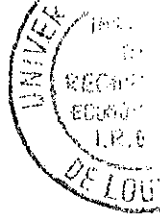




**VALUATION OF THE SHARES OF
A LABOR-MANAGED FIRM**

Mehmet M. TUTUNCU

Discussion Paper n° 9109



Département des Sciences Economiques
Université Catholique de Louvain
3, Place Montesquieu, 1348 Louvain-la-Neuve (Belgique)

D/1991/3082/09

VALUATION OF THE SHARES OF A LABOR-MANAGED FIRM

Mehmet M. Tutuncu*

June 1991

Universite Catholique de Louvain
Departement des Sciences Economiques
Place Montesquieu, 3
B - 1348, Louvain-la-Neuve
Belgium

* I would like to express my thanks to Ronald Anderson and Murat Sertel for their very helpful comments. I am especially grateful to Jacques Drèze for his very stimulating discussions. Any logical errors or unfortunate decisions as to the strategy of exposition are solely mine.

Abstract

Traditional analyses of the labor-managed firm, whose objective is assumed to be the maximization of earnings per worker, have shown that this economic organization must exhibit "perverse" behavior. Recently, it has been claimed that, if entry of new workers into the firm is allowed only when they pay the price of the partnership shares, the labor-managed firm will not be perverse. Here, the shares give their holders both the ownership and the right to work in the firm, and workers and shareholders coincide.

In this paper, we characterize the price of partnership shares under certain assumptions by starting from an explicit formulation of the multi-period optimization problem of the workers in the labor-managed firm. With such prices, one does obtain the result that the labor-managed firm is not perverse. However, we also show that, under the same set of assumptions, the workers in the firm are indifferent between allowing new workers into the firm by selling the shares of the firm, on the one hand, and hiring new workers by paying them the going wage rate without giving them partnership rights, on the other hand.

1. Introduction

The well-known literature on labor-managed firm since Ward (1958) has accused this type of economic organization with several short-comings. For instance, under perfect competition in both output and input markets, if the average product of labor is given by an inverted-U shaped curve and there are no fixed costs, then the firm does not respond to price changes at all. In the case of fixed costs (such as the rental cost of capital or manufacturing overhead), the situation is worse; because, with any inverted-U shaped (or simply, decreasing) curve for average product of labor, as the price of output increases, the labor-managed firm produces less. Furthermore, an increase in the fixed costs leads to an increase in the output. Because of these differences between the profit-maximizing and labor-managed firms, the latter has been said to be perverse.

The source of perversity lies in the objective function assumed for the labor-managed firm (henceforth LMF) where value-added per worker, instead of the total profit, is maximized. If we restrict ourselves with cases in which the working hours per worker are institutionally fixed, this objective can be achieved only by free adjustment of the number of worker-owners of the LMF. This, however, necessitates dismissal of some members whenever contraction would increase the value-added per remaining worker. Hence, as it has been pointed out first by Robinson (1967), the LMF model is further confronted with the problem of lack of a mechanism by which those who will depart from the firm will be given the incentive to do so.

This problem has been removed by using complete compensation schemes (Bonin (1984)). In that model, the number of the worker-members of the LMF is fixed, but, in low demand states, some members are temporarily laid-off and fully compensated for any income losses they will incur due to their working elsewhere. This way, members will not have any incentives not to give up their employment in the LMF whenever maximization of value-added per worker requires some of them to leave. Moreover, within a range up to the point where all members are employed in the LMF, production varies positively with the product price, so, in this sense, perversity disappears.

On the other hand, perversity, or rigidity of output, does not completely disappear with compensation schemes. In sufficiently high demand states, the LMF again does not respond to price signals, being constrained by the fixed number of its members (see Bonin (1984)). Differences between the profit-maximizing firm (henceforth PMF) and the LMF survive also in more complicated frameworks. In Spinnewyn and Svejnar (1987) model, in which new members can be admitted into the LMF, the Ward optimum is a lowerbound and the PMF optimum is an upperbound for the LMF employment which depends crucially on the initial membership size.

It has been suggested that the existence of a market for partnership shares of an LMF would cure any perversities (Sertel (1982, 1987)). Shares will be freely transferable in this market, and new workers are admitted into the LMF if they pay a price to obtain the shares of the enterprise,¹ which then compensates for the utility, or income, loss of the existing workers. This way, the labor input of the LMF is determined such that not only the perversities disappear, but also the employment policy of the LMF becomes identical to its twin PMF.

This brings us directly into the property rights issue. In this context, there are at least two views held about how to define an LMF. Jensen and Meckling (1979) argue that the property rights of a labor-managed firm per se must be not transferable, otherwise we would be back to the traditional PMF. The other view would be to invoke the definition of a workers' cooperative: a firm controlled and operated by the people who work in it (as cited, for example, by Ellerman (1984)). This second definition is general enough to allow for an LMF with transferable property rights. In reality, organizations have been observed to exist which are owned, controlled, and operated by a majority of people who work in it and whose shares are transferable (see Berman (1982)). Regardless of whether they can constitute, from a theoretical point of view, a different class of organization than the traditional firm even though their shares are transferable, they have been characterized and distinguished by workers' ownership and control. From a formal and analytical point of view, workers' ownership and control still implies maximization of income per worker as the objective function of the firm regardless of whether the firm sells its shares and the shares are transferable. Then, if the firm sells its shares, this introduces an additional factor whose implications together with maximization of income per worker should be worked out. Therefore, without necessarily disagreeing with the Jensen and Meckling (1979) position, we believe that it is a necessary exercise to go formally through the effects of share-selling on the behavior of a firm which is owned and controlled by its workers.

In this paper, we formulate a model of an LMF which is embedded in a capitalist economy. The right to work in this firm can only be acquired by buying its shares which are transferable. The distinguishing feature of the model is its explicit intertemporal context and the emphasis on how the LMF's decision about selling shares is made. Under certain restrictive assumptions, we obtain the result that the perversity disappears and the LMF's employment is identical to that of its twin PMF. Furthermore, the present discounted value of surplus --i.e., surplus over wage earnings-- cash flow is the same for both LMF and PMF, making the LMF look like an entrepreneurial firm with N entrepreneurs and giving

¹ Sertel (1987) suggests that the LMFs who sell their shares be called "workers' enterprises" in order to distinguish them from the traditional LMFs.

some support for Jensen and Meckling's position. However, the result about the disappearance of the perversity is obtained by assuming infinite planning horizon for workers, perfect information, and certainty, and one wonders whether it will survive if we relax these assumptions. Moreover, if hiring wage labor becomes an alternative option in varying the employment, the LMF remains indifferent between issuing more shares and hiring more non-member workers under frictionless functioning of the share market.

Before we conclude this introductory section, the relationship of the present paper with two important works in the literature on LMFs must be discussed. Meade (1982) has argued that, in order that an LMF not be perverse, it must be *inegalitarian*, i.e., the earnings must be distributed *unequally* among the new and old members. For example, in the circumstance in which earnings per member in the LMF (EM) exceed the marginal revenue product of a new member (MRP) and MRP, in turn, is larger than what a worker could earn outside of the LMF (OE), the old members will agree to allow a new member into the firm if they can pay him every period less than MRP and an outside worker will be ready to enter the firm if he will be paid more than OE. Since $MRP > OE$, both parties can agree on some amount X which will be earned by the new member every period such that $MRP \geq X \geq OE$. So, the LMF will be *inegalitarian* because the new entrant's income per period will be $EM - X$ less than the average earnings per member, EM. The LMF in our paper, on the other hand, will appear to be *egalitarian* because, in all periods following the one in which the new member has entered the firm, he will have an equal share in the total income flow per period, i.e. in not only the earnings, but also the revenue made by selling new shares. But of course when he enters he is paying the share price and since the share price can be thought of as the present discounted value of a sequence of period-by-period payments by the new entrant to the old members, the new member's net income in every period can actually be seen to be different than those of some other members. Hence the share prices can be thought of as a means of implementing the *inegalitarian* Meade LMF. It will be seen that the LMF in this paper would correspond to a special case of a multi-period version of the Meade LMF.

The present paper is also related with Drèze (1989) where the general equilibrium of a market economy consisting of traditional LMFs --i.e., LMFs which are **not** selling their shares-- is compared with that of an economy consisting of profit-maximizing competitive firms. It is shown that the set of allocations that can be sustained as competitive equilibria and as labor- management equilibria are identical. This result is obtained by imputing rents to LMFs who experience decreasing returns to labor. These imputed rents equal to the profits at the competitive equilibrium. Moreover, the income shares which the different labor types command at the labor-management equilibrium correspond to wages (which reduces to equality between earnings per member and wages in a world of single

homogeneous labor). It is not explicitly discussed, though, how these rents who will drive the LMF economy towards the equilibrium will be imputed and whom, i.e. which ones of the members who will have entered the LMF at different dates, they will accrue to. Although our paper uses partial-equilibrium methods, the share prices may be seen as an endogenous mechanism by which these rents are imputed to the LMFs and distributed among the members of the LMFs.² As it turns out, with optimizing behavior on the part of the existing members at any date, this rent will be --and, in order that the LMF reproduce the output of its twin PMF, it **must** be-- distributed only among the initial members who set up the LMF.

2. Preliminaries

2.1 Basic Assumptions and the Framework

2.1.a. Technology. The LMF produces a nonstorable good using labor (of a single homogeneous type) and other inputs including fixed investment goods. Because of institutional constraints, each worker must work a fixed amount of time per production period. Hence output can only be increased by increasing the number of workers in the enterprise. Let us normalize that fixed amount of time by unity, so that labor input is numerically equal to the number of workers in the firm. In the analysis, we will treat the number of workers as if it is perfectly divisible (so, no integer problems).

2.1.b. Value added. Let L_t be the number of workers in the firm throughout the production period t , X_{jt} ($j = 1, \dots, m$) the quantity of non-labor input j in period t , and $R_t(L_t, X_{1t}, \dots, X_{mt})$ the residual calculated by deducting from the sales revenue the non-labor production costs and payments to debtholders. For any given L_t , value added per worker is defined by

$$v_t(L_t) = \max_{\{X_{1t}, \dots, X_{mt}\}} \{ R_t(L_t, X_{1t}, \dots, X_{mt}) / L_t \}$$

We assume that $v_t(\cdot)$ is a continuous and twice differentiable function. The subscript t denotes that $v_t(\cdot)$ may differ from period to period as a result of, say, shifts in the demand schedule for the output of the firm or in the cost function, changes in the capital stock of the firm, etc. We do not restrict ourselves to perfect competition in the product market, price elasticity of the demand for the product of the firm is embodied in $v_t(\cdot)$.

² In explicit terms, the LMF in this paper is embedded in a capitalistic economy, hence the alternative income the workers can earn outside of the LMF is the going wage rate. But we can think of the LMF as being in a labor-managed economy by interpreting the wage rate as the best income share a worker would earn in another LMF.

2.1.c. Information. We assume that there is no uncertainty about the function $v_t(\cdot)$ and about the alternative income which can be earned by workers outside of the labor managed firm, for all t . Furthermore, we assume that information is perfect and symmetric about the decisions of the LMF. That is, not only the workers in the LMF but also those outside of the LMF know about the decisions made by the LMF at the beginning of the period t as to $L_t, L_{t+1}, \dots$. Hence, not only the inside workers, but also the outside workers can infer $v_t(L_t), v_{t+1}(L_{t+1}), \dots$.

2.1.d. Workers. We will assume that all the workers in the economy, i.e. both those in the LMF we are considering and those outside of it, are identical with respect to their preferences and their productivity, and that workers are infinitely-lived and never retire. Disutility of work will be ignored in conformity with the assumption about working hours. Hence, workers care only about their income.

The assumption about the life-span of workers simplifies the analysis to infinite horizon planning on the part of the workers. But, this is **not** intended to be an approximation to the finite horizon problem. If workers have a finite life, the work force of the LMF will be a mixture of workers of different ages, hence of different preferences at a given point in time. For sufficiently old workers, the optimization problem cannot be approximated by one with an infinite horizon. Therefore, the case of infinite life is rather useful as a benchmark one. It may provide us with some insight about the finite life case and suggest directions for future analysis.

2.1.e. Timing of events and actions. Time is divided into alternating periods of production and decision. Suppose the production period is a "week." Production begins at "Monday morning" and continues until "Friday evening." During the week, the number of workers in the firm is constant, say L_{t-1} . "Saturday morning," the decision period starts. L_{t-1} workers in the LMF choose (i) a price for the partnership shares, and (ii) the number of workers for the future production periods $t, t+1, t+2, \dots$. On "Sunday," the market for partnership shares opens. Based on the decisions by the members, workers outside of the LMF infer the future per-worker income levels which can be earned by joining the LMF, and buy partnership shares, say δL of them.³ Then, the next Monday, production begins again with $L_{t-1} + \delta L = L_t$ workers being in the firm. During the production period, no new shares

³ If the LMF sets the price by taking into account the price elasticity of the demand for its shares, $L_{t-1} + \delta L$ will automatically be equal to L_t chosen by the LMF; otherwise, there will be a tâtonnement with recontracting going on during the "Sunday," and the price set by the LMF will be only the initial price for the iterations in the partnership market. During this process, outside demanders of new shares will not participate in decision-making.

are issued by the LMF, nor can some partners exit the firm by selling their shares to the firm (i.e., to those workers who remain).

2.1.f. Layoffs. We abstract from temporary layoffs of members as an adjustment policy to low-demand states, i.e. members will not be able to work elsewhere without losing their membership right.

2.2. Optimization Problem of the Profit-Maximizing Firm

For purposes of comparison, let us state the first-order condition for the optimization problem of a PMF which uses the same technology and faces the same demand and cost schedules as the LMF for all periods. Let w_t denote the competitive wage rate at which the firm can hire labor at period t . Then its single-period profits will be given by $R_t(L_t, X_{1t}, \dots, X_{mt}) - w_t L_t$. For any given L_t , this will be maximized at exactly the same input combination $(X_{1t}, \dots, X_{mt})$ as that which will be chosen by the LMF with the same L_t . Hence the profits of the PMF can be written as $L_t [v_t(L_t) - w_t]$, and the profit maximizing condition is simply

$$L_t v_t'(L_t) + v_t(L_t) = w_t$$

In addition, $L_t v_t'(L_t) + v_t(L_t)$ is decreasing in L_t so that this condition guarantees a maximum.

3. The Share-Selling Labor-Managed Firm

3.1. Optimization Problem of the Workers in the LMF

With the introduction of transferable partnership shares, which give to their holders both the ownership right and the right to work in the LMF, the expansion of output of LMF will be achieved by selling new shares to nonmember (outside) workers, and the contraction of output will necessitate that the members who will stay in the firm buy back (and destroy) the shares of some other partners, i.e. the shares of those who leave. Hence, in period t , there is an additional source of income or cost. Suppose, at the beginning of the period t , the number of the members of the LMF is L_{t-1} , and the share price is p_t . If new shares are sold to outside workers in order to increase the employment in the LMF to L_t in period t , the L_{t-1} members of the LMF will share the revenue $p_t(L_t - L_{t-1})$, and the income of each worker who was in the firm in period $t-1$ will be

$$v_t(L_t) + p_t(L_t - L_{t-1})/L_{t-1}$$

whereas for the new entrants the income earned in t will be $v_t(L_t)$ only. If, on the other hand, some of the existing members' shares are bought back by others in the firm to reduce the employment to L_t , those who remain in the firm will share the cost $p_t(L_{t-1} - L_t)$, and the income of each worker who is in the firm in t will be

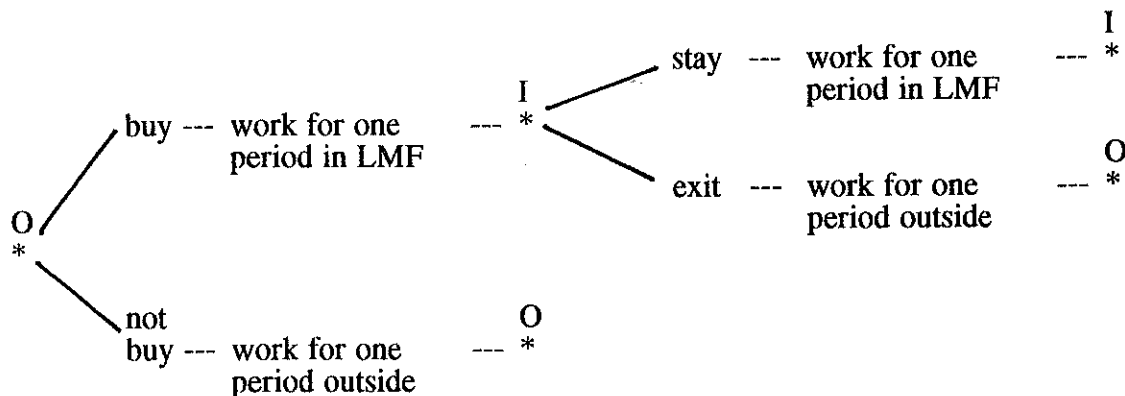
$$v_t(L_t) - p_t(L_{t-1} - L_t)/L_t.$$

For notational convenience below, define

$$S_t = \begin{cases} p_t(L_t - L_{t-1})/L_{t-1}, & \text{if } L_t > L_{t-1} \\ -p_t(L_{t-1} - L_t)/L_t, & \text{if } L_t < L_{t-1} \end{cases}$$

Now, consider the decisions of an individual worker. Note that the assumption about infinite life of workers makes the decisions of a worker independent of his age. Also, in accordance with this assumption, partnership shares are assumed to be issued and to remain valid for an infinite number of periods. Hence, by purchasing a share at the beginning of period t , a worker acquires the membership right for the rest of the whole future, including the period t .

The decision tree of an individual worker can be depicted as follows:



In this diagram, the nodes labeled O indicate that the worker has spent the last period outside of the LMF and those labeled I indicate that the worker was a member of LMF in the last period. What slightly complicates the issue of formulating the optimization problem of the members in the LMF is that at each of these nodes the LMF can be either in an expansionary or in a contractionary regime and that the members will choose different pricing rules in these two regimes.

Let U_t denote the present discounted value of income stream of the worker as a result of his best choice among buying and not buying a share of the LMF at the beginning of period t , if he is at a O-node, and, similarly, let V_t denote the present discounted value of the income stream of the worker as a result of his best choice among staying in or exiting from the LMF at the beginning of the period t , if he is at a I-node. Both U_t and V_t are evaluated for any given $L_t, L_{t+1}, L_{t+2}, \dots$, and $p_t, p_{t+1}, p_{t+2}, \dots$. With these definitions, it is shown in Appendix I that, regardless of whether period t is expansionary or contractionary, we can write

$$V_t = v_t + S_t + \beta V_{t+1} \quad (1)$$

which implies

$$V_t = \sum_{k=0}^{\infty} \beta^k (v_{t+k} + S_{t+k}) \quad (2)$$

where β is the discount factor and the summation runs to infinity (throughout, infinity sign is omitted). Since V_t is the present discounted value of the income stream of the member worker at the beginning of the period t , regardless of whether he stays in or exits from the firm in t or any future period (because V_t results from best decisions as to whether stay or exit), the workers in the LMF will seek to maximize (2), by choosing $L_t, L_{t+1}, L_{t+2}, \dots$, and $p_t, p_{t+1}, p_{t+2}, \dots$ at the beginning of period t , given L_{t-1} (with the reservation that buy-back prices must be set properly, as explained below).

3.2. Buy-Back Price of Old Shares

In achieving (1), the way in which the buy-back price of old shares is set is crucial. At the beginning of a contractionary period, some members will agree to leave if

$$v_t + S_t + \beta V_{t+1} \leq p_t + w_t + \beta U_{t+1}$$

where p_t is the price paid by those who stay to those who exit for a share, and S_t is evaluated for $L_t < L_{t-1}$. In order that some members are persuaded to exit and some to stay, both parties must be indifferent between staying and exiting. Hence, the price chosen, say p_t^C , must satisfy

$$v_t + S_t + \beta V_{t+1} = p_t^C + w_t + \beta U_{t+1} \quad (3)$$

In essence, equation (3) extends the idea of complete compensation schemes to a multi-period framework.⁴

3.3. Price of New Shares

Consider the condition for outside workers buying new shares in an expansionary period:

$$v_t - p_t + \beta V_{t+1} \geq w_t + \beta U_{t+1} \quad (4)$$

Under the assumptions of this paper (homogeneous preferences, certainty, etc), the demand for new shares by outside workers will be infinitely elastic⁵ at $p_t = p_t^E$; for $p_t < p_t^E$, it will be infinite, and for $p_t > p_t^E$, it will be zero, where p_t^E satisfies

$$v_t - p_t^E + \beta V_{t+1} = w_t + \beta U_{t+1} \quad (5)$$

Since neither V_{t+1} nor U_{t+1} in (4) depend on p_t , the workers in the LMF can increase their income given in (2) by increasing p_t up to p_t^E , for any given $L_t, L_{t+1}, \dots$ and $p_{t+1}, \dots$. In other words, the best choice of the firm is to set $p_t = p_t^E$, making thereby the outside workers indifferent between entering the firm or continuing to work outside, and then to pick the best L_t for each t .

⁴ The single-period version of equation (3) would be

$$v_t + S_t = p_t + w_t$$

which implies that

$$v_t + S_t = (L_t/L_{t-1}) v_t + [1 - (L_t/L_{t-1})] w_t$$

Such schemes have been used by, for example, Bonin (1984) and Spinnewyn and Svejnar (1987). Miyazaki and Neary (1983) use the same expression for the **expected** income because in their model L_t/L_{t-1} is the probability that a worker will stay in the LMF, since those who will exit are chosen randomly; and he will either earn v_t , if he is among those who stay in the LMF, or w_t , if he is one of those who work elsewhere. Thus Miyazaki and Neary (1983) do not adopt a complete compensation scheme (**except** for the case of self-insurance, see pp.266-8). Similar remarks apply to Miyazaki (1984a).

⁵ Another reason justifying this is that we want to compare the LMF with a PMF which is a perfectly competitive buyer in the labor market. The infinite elasticity faced by the LMF would be there for the same reason why the PMF experiences an infinite supply of labor if it pays more than w_t , and finds no one to hire if it pays less than w_t , where w_t is the going wage rate in the market.

3.4. Present Discounted Value of the Income Stream of an Outside Worker

It is shown in Appendix I that, regardless of whether period t is expansionary or contractionary, we have

$$U_t = w_t + \beta U_{t+1} \quad (6)$$

which implies

$$U_t = \sum_{k=0}^{\infty} \beta^k w_{t+k} \quad (7)$$

which means that, for a worker who was not a member of the LMF in the last period, the present discounted value of his income stream as a result of his best choice among buying and not buying a share of the LMF at the beginning of period t is the same as the present value of the income stream of a worker who will always work outside of the LMF and earn wage income only, regardless of whether the LMF will expand or contract in any period. Therefore, from the point of view of an outside worker, whether the LMF adopts a policy of selling shares or not does not matter. By using (6), (3) and (5) become

$$v_t + S_t + \beta V_{t+1} = p_t^C + U_t \quad (8)$$

$$v_t - p_t^E + \beta V_{t+1} = U_t \quad (9)$$

implying the worker will make his decision to exit (enter) the firm as if the alternative is never to enter (exit) again.

3.5. The F.O.C. for the Maximization Problem

By substituting

$$S_t = -p_t^C (L_{t-1} - L_t) / L_t$$

into (3) and comparing then (3) and (5), we find

$$p_t^C = p_t^E L_t / L_{t-1} \quad (10)$$

which further leads to the fact that

$$-p_t^C (L_{t-1} - L_t) / L_t = p_t^E (L_t - L_{t-1}) / L_{t-1}$$

implying

$$S_t = p_t^E (L_t - L_{t-1}) / L_{t-1}, \quad \text{for all } L_t \quad (11)$$

or, by substituting for p_t^E from (9) into (11),

$$S_t = (v_t + \beta V_{t+1} - U_t) (L_t - L_{t-1}) / L_{t-1}$$

Substituting this into (1), and rearranging, we obtain

$$V_t = (1/L_{t-1}) [L_t (v_t + \beta V_{t+1}) - (L_t - L_{t-1}) U_t]$$

By leading this equation successively and substituting back into itself, we obtain

$$V_t = (1/L_{t-1}) [L_t v_t + \beta L_{t+1} v_{t+1} + \beta^2 L_{t+2} v_{t+2} + \dots \\ - (L_t - L_{t-1}) U_t - \beta (L_{t+1} - L_t) U_{t+1} - \beta^2 (L_{t+2} - L_{t+1}) U_{t+2} - \dots]$$

or, rearranging, and noting from (6) that $U_t - \beta U_{t+1} = w_t$,

$$V_t = U_t + (1/L_{t-1}) [L_t (v_t - w_t) + \beta L_{t+1} (v_{t+1} - w_{t+1}) \\ + \beta^2 L_{t+2} (v_{t+2} - w_{t+2}) + \dots]$$

or, simply,

$$V_t = U_t + (1/L_{t-1}) \sum_{k=0}^{\infty} \beta^k \pi_{t+k} \quad (12)$$

where $\pi_t = L_t (v_t - w_t)$ represents nothing but the profits of an entrepreneurial firm in period t which produces the same quantities as the LMF. We immediately learn two things. First, (12) implies

$$L_{t-1} (V_t - U_t) = \sum_{k=0}^{\infty} \beta^k \pi_{t+k} \quad (13)$$

That is, the discounted sum of payoffs excess of wage earnings to all workers who are in the firm at the beginning of period t is equal to the discounted sum of profits of an entrepreneurial firm producing the same quantities as the LMF (see below for more comments on this point). Second, (12) shows that maximizing V_t is the same thing as

maximizing the profits of an entrepreneurial firm. Or, with L_{t-1} given, the first-order condition for the LMF, that is,

$$v_t(L_t) + L_t v_t'(L_t) - w_t = 0 \quad (14)$$

is nothing but the first-order condition for the profit-maximizing enterprise. Hence, under the assumptions of Section 2, a labor-managed firm which sells (buys back) its shares in order to expand (contract) its output will have the same outcome as the profit-maximizing firm, if it is embedded in a capitalistic economy. It follows that the existence of conditions making such a share-selling behavior possible will overcome the perversities found in the labor-managed enterprise.⁶

3.6. Total Value of the Shares

Solving (5) for p_t^E and multiplying by L_t we obtain

$$p_t^E L_t = L_t(v_t - w_t) + \beta L_t(V_{t+1} - U_{t+1})$$

or, using (13) for period $t+1$,

$$p_t^E L_t = \pi_t + \beta \sum_{k=1} \beta^k \pi_{t+k} = \sum_{k=0} \beta^k \pi_{t+k} \quad (15)$$

The left-hand side is the value of the outstanding stock of the firm's shares during period t , whereas the right-hand side gives the present discounted value of the profits of a PMF which produces the same quantities as the LMF.

3.7. Characterization of Share Prices

Now it is straightforward to characterize the share prices of the LMF:

1. Choose $L_t, L_{t+1}, \dots$ such that $\sum_{k=0} \beta^k \pi_{t+k}$ is maximized.
2. Calculate $\sum_{k=0} \beta^k \pi_{t+k}$ at the chosen $L_t, L_{t+1}, \dots$.
3. If $L_t > L_{t-1}$, calculate the selling price of new shares as $p_t^E = (\sum_{k=0} \beta^k \pi_{t+k}) / L_t$.
(This follows from (15).)
4. If $L_t < L_{t-1}$, calculate the buying price of old shares as $p_t^C = (\sum_{k=0} \beta^k \pi_{t+k}) / L_{t-1}$.

⁶ By rewriting (14) as

$$v_t(L_t) - w_t = -L_t v_t'(L_t) \quad (F1)$$

we obtain the equilibrium condition for Sertel's (1987) partnership market.

(This follows from (15) and (10).)

3.8. Present Discounted Value of the Income Stream of the Workers in the LMF in Excess of Wage Earnings

Using (15), we can write (12) as

$$V_t = U_t + p_t^E L_t/L_{t-1} \quad (16)$$

Since $U_t = \sum_{k=0} \beta^k w_{t+k}$, it follows from (16) that the difference between the discounted sum of wage (or alternative) earnings of a worker outside of the firm and that of the earnings which will accrue in periods $t, t+1, \dots$ to a worker in the firm is $p_t^E L_t/L_{t-1}$. This, in turn, is equal to p_t^C , the buy-back price (see (10)), hence

$$V_t = U_t + p_t^C$$

This shows again that the function of the buying-back price of shares is to compensate an existing worker for the lifetime income loss, i.e. the difference $V_t - U_t$.

This difference $V_t - U_t$, however, must be interpreted carefully. Consider (12) again:

$$V_t = U_t + (1/L_{t-1}) \sum_{k=0} \beta^k \pi_{t+k} \quad (12)$$

That is, assuming $\sum_{k=0} \beta^k \pi_{t+k} > 0$, each worker in the LMF will enjoy, from t on, a positive payoff excess of wage earnings once he enters the firm before period t . On the other hand, when entering the firm, the price of a share leaves each worker indifferent between joining the LMF or working outside, and, for such a worker, the discounted sum of future earnings in the firm less the share price is equal to the discounted sum of wages (Equation (9)). So, the positive payoff excess of wages which accrues to the worker at (and beyond) period t if he joined the firm before period t must be compensating for some loss which occurred some time between period t and the period the worker joined the firm, and since (12) is valid for any period except the one in which the worker has joined the firm, that loss must have occurred in the period when the worker has joined the firm. Suppose the worker entered the LMF at the beginning of period $t-1$, then, by writing Equation (5) for period $t-1$ and rearranging, we have

$$v_{t-1} - p_{t-1} = w_{t-1} - \beta (V_t - U_t) < w_{t-1}$$

where the left-hand side is the net earnings of the worker in period $t-1$ who joined the firm at the beginning of period $t-1$. These earnings are less than w_{t-1} by $\beta (V_t - U_t)$. It follows that $V_t - U_t$, the positive payoff excess of wage earnings, is the present value of the loss in period $t-1$.

This is not true only for the founding members of the LMF. Only for them does $V_t - U_t$ represent a net gain over wages as a reward to their 'entrepreneurial' undertaking. For L_0 workers who jointly opened the LMF just before period 1, we can write equation (13) as

$$L_0 (V_1 - \sum_{k=0} \beta^k w_{1+k}) = \sum_{k=0} \beta^k \pi_{1+k}$$

In other words, the founding members share the discounted sum of the profits which will accrue to a capitalistic entrepreneur who sets up the twin of the LMF and decides to produce the same quantities as the LMF will do. An implication of this expression is that, for any given production plan $L_1, L_2, \dots, V_1$ will be higher if L_0 , the number of initial members, is lower, hence there will be an incentive to set up the firm with as few initial members as possible.

An alternative to the above expression reveals some further insight. First, note that (15) implies

$$\begin{aligned} p_t L_t &= \pi_t + \beta p_{t+1} L_{t+1} \\ &= L_t (v_t - w_t) + \beta p_{t+1} L_{t+1} \end{aligned} \quad (17)$$

Now, in each period t , the cash flow to any worker in the LMF who has been a member in period $t-1$ will be $v_t + p_t(L_t - L_{t-1}) / L_{t-1}$. By substituting from (17) for p_t , we can write this as

$$v_t + (v_t - w_t + \beta p_{t+1} L_{t+1} / L_t) (L_t - L_{t-1}) / L_{t-1}$$

or, upon rearranging,

$$w_t + \pi_t / L_{t-1} + \beta (p_{t+1} L_{t+1} / L_t) (L_t - L_{t-1}) / L_{t-1}$$

Hence, the cash flow excess over wage earnings shared by L_{t-1} members in period t is

$$\pi_t + \beta (p_{t+1} L_{t+1} / L_t) (L_t - L_{t-1}) \quad (18)$$

Since all of these L_{t-1} workers, regardless of when they entered the firm, have equal share in the cash flow in period t , the L_0 founding members will together receive the excess over wage earnings

$$(L_0/L_{t-1}) [\pi_t + \beta (p_{t+1}L_{t+1}/L_t) (L_t - L_{t-1})]$$

in period t . Now, it is shown in Appendix II that

$$\sum_{t=1} \beta^{t-1} (L_0/L_{t-1}) [\pi_t + \beta (p_{t+1}L_{t+1}/L_t) (L_t - L_{t-1})] = \sum_{k=0} \beta^k \pi_{1+k}$$

The left-hand side is the discounted sum of earnings excess over wages which accrues to founding members, and right-hand side is the discounted sum of the profits of the capitalistic twin of the LMF throughout its entire existence. This equation also shows that the cash flow to the founding members is not equal to π_t period by period. For example, in period 1, the members obtain

$$\pi_1 + \beta (p_2 L_2/L_1) (L_1 - L_0) > \pi_1 \quad \text{for } L_1 > L_0$$

implying that, for some other period(s),

$$(L_0/L_{t-1}) [\pi_t + \beta (p_{t+1}L_{t+1}/L_t) (L_t - L_{t-1})] < \pi_t$$

4. Role of Price-Setting Behavior

Now we would like to stress a simple but crucial point. The effect of the choice of L_{t+k} , where $k = 0, 1, \dots$, on the price which the outside workers are willing to pay --denote it by p_t^D -- is not necessarily negligible and it is completely predictable and controllable by the LMF. Hence, in Section 3, the workers in the LMF set the price of the shares by taking into account the effect of employment decisions on p_t^D fully; and it is not plausible to assume that the LMF is a price-taker in the market for partnership shares. But it may be fruitful to consider the implications of this assumption as well.⁷ Below, we will find that price-taking behavior on the part of the workers in the firm would result in path-dependent equilibria, and consequently the behavior of the LMF would deviate from that of the PMF.

⁷ Sertel (1982) calls the left-hand side of (F1) --written in utility terms-- the demand price of the shares, and the right-hand side the supply price. A terminological issue arises since these may imply that the share price is taken both by the outside workers and the workers in the firm as given and determined by the interaction of supply and demand in the market for shares.

For the purposes of this section, we may allow ourselves to be restricted by the fact that period t is an expansionary one, i.e. $L_t > L_{t-1}$. By substituting $S_t = p_t(L_t - L_{t-1})/L_{t-1}$ into (1), we have

$$V_t = v_t + p_t(L_t - L_{t-1})/L_{t-1} + \beta V_{t+1} \quad (19)$$

Define

$$\phi_{t+1}(L_t) = \max_{\{L_{t+1}, L_{t+2}, \dots\}} V_{t+1}$$

given $p_{t+1}, p_{t+2}, \dots$. Assume $\phi_{t+1}(L_t)$ and $\phi_{t+1}'(L_t)$ are continuous in L_t and $\phi_{t+1}'(L_t)$ is decreasing in L_t . Then, if the workers in the firm take the share price p_t as given, the first-order condition for the maximization of (19) will be

$$v_t'(L_t) + p_t/L_{t-1} + \beta \phi_{t+1}'(L_t) = 0 \quad (20)$$

This condition says that, although $\phi_{t+1}'(L_t)$ is independent of L_{t-1} , L_t , the optimum new number of workers for the workers in the firm at a given share price, is **not** independent of L_{t-1} , the number of workers in the firm. Rearranging (20), we obtain

$$p_t^S = -L_{t-1} [v_t'(L_t) + \beta \phi_{t+1}'(L_t)]$$

where p_t^S is defined as the supply price of shares.⁸ On the other hand, the demand price will be given by

$$p_t^D = v_t(L_t) + \beta \phi_{t+1}(L_t) - \sum_{k=0}^{\infty} \beta^k w_{t+k} \quad (21)$$

⁸ The following point is worth emphasizing: Since (20) is a first-order condition, we have the elementary fact that

$$p_t^S/L_{t-1} > -[v_t'(z) + \beta \phi_{t+1}'(z)], \quad \text{for all } z < L_t$$

Hence, by integrating with respect to z from L_{t-1} to L_t ,

$$p_t^S(L_t - L_{t-1})/L_{t-1} > v_t(L_{t-1}) + \beta \phi_{t+1}(L_{t-1}) - [v_t(L_t) + \beta \phi_{t+1}(L_t)]$$

i.e., the revenue made by selling the shares at the supply price **more** than compensates for the decrease --which is caused by the increase in the labor input-- in the present value of the earnings of the L_{t-1} workers in the LMF.

or, by (4) with the equality holding (because competition among demanders would push the price up to the highest which the demanders will be willing to pay for the shares). Now it follows from (20) and (21) that the number of workers in period t , L_t , which satisfies the equilibrium condition $p_t^S = p_t^D$ will not be independent of L_{t-1} . But then, in general, L_t will not satisfy (14), either.

5. Share-Selling Versus Wage-Labor Hiring

So far, we have assumed implicitly that the only means available to the LMF for increasing its labor force is to sell its shares so that its entire labor force consists of only member workers. But there is nothing which would prevent the members from hiring wage-workers without giving them the partnership right, since it is embedded in a capitalist economy and may have access to a labor market. If it turns out to be optimal, say in period t , the LMF may turn into a PMF owned by L_{t-1} entrepreneurs hiring $L_t - L_{t-1}$ wage workers. In reality, it has been observed that the labor-managed firms' labor force consists of a mixture of members and hired wage workers (see Berman (1982)). So then, the question is: Under what conditions is it optimal to hire wage workers together with --or, rather than-- selling shares to new members?

To analyze these questions, let h_t be the number of workers to be hired during period t , and m_t be the number of partners in the LMF. So, $L_t = m_t + h_t$. Naturally, the revenue made from selling partnership shares at the beginning of period t will be distributed among m_{t-1} members who are in the firm then, and the costs of hiring wage workers will accrue to all members, i.e. to m_t , who are in the firm during period t . Also, note that the total value-added in period t will be

$$L_t v_t(L_t) = (m_t + h_t) v_t(m_t + h_t)$$

Under these circumstances, the revenue (cost) of selling new (buying old) shares is given by

$$S_t = \begin{cases} p_t(m_t - m_{t-1}) / m_{t-1}, & \text{for } m_t > m_{t-1} \\ -p_t(m_{t-1} - m_t) / m_t, & \text{for } m_t < m_{t-1} \end{cases}$$

and v_t in Equ.s (A1) - (A11) of Appendix I must be replaced by

$$(m_t + h_t) v_t(m_t + h_t) / m_t - h_t w_t / m_t$$

but the analysis of Sec.s 3.1 - 3.3 and Appendix I remains valid after these changes, so that we have, for $m_t > m_{t-1}$,

$$p_t^E = (m_t + h_t) v_t(m_t + h_t)/m_t - h_t w_t/m_t + \beta V_{t+1} - w_t - \beta U_{t+1} \quad (22)$$

and, for $m_t < m_{t-1}$,

$$p_t^C + w_t + \beta U_{t+1} = (m_t + h_t) v_t(m_t + h_t)/m_t - p_t^C(m_{t-1} - m_t)/m_t - h_t w_t/m_t + \beta V_{t+1} \quad (23)$$

with

$$U_t = w_t + \beta U_{t+1} = \sum_{k=0}^{\infty} \beta^k w_{t+k}$$

and the objective to be maximized for m_{t-1} workers during the decision-making stage at the beginning of period t becomes

$$V_t = (m_t + h_t) v_t(m_t + h_t)/m_t - h_t w_t/m_t + S_t + \beta V_{t+1} \quad (24)$$

From (22) and (23) we see that

$$p_t^C = p_t^E m_t / m_{t-1}$$

implying

$$S_t = p_t^E(m_t - m_{t-1}) / m_{t-1} = -p_t^C(m_{t-1} - m_t) / m_t$$

so that (24) can be written as

$$V_t = (m_t + h_t) v_t(m_t + h_t)/m_t - h_t w_t/m_t + p_t^E(m_t - m_{t-1})/m_{t-1} + \beta V_{t+1}, \quad \text{for all } m_t$$

By substituting for p_t^E from (22),

$$V_t = (1/m_{t-1}) [(m_t + h_t)v_t(m_t + h_t) - h_t w_t + \beta m_t V_{t+1} - (m_t - m_{t-1}) U_t]$$

Upon leading this equation successively and substituting back into itself,

$$\begin{aligned}
V_t = & (1/m_{t-1}) [(m_t + h_t) v_t(m_t + h_t) - h_t w_t \\
& + \beta (m_{t+1} + h_{t+1}) v_{t+1}(m_{t+1} + h_{t+1}) - \beta h_{t+1} w_{t+1} + \dots \\
& - (m_t - m_{t-1}) U_t - \beta (m_{t+1} - m_t) U_{t+1} - \dots]
\end{aligned}$$

or, using $U_t - \beta U_{t+1} = w_t$, and rearranging,

$$V_t = U_t + (1/m_{t-1}) \sum_{k=0}^{\infty} \beta^k (m_{t+k} + h_{t+k}) [v_{t+k}(m_{t+k} + h_{t+k}) - w_{t+k}]$$

Again we see that the aggregate excess of lifetime earnings over wages is equal to the sum of discounted profits of an entrepreneurial firm producing the same quantities as the LMF. Also, one observes again the presence of incentives to set the firm at $t = 0$ with as little members m_0 as possible.

Let us consider now the optimal choice of membership and wage-worker employment by the m_{t-1} members of the LMF. The fact that the variable part of V_t is identical with the profits of the PMF implies immediately that (i) $m_t + h_t$, the labor force of the LMF, satisfies condition (14) and it is determined again as being equal to the employment level of the PMF, and, on the other hand, (ii) that, since V_t depends only on $m_t + h_t$ and not on m_t and h_t separately, we don't have another condition to determine how the optimal level of L_t is split between m_t and h_t . Hence, m_{t-1} members of the LMF are indifferent between selling $L_t - m_{t-1}$ shares, or hiring wage workers of the same number, or selling $m_t - m_{t-1}$ shares and hiring $L_t - m_t$ workers at time t . In other words, suppose there are two different labor managed firms, both embedded in a capitalistic economy. In one of them, the members refuse to hire wage laborers, do not sell their shares either, hence the production of this firm exhibits the usual perversity. In the other, the labor force of the firm is a mixture of members and wage-laborers, and the output is expanded or contracted by hiring and firing nonmember workers. Now, suppose that, in order to overcome the perversity of the first LMF, we suggest that the first LMF sell its shares. But by making this suggestion we are only suggesting that the members of the first LMF adopt an organizational change which would leave them indifferent between what we are suggesting they adopt and what they could have done anyway but were refusing to do, namely, to hire nonmember workers. Hence, under the ideal conditions of our framework, share-selling as a device for curing the perversities of LMF seems to put the theory of labor management in an awkward situation.

6. Summary and Conclusions

Our approach and results have already been summarized in the **Introduction**. Here, perhaps the nature of the share prices which lead to our results should be emphasized: If the

LMF is expanding, the price is the **best** for the existing members --i.e. it is optimal from the point of maximization of earnings per worker-- and the total number of shares **after** the expansion valued at this price equal the discounted profits of the twin PMF. If the LMF is contracting, the price fully compensates the loss of exiting workers in this dynamic framework, and the number of shares **before** contraction valued at this price are equivalent to the value of discounted profits. In either case, employment decisions of the LMF are independent from those about pricing the shares.

In addition to our main results --that is, the disappearance of perversity and the indifference between share-selling and wage-worker-hiring-- we see that workers have incentives to start the LMF with as little members as possible. Taken all together, our results make us observe that the distinction between the labor-managed and profit-maximizing firms is blurred if the LMF sells (buys) its shares to let workers (members) enter (exit). One can argue that this is because our restrictive assumptions reduce the difference between the LMF and the PMF to the choice of employment levels to maximize different objective functions. We need a model in which we continue to assume that the LMF sells or buys its shares to adjust employment and, in addition, extend the list of decision variables of both firms beyond the choice of employment levels. It remains an open question whether the perversity will disappear and, at the same time, the LMF will choose different financing strategy, working conditions,⁹ and/or technology than the PMF in such a model; and how the rents generated in the firm will be distributed among old and new members.

⁹ The analysis reported on by Drèze (1976) sheds light upon the differences which result when one allows for endogeneous choice of working conditions under profit-maximizing and labor-management in the usual sense, i.e. where entry (exit) of members into (from) the LMF takes place without the worker buying (selling) the partnership share. Perhaps, an analysis along the same lines can be fruitfully pursued in the framework of the present paper, too.

Appendix I

First, consider a worker at a O-node and suppose period t is expansionary. Then

$$U_t = \max \{ v_t - p_t + \beta V_{t+1}, w_t + \beta U_{t+1} \} \quad (A1)$$

where β is the discount factor, and w_t is the alternative (wage) income which can be earned outside of the firm in period t . Workers outside of the LMF will buy new shares if

$$v_t - p_t + \beta V_{t+1} \geq w_t + \beta U_{t+1} \quad (A2)$$

Next, consider a worker at a I-node and suppose period t is contractionary. We have

$$V_t = \max \{ v_t + S_t + \beta V_{t+1}, p_t + w_t + \beta U_{t+1} \} \quad (A3)$$

where p_t is the price paid by those who stay to those who exit for a share, and S_t is evaluated for $L_t < L_{t-1}$. In order that members be indifferent between staying and exiting, the price chosen, say p_t^C , must satisfy

$$v_t + S_t + \beta V_{t+1} = p_t^C + w_t + \beta U_{t+1} \quad (A4)$$

Combining (A3) and (A4), we can write

$$V_t = v_t + S_t + \beta V_{t+1}, \text{ for } L_t < L_{t-1} \quad (A5)$$

Now consider a worker at a O-node, and suppose period t is contractionary. Suppose some of the exiting workers sell their shares to outside workers, instead of to staying members, at a price p' . Then

$$U_t = \max \{ v_t + S_t + \beta V_{t+1} - p', w_t + \beta U_{t+1} \} \quad (A6)$$

assuming that the new workers enter the firm **before** the cost $p_t^C(L_{t-1}-L_t)$ is distributed among the members, hence they also incur S_t .¹⁰ In order that outside workers buy,

$$v_t + S_t + \beta V_{t+1} - p' \geq w_t + \beta U_{t+1} \quad (A7)$$

implying $p' \leq p_t^C$. Since exiting workers wouldn't sell to outside workers for $p' < p_t^C$, we either have $p' = p_t^C$, or no outside workers would buy shares of exiting workers at the beginning of a contractionary period. In either case, using (A6) above, we have

$$U_t = w_t + \beta U_{t+1}, \text{ for } L_t < L_{t-1} \quad (A8)$$

Finally, consider a worker at a I-node, and suppose period t is expansionary. We have

$$V_t = \max \{ v_t + S_t + \beta V_{t+1}, S_t + p^{\sim} + w_t + \beta U_{t+1} \} \quad (A9)$$

where $p^{\sim}$ is the price paid by the outside workers who buy shares from exiting members, and S_t is now evaluated for $L_t > L_{t-1}$. It has been assumed that this sale will be made **after** the revenues from selling new shares have been distributed among L_{t-1} old members.¹¹ In order that some members sell their (previously issued) shares to outsiders,

¹⁰ If an outside worker buys a share from a member **after** S_t is paid by the staying members to those who exit by selling their shares to the staying, it can still be shown that equation (A8) below is valid.

¹¹ If this sale is made **before** the revenues from selling new shares have been distributed among L_{t-1} old members, it can still be shown that equation (A11) below is valid.

$$v_t + S_t + \beta V_{t+1} \leq S_t + \tilde{p} + w_t + \beta U_{t+1} \quad (\text{A10})$$

which implies $\tilde{p} \geq p_t$, where p_t satisfies (A2). Since entering workers wouldn't buy from exiting workers for $\tilde{p} > p_t$, we either have $\tilde{p} = p_t$, or no outside workers would buy shares of exiting workers in an expansionary period. In either case, using (A9) above, we have

$$V_t = v_t + S_t + \beta V_{t+1}, \quad \text{for } L_t > L_{t-1} \quad (\text{A11})$$

Now, the following conclusions can be drawn. First, by combining (A5) and (A11), we have

$$V_t = v_t + S_t + \beta V_{t+1}, \quad \text{for all } L_t$$

Second, suppose the price of the new shares, p_t^E , is chosen such that

$$v_t - p_t^E + \beta V_{t+1} = w_t + \beta U_{t+1}$$

Then, using the definition of U_t (see equation (A1) above) we can write

$$U_t = w_t + \beta U_{t+1}, \quad \text{for } L_t > L_{t-1} \quad (\text{A12})$$

By combining (A8) and (A12), we have

$$U_t = w_t + \beta U_{t+1}, \quad \text{for all } L_t$$

Appendix II

By using (17) of Section 3.8 with $\pi_t = L_t (v_t(L_t) - w_t)$, we can rewrite

$$(L_0/L_{t-1}) [\pi_t + \beta (p_{t+1} L_{t+1}/L_t) (L_t - L_{t-1})] \quad (\text{A13})$$

as

$$(L_0/L_{t-1}) \{ p_t L_t + \beta p_{t+1} L_{t+1} [(L_t - L_{t-1})/L_t - 1] \}$$

or as

$$L_0 [p_t L_t/L_{t-1} - \beta p_{t+1} L_{t+1}/L_t] \quad (\text{A14})$$

From (16) of Section 3.8, we obtain

$$V_t - \beta V_{t+1} = p_t L_t/L_{t-1} - \beta p_{t+1} L_{t+1}/L_t + w_t$$

Noting that $\sum_{t=1}^{\infty} \beta^{t-1} (V_t - \beta V_{t+1}) = V_1$, this implies

$$V_1 = \sum_{t=1}^{\infty} \beta^{t-1} [p_t L_t/L_{t-1} - \beta p_{t+1} L_{t+1}/L_t] + \sum_{k=0}^{\infty} \beta^k w_{1+k}$$

and, by the equality of (A13) and (A14),

$$\begin{aligned} \sum_{t=1}^{\infty} \beta^{t-1} (L_0/L_{t-1}) [\pi_t + \beta (p_{t+1} L_{t+1}/L_t) (L_t - L_{t-1})] \\ = L_0 (V_1 - \sum_{k=0}^{\infty} \beta^k w_{1+k}) \end{aligned}$$

It follows from (13) of Section 3.5 that

$$\sum_{t=1}^{\infty} \beta^{t-1} (L_0/L_{t-1}) [\pi_t + \beta (p_{t+1} L_{t+1}/L_t) (L_t - L_{t-1})] = \sum_{k=0}^{\infty} \beta^k \pi_{1+k}$$

References

Berman, Katrina (1982) "The United States of America: a Cooperative Model for Worker Management" in Frank H. Stephen (ed.) **The Performance of Labor Managed Firms**, St. Martin's Press, New York.

Bonin, John (1984) "Membership and Employment in an Egalitarian Cooperative" **Economica**, Vol. 51, pp.295-305.

Drèze, Jacques (1976) "Some Theory of Labor Management and Participation" **Econometrica**, Vol. 44, pp. 1125-1139.

Drèze, Jacques (1989) **Labor Management, Contracts and Capital Markets**, Basil Blackwell, Oxford.

Ellerman, David (1984) "Workers' Cooperatives: The Question of Legal Structure" in Robert Jackall and Henry M. Levin (ed.s) **Worker Cooperatives in America**, University of California Press, Berkeley.

Jensen, Michael and Meckling, William (1979) "Rights and Production Functions: An Application to Labor-managed Firms and Codetermination" **Journal of Business**, Vol. 52, pp. 469-506.

Meade, James (1982) **Wage-Fixing**, George Allen and Unwin, London.

Miyazaki, Hajime (1984a) "Internal Bargaining, Labor Contracts, and a Marshallian Theory of the Firm" **American Economic Review**, Vol. 74, pp. 381-393.

Miyazaki, Hajime and Neary, Hugh (1983) "The Illyrian Firm Revisited" **Bell Journal of Economics**, Vol. 14, pp. 259-270.

Robinson, Joan (1967) "The Soviet Collective Farm as a Producer Cooperative: Comment" **American Economic Review**, Vol. 57, pp. 222-223.

Sertel, Murat (1982) **Workers and Incentives**, North-Holland, Amsterdam.

Sertel, Murat (1987) "Workers' Enterprises Are Not Perverse" **European Economic Review**, Vol. 31, pp. 1619-1625.

Spinnewyn, Frans and Svejnar, Jan (1987) "Optimal Membership, Employment and Income Distribution in Unionized, Participatory and Labor-Managed Firms", unpublished.

Ward, Benjamin (1958) "The Firm in Illyria: Market Syndicalism" **American Economic Review**, Vol. 49, pp. 566-589.

DISCUSSION PAPERS

RECENT TITLES

1990

- 9001 A. STEINHERR, Ch. HUVEENEERS, Universal Banks: The Prototype of Successful Banks in the Integrated European Market? A View Inspired by the German Experience.
- 9002 H. SNEESSENS, Structural Problems and Quantity Constraints in Macroeconomic Models.
- 9003 O. LICANDRO, Uncertainty and Tobin's Q in a Monopolistic Competition Framework.
- 9004 F. FORGES, J.-F. THISSE, Game Theory and Industrial Economics: An Introduction.
- 9005 G. PFANN, Economic Crisis and the Asymmetric Multivariate Flexible Acceleration Model.
- 9006 M. GERMAIN, Le Principe de Conservation de la Matière dans le Cadre du Modèle d'Harrod-Domar.
- 9007 C. ARNSPERGER and D. DE LA CROIX, Wage Bargaining with a Price-Making Firm: Right-to-Manage and Efficient Bargaining.
- 9008 M. DE VROEY, Crise du Marxisme: L'Aspect Théorique.
- 9009 A. RODRIGUEZ HERRERA, La Firme dans la Théorie Néoclassique.
- 9010 D. DE LA CROIX, O. LICANDRO, Investment Under Demand Uncertainty and Capacity Constraints: An Empirical Application to Belgium.
- 9011 P. SIMMONS and D. WEISERBS, Consumer Price Perceptions and Expectations.
- 9012 R. GILLET, Processus d'Evolution du Prix des Actions en Temps Continu et Efficience du Marché Boursier.
- 9013 D. DE LA CROIX, Wage Bargaining, Social Security and Capital-Labour Substitution.
- 9014 Ch. ARNSPERGER, Information Failures and Wandering Systems in Keynesian Economics - Clower-Leijonhufvud Revisited.
- 9015 Ch. ARNSPERGER and D. DE LA CROIX, Union Power and Price Fixation: A General Equilibrium Perspective.
- 9016 H. YAMAWAKI, Exports and Foreign Distributional Activities: Evidence on Japanese Firms in the United States.

1991

- 9101** R. GILLET, Efficience informationnelle du marché boursier: définitions, tests empiriques et interprétation cohérente des résultats
- 9102** H. ENTORF, Real Business Cycles: Is Neglecting Demand Shocks Justified ?
- 9103** M. LUBRANO, Testing For Unit Roots Cointegration in a Bayesian Framework.
- 9104** J. BUGHIN, Testing Oligopolistic Behavior within an Efficient Wage Bargaining Model.
- 9105** R. GILLET, l'efficience informationnelle du marché boursier : aspects théoriques et empiriques.
- 9106** J. BUGHIN, An Analysis of the Supplier-Induced Demand in the Hospital Sector : Switching Regime Estimates for Belgium.
- 9107** R. ANDERSON and A. POWELL, Markets, Stabilisation and Structural Adjustment in Eastern European Agriculture.
- 9108** H. BOGAERT, T. DE BIOLLEY, J. VERLINDEN, L'ajustement des salaires face aux chocs pétroliers et les réponses de la politique économique.
- 9109** M. TUTUNCU, Valuation of the Shares of a Labor-Managed Firm.

Copies of the Discussion papers can be obtained from :
Mrs Cl. STAGE, Département des Sciences Economiques - IRES
Place Montesquieu, 3 - 1348 Louvain-la-Neuve Belgium

BULLETIN DE L'IRES**TITRES RECENTS /
RECENT TITLES**

1990

- 142 B. VAN DER LINDEN, Dans quelle mesure une diminution des cotisations patronales de sécurité sociale stimule-t-elle l'emploi ?
- 143 Ph. DEFEYT, L'emploi et le coût du travail. Pourquoi, pour qui et comment réduire le coût du travail ?
- 144 O. LEFEBVRE, Caractéristiques de l'intermédiation financière et conditions de la sécuritisation en Belgique.
- 145 V. KOMAREK, East European Governments in East-West Economic Relations : The Role of Czechoslovakia.
- 146 D. DE LA CROIX, Un modèle explicatif des politiques sociales.
- 147 J. LUIS PEREZ, Offre et demande d'emplois: le chômage en Belgique de 1984-1988.
- 148 Ph. DEFEYT, P.-M. BOULANGER ET A. LAMBERT, Soins de santé et santé publique: la dimension régionale.
- 149 M. VAN OVERBEKE, Comportement des stocks et fluctuations conjoncturelles.

1991

- 150 Ph. DEFEYT, La situation sociale et économique en Wallonie: bilan et perspectives.
- 151 Ph. DEFEYT, L'harmonisation de la fiscalité indirecte en Europe "Les propositions de la Commission.
- 152 Séries de base de l'économie belge.

<p>Les Bulletins de l'IRES peuvent être obtenus auprès de: Mme A.-M. SCALLIET, Département des Sciences Economiques - IRES Place Montesquieu, 3 - 1348 Louvain-la-Neuve Belgique Le prix moyen d'un Bulletin est de l'ordre de 200FB</p>
--

<p>Copies of the "Bulletin de l'IRES" can be obtained from : Mrs A.-M. SCALLIET, Département des Sciences Economiques - IRES Place Montesquieu, 3 - 1348 Louvain-la-Neuve Belgique The average price around BF 200.00 for a single copy</p>
