

me idealizovana kapitalistička kompetitivna firma, nego kapitalistička firma koja je pod snažnim uticajem sindikata — onda je privreda sa Wardovim kooperativama daleko aktraktivnija alternativa, nego što to pokazuje prvobitna tehnička analiza.

WORKER MANAGEMENT AND WORKER-OWNER SHARING IN THE HIERARCHICAL WORK ORGANIZATION*

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1. INTRODUCTION

The aim of paper is the microscopic analysis of the implications of worker management in the context of a model of a firm facing growth opportunities. In particular, it attempts to do the following:

(1) Provide an explicit treatment of the internal organization of the firm (section 2). In most of the models considered by earlier authors, the aim of the worker-managed firm is identified with the maximization of (life-time) income per worker, treating all the workers associated with the firm as homogeneous.¹⁾ Sometimes the firm is assumed to be interested in its growth, which supposedly reflects the preference of the manager (see Atkinson [2]). But the managerial growth maximization hypothesis seems to me to be made *ad hoc* to explain an apparent tendency of worker-managed firms to grow. By assuming the seniority principle of the internal organization of the firm, the workers' preference for the growth of the firm is deducible from the more fundamental axiom of their life-time income maximization.

(2) Examine the way in which the financial structure of the firm is chosen in conjunction with the growth planning of the firm (section 3). The firm is supposed to have two options to finance capital formation. It can either plough back income or borrow from the outside under specified terms. Atkinson's model [2] allows for the possibility of internal financing, but the fraction of internal financing in the total cost of capital formation is treated as a parameter of the model, not as a variable.

(3) Compare the short-run and long-run market policy of the worker-managed firm with that of the state-owned, decentralized firm (section 4.). The difference between the two types of firms lies in that, for the former, the total income of the firm is disposable at the discre-

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¹⁾ An exception which I have come across is a paper by Meade [4] discussing the behaviour of egalitarian cooperatives in Vanek [5], ch. 11: their approaches are, however, quite different from that adopted here.

tion of the associated workers, while for the latter a portion of income accrues to the state as a "tax" on the use of capital.

(4) Suggest a means for relating the economics of the worker-managed firm to a more general theory of the firm (section 4). In particular, it will be indicated how the analysis of the behaviour of the worker-managed firm with respect to pricing, investment and financing serves as an indispensable element for understanding the behaviour of a "worker participatory" type capitalist firm in the broad sense of the word.

Let me explain point (4) in a little more detail. As the vast and growing literature on the internal labour market indicates, the workers of big firms in the capitalist economies are equipped with more or less firm-specific skills and knowledge, thereby enjoying a certain degree of monopolistic power in the labour market. To put it differently, incomes generated by the firms are distributed within the firms between the stockholders and the employed workers according to their relative bargaining powers. Such income sharing is realized through diverse institutional arrangements such as the formation of monopolistic labour unions, codetermination, the custom of periodic bonus payment contingent upon the market performances of firms, and more explicit profit-sharing schemes.

Worker management has various facets, but if we simplify the matter by identifying its economic motivation with the objective of maximizing (life-time income per worker, then there is, so to speak, "creeping worker management" even in many of the capitalist firms. Otherwise, there would be no point in our getting together here in Dubrovnik to talk about "The Transition to Self-Management in the Modern Capitalist Countries", except to plot revolutions.

In most of the models considered by earlier authors, the behaviour of the worker-managed firm was compared with that of a corresponding profit (value) maximizing capitalist twin in order to judge the efficiency of the former with the latter as a norm. However, from the positivistic analytical point of view, an aspect of the consequences of stockholder-worker bargaining may be characterized as the weighted average of the market behaviour of the pure worker-managed firm and that of the pure stockholder-oriented firm, with the bargaining powers of workers and stockholders serving as weights in the averaging. The economics of worker management is thus not only relevant to the Yugoslav economy, but may also give a hint as to how the capitalist firm of a worker-participatory type behaves.

2. THE INTERNAL ORGANIZATION

Consider a market economy in which the product of the worker-managed firm is sold on the monopolistically competitive market. It is assumed that time extends indefinitely through periods of equal duration, each of which is denoted by $t = 0, 1, 2, \dots$. At the beginning of the current period, the firm's output level is adjusted (implicit in this assumption is that the firm adjusts the sales price then). At the same time, growth expenditures for sales promotion and investment in new

equipment are made. The effects of these expenditures are not realized until the beginning of the next period.

The current market and technological conditions facing the firm are summarized by the revenue function:

$$R = R(x) \quad \dots (1)$$

where R is the total revenue net of current cost for materials and x is the amount of output measured by the number of the workers needed when production is organized in the most efficient way.

The long-run market condition is summarized by what I will call the growth cost function:

$$T = \psi(g) \quad \dots (2)$$

which relates the desired rate of sales growth g from one period to the next (under a chosen sales price) to the amount of expenditure T per unit of current sales necessary for that sales expansion. $\psi(\cdot)$ is a monotone increasing, convex function. That is, if the firm wants to expand its sales at a faster rate, then it has to spend more to promote sales. But the marginal effect on sales growth of an additional expenditure is diminishing. The growth cost function is supposed to remain unchanged over periods.

As for fixed equipment, I assume that units of equipment required per unit output can be bought for k dinar a period before their use and that they are subject to complete depreciation within a period. In other words, there is only a one-period capital. I know that this is a stringent assumption. But it is good enough for our purpose.²⁾ I suppose that the firm is equipped with K_0 dinar worth of capital stocks at the beginning of the current period.

In this section, I shall confine myself to the analysis of a simple case where the cost of investment is entirely bound to be financed internally. Then the cost of old investments is "sunk" and the firm's income net of investment cost is now defined as

$$\pi = R(x) - [T + k(l + g)]x. \quad \dots (3)$$

where x is a chosen output. This amount is to be divided up among the associated workers. I assume that the number of workers is adjustable to the requirement of current production. (Alternatively, I can assume only at the cost of notational complexity that there is a lower bound-ary for the number of workers, possibly equal to the number of existing workers.) The current mean income of the associated workers is given by π/x .

It is assumed that the firm makes a once-and-for-all decision about its sales price (which is implicit in the decision about its output) and about its rate of growth. The firm is therefore in steady state growth.

²⁾ Sometimes an alternative assumption is made to the effect that equipment is durable, but that their amounts can be adjusted instantaneously to the requirement of current production. This assumption is not only unrealistic, but also fails to capture a particular price-setting pattern of the worker-owner sharing firm resulting from the fixity of durable equipment. I discuss this problem elsewhere [1] and interested readers may refer to it.

That is, the income of the firm net of costs for materials, sales growth and investment at time period $t(t=0, 1, 2, \dots)$ is expected to be $\pi(1+g)^t$.

Now I shall look into the internal organization of the firm. Instead of complicating the model too much by supposing a general hierarchical structure, I shall assume a simple two-layer structure, that is, the associated workers are classified into two groups, the senior workers and the junior workers. The senior workers receive more income than the junior workers. This may sound dissonant to the egalitarian spirit of worker-management. Still, there seems to me two reasons to postulate this, one positive and the other normative. First, through perpetual association with the firm, a worker may acquire firm-specific skills and knowledge and thereby become more productive. If the workers are to be paid according to their work, an unequal earnings structure is likely to emerge. Second, workers who have been associated longer with the firm have contributed more to the accumulation of physical and human capital at the firm. Therefore, they may deserve more income as returns from the accumulated capital.

A proportion β of the senior workers in the total labour force of the firm is constant regardless of the size of the firm. The size of the total labour force is set proportionally to the amount of current output. Therefore, both groups will expand at the same rate g as sales. When there are vacancies in the senior groups, they are filled by the promotions of junior workers already in the firm. No recruitment is made from the outside. Only vacancies in the junior group are filled externally.

For simplicity's sake, let us further assume the following: (1) All the workers live forever (this assumption can be removed only at the cost of notational complexity). (2) All the workers have an identical von Neumann-Morgenstern utility function of income ω per period of the following form:

$$u(\omega) = \begin{cases} \frac{\omega^{1-\alpha}}{1-\alpha} & \alpha \neq 1 \\ \log \omega & \alpha = 1 \end{cases}$$

(3) All the workers have the rate ρ at which they discount the future utilities of incomes. (4) Given a rate of organizational growth, all the junior workers currently in the firm have an identical probability of their promotion to the rank of a senior worker at the beginning of each period.

The life-time income of a junior worker is then uncertain. The discounted sum of an expected utility stream derived from the present income to indefinite future incomes depends upon the probability that he will be promoted to the rank of senior worker at each of the future periods which, in turn, depends upon the rate of sales growth which the firm is planning. Let g be the planned sales growth. Let w_1 stand for the incomes per period of a junior worker and $\delta (> 1)$ represent the income differential between the junior and senior worker, defined as the senior worker's income expressed in units of income of a junior

worker. The value of w_1 and δ are constrained by the condition:

$$\pi = [(1-\beta) + \beta\delta]w_1x \quad \dots (4)$$

Let us treat δ as a parameter of the model and leave the way of its determination open.²⁾ The certainty equivalence of a junior worker's income w_1 is defined as the income such that he is indifferent between earning \bar{w}_1 in each period for ever and earning w_1 or δw_1 depending upon his position in the hierarchical order. It is given by

$$w_1 = \frac{\pi}{x} G(g), \quad \dots (5)$$

where

$$G(g) = \begin{cases} \frac{[1-t(g) + t(g)\delta^{1-\alpha}]^{1/(1-\alpha)}}{(1-\beta) + \beta\delta} & (\alpha \neq 1) \\ \frac{\delta^{t(g)}}{(1-\beta) + \beta\delta} & (\alpha = 1) \end{cases}$$

and

$$t(g) = \frac{\beta g}{\rho(1-\beta) + \beta g}$$

The certainty equivalence of a junior worker's income \bar{w}_1 is the product of the mean income of the associated workers and a factor $G(g)$ depending upon g . $t(g)$ may be interpreted as the life-average probability of a junior worker's promotion. The derivation of the formula is relegated to the Appendix. It is also verified that

$$G(0) = \frac{1}{\beta + (1-\beta)\delta} < 1 \text{ and } G'(g) > 0$$

and that for a sufficiently large g , $G(\tilde{g}) > 1$. Let \tilde{g} be defined as $G(\tilde{g}) = 1$. The value of \tilde{g} depends upon the value of α , therefore let us denote it by $\tilde{g}(\alpha)$. As is well-known in the literature on the economics of uncertainty, the value of α is identifiable with the Arrow-Pratt measure of relative risk aversion of a worker. It can be proved (see the Appendix) that

²⁾ This presumption just ignores a possible internal conflict between the interests the senior workers and the junior workers. Something like a Nash bargaining solution may be a more appropriate concept characterizing the nature of the optimal policy of the worker managed firm. If we assume a hierarchical structure with infinite ranks, this difficulty disappears, however, for the maximization of the certainty equivalence of life-time income of any worker leads to same policy. See an unpublished manuscript, »A Further Analysis on »Dual Labor Market Hypothesis and Long-Run Income Distribution« by T. Ishikawa (1978, University of Tokyo).

$$\frac{d\tilde{g}(\alpha)}{d\alpha} > 0.$$

These properties of the multiplicative factor $G(g)$ which represents the gains from growth is then interpreted as follows. If a planned growth rate is very low, then a junior worker is better off under an egalitarian system than under a hierarchical system. There is a critical rate of growth rate \tilde{g} under which he is indifferent between the two systems. If a planned growth rate of the firm is higher than the critical rate, a junior worker is expected to be better off *ceteris paribus* under the hierarchical system. The value of critical rate depends upon his relative averseness toward risk. The more he is risk averse, the higher the critical rate is. For example, if $\beta = 0.3$, $\delta = 1.5$ and $\rho = 0.1$, then $\tilde{g}(0) = 0.088$, $\tilde{g}(1) = 0.106$ and $\tilde{g}(2) = 0.113$. That is, risk averse workers want to consume more today rather than to bet on uncertain future gains from promotion.

Even for a fixed income differential δ , the maximization of the certainty equivalence \bar{w}_1 of the junior worker's life-time income (or equivalently the maximization of the expected discount sum of life-time stream of utilities) and the maximization of the senior worker's income $w_1\delta$ are not compatible. Since everybody starts off with a junior worker, however, it may not be unreasonable to presume that the optimal policies for the worker-managed firm is characterized by conditions for the maximization of the certainty equivalence subject to appropriate constraints.³⁾ Let us

$$\begin{aligned} & \text{maximize } \bar{w}_1 \text{ with respect to } x, \text{ and } g, \\ & \text{subject to the constraint (1), (2), (3), (5) and} \\ & kx \leq K_0. \end{aligned} \quad \dots (6)$$

The last conditions imply that the existing stocks of equipment set an upper boundary for feasible output.

We have the following Kuhn-Tucker conditions for the maximization:

$$R'(x^*) - \frac{R(x^*)}{x^*} \geq 0 \quad (= 0 \text{ if } kx^* < K);$$

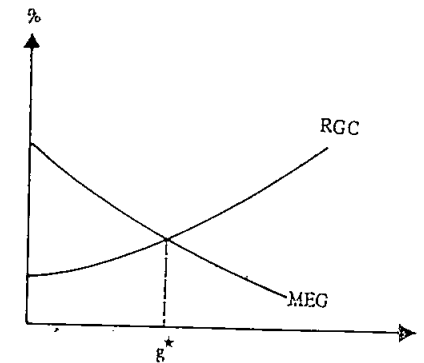
$$\frac{R(x^*) - [\psi(g^*) + k(1 + g^*)]x^*}{[\psi(g^*) + k]x^*} = \frac{G(g^*)}{G'(g^*)}$$

The first equation is the well-known short-run optimal condition observed by Ward, Domar, Vanek, Mead *et al*: The existing workers will wish to build up the association until the marginal contribution to revenue by an additional worker is equal to the average revenue per worker.

The second condition is to determine the optimal growth rate. Let the discount rate that equates the present value of the additional income stream resulting from an extra one per cent of growth to the marginal growth cost (inclusive of investment cost) be called the marginal efficiency of growth (MEG), which is represented by the lefthand side of the equation. The schedule of the MEG is a decreasing function of a planned growth rate g because of the concavity of ψ . The righthand side of the equation $G(g)/G'(g)$ tells how many extra per cents of growth are needed to realize one percentage increase of the certainty equivalence of life-time income of a junior worker, and may be called the relative growth cost (RGC). Its schedule is given by

$$\frac{G(g)}{G'(g)} = \begin{cases} \frac{(1-\alpha)[1-t(g) + t(g)\delta^{1-\alpha}]}{(\delta^{1-\alpha} - 1)t'(g)} & \alpha \neq 1 \\ \frac{1}{(\ln\delta)t'(g)} & \alpha = 1 \end{cases}$$

It can be easily verified that it is an increasing function of g and



$G(0)/G'(0) > 0$ if $\delta > 1$ and $\beta > 0$. The second condition is then interpreted to say that growth expenditure should be expanded until the MEG becomes equal to the RGC. Thus, the optimal growth rate for the worker-managed firm is positive even if there are no external economies of scale, the sole factor which has been cited as the cause of its growth in the literature (See Atkinson [2], p. 380).

3. The Financial Structure

In this section let us introduce the possibility of external finance for investment, and treat the financial structure of the firm as its controlling variable. Let λ be a debt-asset ratio to be chosen at an interest rate i . Suppose that currently the firms make a once-and-for-all decision about it together with sales price and growth rate. Then the firm is in

„steady state growth” from the next period on. But the present capital stocks and debt were chosen in the past and are not in line with steady state requirements, except by mere chance. If they were, the current net income of the firm would be

$$\pi = R(x) - [T + (1-\lambda)gk + \lambda ik + k]x \quad \dots (7)$$

and it would grow at the rate g from the next period on. But the actual current net income of the firm is

$$\pi^o = R(x) - Tx - (1-\lambda)(1+g)kx - \lambda_{-1}(1+i)K_o$$

where λ_{-1} is the ratio of total stocks of debt to the value of capital stocks. Define

$$\psi(x, \lambda) = \pi^o - \pi = (1+i)[\lambda kx - \lambda_{-1}K_o] \quad \dots (8)$$

Let us confine our analysis to the case where $\alpha = 0$, i. e., where the workers are risk neutral. Then the certainty equivalence (the expected value) \bar{w} of a junior worker's life-time income is given by

$$\bar{w}_1 = \frac{1}{x} [\pi G(g) + \frac{\rho \psi(x, \lambda)}{(1-\beta) + \beta \delta (1+\rho)}]$$

Differentiating \bar{w}_1 with respect to λ , we have

$$\frac{\partial \bar{w}_1}{\partial \lambda} = \frac{k}{x[(1-\beta) + \beta \delta]} [(g-i)(1-i(g) + i(g)\delta) + \frac{\rho}{1+\rho}(1+i)]$$

Let \tilde{i} be the value of g which sets the righthand side of the equation equal to zero for $x = x^*$. A little calculation shows that

$$\tilde{i} = \frac{1}{1+\rho} [i - \rho] \quad \text{if } \delta = 1$$

and

$$\frac{d\tilde{i}}{d\delta} > 0 \quad \text{if } \delta > 1.$$

The \tilde{i} may be interpreted as the effective interest rate. For $\delta = 1$, it is the present value difference of the loan rate and the worker's subjective discount rate.

The maximization of \bar{w}_1 now requires that

$$\lambda^* = \begin{cases} 1 & \text{if } g^* > \tilde{i} \\ 0 & \text{if } g^* < \tilde{i} \end{cases}$$

In words, this means the following. Given a hierarchical structure δ , the

firm wishes to secure investment funds from external source, as far as the planned growth rate is higher than some critical rate \tilde{i} . If the planned growth rate becomes lower than the critical rate because of a downward shift of the MEG schedule and/or of upward shift of the RGC schedule, the firm will wish to substitute internal funds for external loans. The critical rate \tilde{i} is lower and accordingly external funds are preferred, if (1) the interest rate is lower, (2) relative to the workers' subjective discount rate and the pay structure is more egalitarian.

This line of analysis suggests that the worker-managed firm is not likely to be engaged in much self-financing. However, it may be desirable to limit the availability of external funds depending upon the prevailing social opinion about distributive justice. Let us therefore examine the effect of community control on the behaviour of the worker-managed firm which sets the limit of external financing according to the availability of internal funds. Specifically, I assume that λ is not a control variable of the firm, but is a decreasing function of the average revenue per worker of the following type:

$$\lambda = 1 - a \frac{R(x)}{x}$$

where a is a positive constant.⁴⁾

For simplicity's sake, let us consider the case where $\delta = 1$. Then differentiating the corresponding income \bar{w} of the workers with respect to x , we have

$$\frac{\partial \bar{w}}{\partial x} = \frac{1}{x} [(R'(x) - \frac{R(x)}{x}) (1 - ak(g - \tilde{i})) - \frac{\rho K_o}{1+\rho} \cdot \frac{R(x)}{x}]$$

To make a (meaningful) comparison, let $g > \tilde{i}$. Then if there is no financial constraint from outside, the firm wishes to be financed completely externally and it holds that

$$\frac{\partial \bar{w}_1}{\partial x} = \frac{1}{x} [R'(x) - \frac{R(x)}{x} - \frac{\rho K_o}{1+\rho} \cdot \frac{R(x)}{x}]$$

In order for the income of the firm to be positive, x and g must satisfy $R(x) > (g - \tilde{i})kx$. For those x and g $\frac{\partial \bar{w}}{\partial x} < \frac{\partial \bar{w}_1}{\partial x}$, hence \bar{x}^*

⁴⁾ The 1972 reform in Belgrade is described by Furubotn and Pejovich as follows:

„The participating firms agreed to allocate their earnings between the wage fund and other funds in accordance with the rules stipulated in Article II of the Social Contract for Belgrade. The latter stated that those firms whose earnings per worker exceeded the average level established for the city by the Social Contract (24, 850 dinars) had to allocate a larger percentage of their earnings to internal funds, while those firms whose earnings per worker fell below the average level could channel a larger percentage of earnings into the wage fund. ([3], p. 294).

maximizing \bar{w} is smaller than \bar{x}^* maximizing \bar{w}_1 (g^* maximizing \bar{w} is equal to \bar{x}^* maximizing \bar{w}_1).

We conclude that if there is a financial constraint as specified above, the output chosen by the firm will be smaller (the sales price chosen by the firm is higher) than the one under the free operation of the loanable fundus market. This is a dilemma for the worker-management economy. If the society tries to control the availabilities of investment funds from the social distributive point of view, the firms react to it by raising their sales prices and limiting entries of new workers to the existing association.

4. Owner-Worker Sharing

In this section, I would like to introduce the model the external owner(s) of the firm who shares the income of the firm with the workers of the firm. Let Θ be the owner's share of the firm's income π . By examining how the model firm reacts to a change in the value of Θ from zero to a positive value, I shall try to understand how the worker's self-managed firm behaves differently from the owner-worker sharing type firm.

It is assumed that the firm makes once-and-for-all decisions about sales price (implicit in decision about output), growth rate and distributive share Θ . Suppose that it always finances its capital formation internally (this assumption will be relaxed later). In this case, the present value of the owner's income at the discounted rate i is given by

$$V = \frac{\Theta\pi}{i-g} \quad \dots (9)$$

provided that $g < i$.

Let me now comment on possible relationships between the worker and the external owner. In a socialist environment, the external owner may be identified with the state. In this interpretation, $\Theta\pi$ may represent income transfer from the firm to the state, say in the form of tax, and its present value V may represent the state's income-transferring power from present to future when the income-sharing ratio between the firm and the state remains unchanged at Θ . In a capitalist environment, the external owner may be identified with a collective body of stockholders. In this case, $\Theta\pi$ represents dividends to the share and V , market value of the firm. In contrast to those institutional settings, the workers' self-managed firm is identified with the case where there is no external owner, i. e., $\Theta = 0$. The external control over the firm from the community (the society) as a whole is pronounced only through the manipulation of conditions on external loans such as the interest rate and credit availabilities, or through moral persuasion.

An efficient policy of the worker-owner sharing firm is defined as the set of 3-tuple, output level x^* , growth rate g^* and distributive share Θ^* of the owner under which the value of V and that of the certainty equivalence of a junior workers' life-time income \bar{w}_1 cannot be raised si-

multaneously by any change of the policy. As is well-known, such policies are not determined uniquely, but all of them are characterized as the 3-tuple which

$$\text{maximizes } \bar{w}_1 = \frac{(1-\Theta)\pi}{x} G(g)$$

subject to the constraints (1) (2) (3) (6) (9) and

$$V \geq \bar{V}$$

for some value of \bar{V} .

The Kuhn-Tucker conditions for the maximization are given as follows:

$$(1-\Theta^*) \frac{R'(x^*)x^* - R(x^*)}{x^{*2}} G(g^*) + \mu \frac{\Theta^*}{(i-g^*)}$$

$$[R'(x^*) - \psi(g^*) - (1+g^*)k] = 0;$$

$$\frac{(1-\Theta^*)}{x^*} [G'(g^*)\pi^* - G(g^*)(\psi'(T^*) + k)]$$

$$+ \mu \frac{\Theta^*}{(i-g^*)^2} [-\psi'(T^*) + k](i-g)x^* + \pi^*] = 0;$$

$$-\frac{1}{x^*} G(g^*) + \frac{1}{i-g^*} = 0;$$

where

$$\pi^* = R(x^*) - [\psi(g^*) - k(1+g^*)]x^*$$

and μ is a Lagrange multiplier. Those three equations are to be solved simultaneously for x^* , g^* and Θ^* . But in general, the higher value of Θ^* corresponds to the higher value of \bar{V} .⁵⁾ Assuming the equations have been solved for Θ^* , substituting the third equations into the first and the second to cancel the Lagrange multiplier and after re-arrangements, we get

$$[A] (1-\Theta^*) \left[R'(x^*) - \frac{R(x^*)}{x^*} \right] + \Theta^* [R'(x^*) - \psi(g^*) - (1+g^*)k] = 0,$$

$$[B] MEG^* = \frac{1}{(1-\Theta^*) \frac{1}{RGC^*} + \Theta^* \frac{1}{i-g^*}}$$

⁵⁾ See [1].

The condition [A] says that the firm wishes to select the output level under which the weighted arithmetic mean of marginal revenue per worker and of the marginal income of the firm is equal to zero, with the fractions of income shares by the workers and the external owner as weights in the averaging. Since $R(x^*) - [\psi(g^*) + (1 + g^*)k]x^* > 0$, the more weight given to the workers, the less the chosen output will be (the higher the chosen sales price will be).

The condition [B] says that the firm wishes to expand until the MEG becomes equal to the harmonic means of the workers' RGC and the effective interest rate for the owner defined as the difference between the interest rate and the rate of growth of the firm (the rate of capital gain), where the weights are given again by the respective shares of the workers and the owner. Whether the owner-worker sharing firm grows faster or not as the workers' share increases depends upon the relative magnitudes of the RGC and the effective interest rate. As noted already, $[G(g)/G'(g)]$ is an increasing function of g , whereas $-g$ is a decreasing function of g . Therefore, is $[G(0)/G'(0)] > 1$, the RGC is always greater than $-ig$ for any positive value of g so that the desired growth rate would decrease as more weight is given to the workers. We have

$$\frac{G(0)}{G'(0)} = \begin{cases} \frac{(1-\alpha)\rho(1-\beta)}{(\delta^{1-\alpha}-1)\beta} & \text{if } \alpha \neq 1 \\ \frac{\rho(1-\beta)}{\ln \delta \beta} & \text{if } \alpha = 1 \end{cases}$$

so that a higher value of $[G(0)/G'(0)]$ corresponds to higher values of β , ρ and α . In words, (1) if the proportion of the senior workers in the total labour force is bigger, (2) the workers' subjective discount rate is higher, and/or (3) if the junior workers are more risk averse, each relative to the interest rate, then it is more likely that the firm wants to grow slower and to consume more today, accordingly as more weight is given to the workers' preference.

So far we have assumed *a priori* that internal funds are the only source of growth financing. Actually, the external owner is indifferent between external and internal financing. For the sum of value V and the owner's share of external debt is independent of the firm's choice of financial structure represented by λ in the manner of Modigliani-Miller. Using (7) and (8), this can easily be seen as follows.

$$V + \lambda_{-1}K_0 = \Theta \left[\frac{\pi}{i-g} + \frac{\psi(x, \lambda)}{1+i} + \lambda_{-1}K_0 \right]$$

$$\frac{R(x) - [T + (1+g)k]x}{i-g} + \frac{i\lambda_{-1}K_0}{1+i}$$

the value of which is independent of λ . Therefore, as far as the choice of financial structure is concerned, the workers' preference would prevail and the analysis of section 2 holds just as it was for owner-worker sharing firm.

The following should be noted: The values of x , g , and λ which maximizes w_1 for an arbitrarily fixed value of Θ^* are different from x^* , g^* , and λ^* which would constitute an efficient policy together with the Θ^* . The former is simply equivalent to the optimal output, growth rate and financial structure for the purely worker-managed firm. In other words, maximization of w_1 (or alternatively that of V) for a fixed value of Θ would not lead to an efficient outcome. w_1 should be maximized for a fixed value of V or *vice versa*.

This property of the model has an interesting implication of the management of a state ownership economy where investment and price-setting decisions are decentralized. If the state is interested in efficient income redistribution in such an economy, it should not rely upon a scheme of proportionate income tax applied to firms. This would lead to inefficient production decisions by the firm. The state should rather levy an «interest» — like change iV on the value V of the firms and give the growth credit gV to the firm. Then income transferred to the state is equal to $\Theta\pi$ corresponding to an efficient policy of the firm, as can be seen from (6). The value of the firms need not be assessed «objectively», if it is meant by the market valuation. In fact, as von Mises argued about sixty years ago, this would be impossible in socialist economies, where the capital market does not exist. The value of a firm may be set by the state according to the needs of the socialist community and only needs to be revalued afterwards, according to how the firm grows. The more the state sees it necessary to transfer income from the firm, the lower the firm would set its sales price to protect the interests of their own workers.

As for the capitalist firm, the stockholders' share Θ^* and the workers' share $1 - \Theta^*$ would be determined as a result of an equilibrium of their bargaining powers. The bargaining power of each party may be conceptualized in terms of its attitude toward risk and its external opportunities outside the firm (for instance, the state of the labour market for the workers and the state of the financial market for the stockholders). Such a conceptualization and the description of a (bargaining) process which would bring about an equilibrium of the bargaining powers are expounded in my other paper [1]. In that model, the manager of the firm is regarded as an agent who assesses the bargaining powers of both the workers and stockholders, and brings about the stability of the organization through the formulation of efficient market and distributive policies.

APPENDIX

If the firm grows from one period to the next at a rate, g , the probability q of a junior worker to be promoted to the rank of junior worker in the next period is given by

$$q = \frac{g\beta}{1-\beta}$$

The probability of promotion in future period t ($t = 1, 2, \dots$) assessed at the current period ($t = 0$) is given by $q(1-q)^{t-1}$. After promotion, he expects the present value of utility sum

$$\frac{q(1-q)^{t-1}}{(1+\rho)^{t-1}} \sum_{\tau=1}^{\infty} \left(\frac{1}{1+\rho} \right)^{\tau} u(w_1\delta) = \frac{q(1-q)^{t-1}}{\rho(1+\rho)^{t-1}} u(w_1\delta).$$

Summing over t ,

$$\sum_{t=1}^{\infty} \frac{q(1-q)^{t-1}}{\rho(1+\rho)^{t-1}} u(w_1\delta) = \frac{q(1+\rho)}{\rho(\rho+q)} u(w_1\delta) = \frac{\beta g(1+\rho)}{\rho[\rho-\rho\beta+g\beta]} u(w_1\delta)$$

The probability in period t ($t = 0, 1, 2, \dots$) of a junior worker staying at the rank of a junior worker is given by $(1-q)^t$. The present value of utility he expects in that period is given by

$$\frac{(1-q)^t}{(1+\rho)^t} u(w_1).$$

Summing over t ,

$$\sum_{t=0}^{\infty} \frac{(1-q)^t}{(1+\rho)^t} u(w_1) = \frac{1+\rho}{\rho+q} u(w_1) = \frac{(1+\rho)(1-\beta)}{\rho-\rho\beta+g\beta} u(w_1)$$

Therefore, the present value of total sum of utilities, when $\alpha \neq 1$, is given by

$$\frac{w_1^{1-\alpha}}{1-\alpha} \frac{(1+\rho)}{\rho-\rho\beta+g\beta} [(1-\beta) + \beta g \delta^{1-\alpha}].$$

On the other hand, if a junior worker earns a certain income \bar{w} forever, the present value of utility sum is given by

$$\frac{\bar{w}_1^{1-\alpha}}{1-\alpha} \sum_{t=0}^{\infty} \frac{1}{(1+\rho)^t} = \frac{\bar{w}_1^{1-\alpha}}{1-\alpha} \frac{1+\rho}{\rho}.$$

Setting the two present values equal and using the constraint (4), we have the formula (6). The case when $\alpha = 1$ can be treated in the same way.

Next, differentiating $t(g)$ with respect to g ,

$$t'(g) = \frac{\beta\rho(1-\beta)}{\rho[(1-\beta) + \beta g]^2} > 0,$$

by which we see that there is a positive one-to-one correspondence between g and α . Therefore, in order to know the reaction of the value of $\bar{g}(\alpha)$ as defined in the text to the parametric change in α , we might as well examine the reaction of \bar{t}_α satisfying $1 =$

$$= \frac{[(1-\bar{t}_\alpha) + \bar{t}_\alpha \delta^{1-\alpha}] / 1-\alpha}{(1-\beta) + \beta\delta}$$

Let $(1-\beta) + \beta\delta = k$. Then

$$\bar{t}_\alpha = \frac{1-k^{1-\alpha}}{1-\delta^{1-\alpha}} \quad (\alpha \neq 1).$$

Differentiating \bar{t}_α logarithmically with respect to α

$$\frac{1}{\bar{t}_\alpha} \frac{d\bar{t}_\alpha}{d\alpha} = \frac{k^{1-\alpha} \log k}{1-k^{1-\alpha}} - \frac{\delta^{1-\alpha} \log \delta}{1-\delta^{1-\alpha}}.$$

Since $\delta > k > 1$, we have

$$(1-k^{1-\alpha})\delta^{1-\alpha} - (1-\delta^{1-\alpha})k^{1-\alpha} = \delta^{1-\alpha} - k^{1-\alpha} < 0,$$

hence $d\bar{t}_\alpha/d\alpha > 0$, which implies that

$$\frac{d\bar{g}(\alpha)}{d\alpha} > 0,$$

as required.

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RADNIČKO UPRAVLJANJE I UČESĆE RADNIKA U RASPODELI
PREKO AKCIJA U HIJERARHIJSKIM RADNIM
ORGANIZACIJAMA

Masahiko AOKI

Rezime

Cilj ove rasprave je detaljna analiza implikacija radničkog upravljanja u kontekstu modela preduzeća koje se suočava sa mogućnostima rasta, te nastoji:

(1) da obezbedi eksplicitan tretman unutrašnje organizacije preduzeća koji se bazira na principu starosnog prvenstva (seniority principle). Dohodak radnika tokom njegovog života postaje nesiguran, u zavisnosti od odabrane stope rasta od strane preduzeća. Radnikovo opredeljenje za rast preduzeća izvedeno je iz aksioma o maksimiziranju njegovog dohotka u celokupnom radnom dobu;

(2) da ispita način na koji se izabrana postojeća struktura preduzeća u vezi sa njegovim planiranim rastom. Smatra se da preduzeće ima dve mogućnosti za finansiranje investicije. Jedna se sastoji u korišćenju sopstvenih sredstava, a druga u pozajmljivanju finansijskih sredstava;

(3) da sugeriše način povezivanja ekonomike samoupravnog preduzeća sa opštom teorijom preduzeća.

Od analitičkih nalaza mogu se pomenuti sledeći:

(1) Opredeljenje radnika za rast zavisi od njihovog položaja u odnosu na rizik i hijerarhijsku strukturu unutrašnje organizacije. Što je manji rizik koji snose i što je manja jednakost unutrašnje raspodele, utoliko se više radnici opredeljuju za rast preduzeća.

(2) Optimalna stopa rasta u preduzeća sa radničkim upravljanjem bira se tako da izjednači marginalnu sposobnost rasta (MEG) i relativan rast troškova (RGC). RGC je veći, a prema tome i optimalna stopa rasta je niža, što se više radnici protive prihvatanju rizika.

(3) Preduzeće sa radničkim upravljanjem nastoji da svoje investicije finansira spolja, ukoliko je izabrana stopa rasta veća od kritičnog nivoa. Kritični nivo zavisi od relativne razlike između kamatne stope i subjektivne diskontne stope udruženih radnika, i od razlika u visini nadnica unutar preduzeća. Ukoliko je raspoloživost spoljnih fondova opadajuća funkcija dohotka po pojedinačnom radniku preduzeća, ono nastoji da poveća svoje prodajne cene i ograniči priliv novih radnika, za razliku od slučaja odsustva restrikcije u korišćenju spoljnih fondova.

(4) Optimalna stopa rasta kapitalističkog preduzeća u kome postoji učešće radnika u upravljanju biće izabrana tako da izjednači MEG sa harmonijskom sredinom relativnog rasta troškova radne snage i efektivnom kamatnom stopom za akcionare, pri čemu kod uprosečavanja učešća radnika i akcionara u dohotku služe kao ponderi. (1) Što je udeo starijih radnika u ukupnoj radnoj snazi veći, (2) diskontna stopa radnika je viša, i/ili (3) ukoliko su mladi radnici manje spremni da prihvate rizik, utoliko je verovatnije da preduzeće prihvata sporiji rast, kao i u slučaju relativnog povećanja pregovaračke moći radnika u odnosu na akcionare.

PROFIT AND SELF-MANAGEMENT ENTERPRISE:
SIGNIFICANCE AND IMPLICATIONS

Veselin ĐURĐEVAC*

I. — THE OBJECTIVES AND BEHAVIOUR OF THE SELF-MANAGED ENTERPRISE

1. The theory of the business firm has generally focused attention on two points:

The firm as a decision-making power, and its goals;

The motivation and behaviour of the firm.

Recent analyses of firms clearly show that their objectives may be multiple and not always reconcilable. Most contemporary theoreticians defend the concept of profit maximization. What is largely in dispute, however, is the uniformity of these aims. In their analyses, various methods of multicriteria and pluri-objectives have been developed.

The question of the motivation of the self-managed enterprise in market economics is among the most controversial in present economic literature. The theories advanced range from moderate to extreme, often with strong ideological overtones.

Thus some non-Yugoslav scholars, such as Ward (21), Dumar (5), Vanek (19) as well as others, believe that the main objective of a self-managed enterprise in a market economy is the maximization of the per worker income. This conception seems to be in contradiction with the present economic evolution in Yugoslavia, although it may have been nearer the truth at the initial stages of its self-managed development, when enterprises did not possess independent sources of capital accumulation. Among the Yugoslav economists, one may distinguish three main schools of thought:

... The first claims that the principal objective of a self-managed enterprise is the rate of income — relation between the income realized and the amount of investment applied to the means of production, including the new added value (11). The second group of authors regard profit as the maximizing objective of a self-managed socialist enterprise (16). And finally, according to the third group, the maximization of per worker income acts as the all-embracing aim in a socialist economy (17).

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