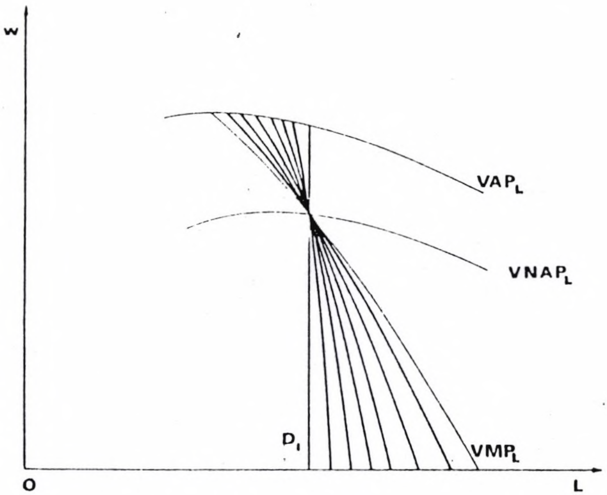

Fig. 1: *The Collection of Demand for Labour Curves Available to the LMF*

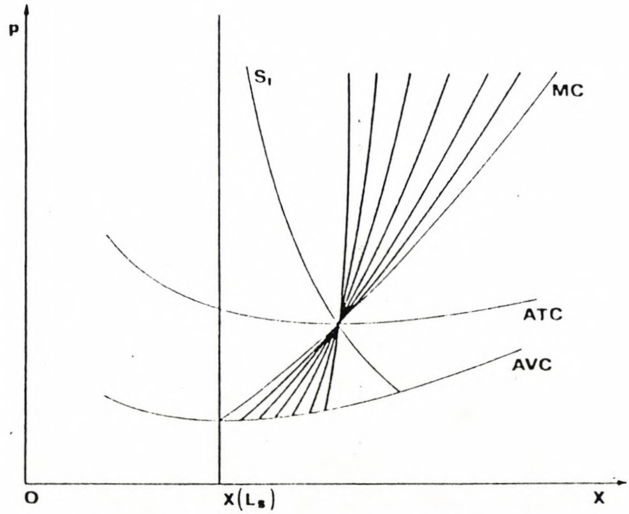

Fig. 2: *The Collection of Product Supply Curves Available to the LMF*

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