ORIGINALNI NAUČNI ČLANCI — ARTICLES

POWER, EFFICIENCY AND PROFITABILITY: A RADICAL THEORY OF THE FIRM

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INTRODUCTION

It is difficult to define what is meant by radical economics.*** There is no uniform radical paradigm. The bond unifying those economists we might call radical is not so much a positive theoretical research program but rather the rejection of the methods, contents, and *Weltanschauung* represented by mainstream economics. This line of thought arose in the late 1960s in the USA. The heterogeneity of radical authors prevents us from defining radical theory, but we hope that what we mean by it will become clear in the course of the exposition. Neither do we give a survey of the radical theory of the firm since there is no such agreed theory, but only a number of articles referring to the firm in one way or another.

Since there is no coherent radical theory of the firm we try to provide a coherent approach ourselves with the help of the work of economists who might even never think of themselves as being radical. We attempt to develop elements of a radical theory of the firm in order to characterize the concept of power in the capitalist enterprise, a concept which is often used but frequently only vaguely defined in radical writings. At first we try to establish the necessity of power in a capitalist firm. Then we analyze the possibilities and the instruments of exercising power. Finally, the relationship between power and efficiency in a capitalist firm is investigated. We come to the conclusion that capitalist enterprises tend to chance inefficiencies in order to guarantee their profitability. In contrast, labor-managed firms seem to avoid these inefficiencies.

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*** The publication criteria of the Review of Radical Political Economics (RRPE) may provide a substitute for a precise definition: "The RRPE encourages articles from all perspectives within a broad definition of radical political economics. A *non-exclusive* list in this tradition includes: Marxism, Institutionalism, the Cambridge Approach, Patriarchy, Social Democracy, Anarchy, Feminism, and Trotzkyism".

1. POWER AND THE CONFLICT OF INTERESTS

1.1. The Incompleteness of the Labor Contract

The relationship between workers and capitalists is viewed by radical economists as an antagonistic relation of a special kind, whereas neoclassical theorists assert that there is no fundamental difference between exchanges in the labor market and in the goods markets. Buyers and sellers of goods always have opposed interests since the buyer wants to minimize the amount he has to pay and the seller wants to maximize revenues. The same holds true for buyers and sellers of labor. This conflict of interests is dissolved as soon as the transactors agree to exchange the goods in question. Since all the transactors do so by their own will and since in a competitive market the price is not the object of negotiations the exchange contract settles the conflict of interest.

Even if the market structure is not competitive the market still fulfills this function. The buyer has to pay a higher price compared to the competitive level but there may be a conflict after the agreement only if one of the parties breeches the contract. According to neoclassical theory the labor market functions in the same fashion. Even if there is a monopsony in the labor market the theory predicts that the amount of conflict is not much different from the level in other markets. Therefore the labor market may be treated in the same way as any other market.

Radical economists disagree with this view. They maintain that in the labor market the object of negotiations is not the amount of work to be done but rather it is labor power, the faculty to work, which is exchanged against a certain wage. The entrepreneur only buys the right to have the worker at his disposal during a specified period of time. The labor contract usually contains only vague provisions concerning the concrete work to be done. Therefore, radicals argue that a labor contract is inherently incompletely specified. In consequence, industrial relations are characterized by a strong tendency for conflicts, as the contracts do not regulate all the relevant items. In the radicals' view, these conflicts will become apparent mostly in the production process. Labor relations may not be interpreted as a form of market exchange but as the process of extracting labor from labor power.

This view of the labor contract is partly shared by authors such as Coase (1937) and Simon (1951) trying to explain why in many cases the market mechanism was supplanted by internal organization, the commands of an entrepreneur. The production process within a firm is not governed by price signals but by entrepreneurial directions. Thus, the production process is not a market relation, an interpretation coinciding with the radical one.

Exploring the difference between contracts regulating goods exchange and labor contracts, Simon stresses the specificity of the latter: the labor contract constitutes an authority relation between the entrepreneur or manager and the worker. The entrepreneur's authority to

tell the worker what to do is restricted by the worker's "area of acceptance". All assignments within this area will be accepted by the worker without opposition.

Simon's and Coase's theories differ from the radical one in one important aspect. Even though Coase emphasizes that production is a non-market process and though Simon's analysis centers on the authority relation their theories still belong to the neoclassical tradition. Both claim that the entrepreneur is able to determine totally the actions of the worker as soon as the employment contract is signed. All potential conflicts are resolved by the bilateral acceptance of the contract terms. The worker submits himself completely to the entrepreneur's power of disposition whenever the boundaries of his area of acceptance are not violated. Therefore, the allocation of work within the firm may be treated in the same manner as the allocation of any other input. The difference between labor and all other factors of production has again vanished.

Radical economists, on the other hand, insist on the antagonistic quality of the employment relation within the firm. Their view paradoxically even conflicts with Marx's own position. Bowles and Gintis (1981) are able to demonstrate that Marx conceptualizes the production process within the capitalist firm as a process of administrating things. By treating labor power as a good and labor as the use value of labor power Marx implicitly assumes that the capitalists are in total control of labor power. In this sense the difference between labor and all other inputs disappears in Marx's theory, too.

I.2. The Enforcement of the Labor Contract

When a firm buys an input other than labor the firm may put it to whatever use it decides. Property rights to that input are completely and unambiguously defined and enforcement of these property rights is guaranteed as soon as the firm is actually in possession of the good. As far as labor power is concerned, not only are the property rights the entrepreneur purchases incompletely defined but also the enforcement of these ill defined rights is not warranted. The entrepreneur has bought the right to direct the worker within certain limits and is therefore entitled to do so *according to law* but *factually* the power of disposition over himself is still embodied in the worker, because his labour power cannot be separated from his person. Since such a separation is physically impossible and since slavery is illegal, a discrepancy between the factual and the legal right of disposition necessarily emerges. This would be of no consequence only *if* there were no disutility associated with work, in other words, only if the marginal utility of labor were positive throughout.

Therefore, the antagonistic relationship between worker and entrepreneur in the production process is a result of the difficulty of enforcing an incompletely transferable property right. The authority relation in production is not generated by a contractual argeement as such but calls for the entrepreneur's power to be enforced. This kind of

power is necessary even if the labor market is competitive and is therefore different from monopolistic or oligopolistic market power.

Whenever a capitalist firm is not able to enforce its authority in the production process its profitability is threatened. Its formal position of authority has to be supported by power. Of course there are instances when property rights are not fully enforceable in a goods market, too. But as there are no *systematic* reasons why they are poorly defined and as there is no such fundamental inseparability as between labor power and person it is not necessary for power to intervene between the parties to the transaction. In such a case the external power of the law guarantees the enforcement of the terms of the contract.

Because of the poor definition of the entrepreneur's rights long lasting and expensive proceedings might threaten the production process if the courts were depended upon to settle every conflict between the workers and the entrepreneurs. The firm would have to prove that the worker has not done his duty although it is not clear what his duties are. Evidently, costs might rise to a prohibitive level if the firm is not able to support the authority relation by something other than external power. The only possibility to solve this problem is the use of power in the production process itself. Only a relationship founded on power is able to bridge the gulf between legal and factual property rights to labor power. This view is, in a sense, compatible with neoclassical theory: The capitalist firm will try to raise the worker's cost of disobedience to a level higher than the reduction of utility associated with executing the employer's command. A utility maximizing worker will then obey "at his own will" even though he may be convinced that the job he is assigned is not in accordance with his labor contract.

I.3. An Economic Theory of the distinction between Labor and Labor Power

The necessity of power relations within the firm results from the radicals' distinction between labor and labor power. Even though this difference is a fundamental prerequisite of their reasoning, they have not provided a sound economic justification for it. If one does not accept it as an axiom defining a capitalist system an economic theory has to be constructed. We use Coase's theory as a starting point. Coase (1937, p. 390) argues that it is transaction costs which are responsible for the existence of firms. Transaction costs are costs of using the price mechanism and of discovering what the relevant prices are. Using the market may be more costly than organizing certain transactions within a firm.

Cheung (1983) lists the following reasons for the existence of non--trivial transaction costs:
(i) The number of transactions necessary for discovering and negotiating prices is reduced when there are firms because the firm is a central contracting agent for all factory owners who would have to transact with each other when using the market.

(ii) Often, a good is composed of many pieces. If the consumer had to buy all these single pieces separately, he would usually not know how to combine the pieces and what value he should put on them. Information costs may become even prohibitive which can be prevented by buying the final product as produced by a firm.

(iii) Information costs play an important role when assessing a worker's effort. When the kind of job assigned to him changes frequently and the nature of future jobs is hard to predict measurement costs can be avoided by paying the worker according to hours worked. A similar problem arises with team production where the productivity of a team member is not directly measurable. In this case, the incentive to shirk may be overcome by assigning a monitor to the group.

All these costs can be reduced substantially by the organization of the firm. If the firm internally only simulated markets, i.e., if the allocation of resources within the firm were governed by the price mechanism, there would be no incentive for firms to emerge. A prerequisite for using the price mechanism is the possibility of exchanging well-defined goods and services. With positive transation costs a centralized allocation of resources governed by the authority of the entrepreneur may be more profitable than using the market. The replacement of a large number of transactions by one single contract is the characteristic feature of labour contracts where the wage is exchanged against the formal acceptance of the entrepreneur's power.

One might argue against this analysis of the labor contract that it is only true when the worker is paid by hours worked. When the worker is remunerated by a piece rate the fundamental difference between labor time and work done vanishes. The institutionalized conflict between worker and entrepreneur is neutralized. One can hold against this view that the majority of workers today is paid by labor time.

Moreover, even if the parties agree on a piece rate the worker usually has to use the firm's machines so that the entrepreneur is not indifferent towards the number of pieces produced. The entrepreneur is interested in a maximum piece rate per unit of capital whereas the worker would like to produce the number of pieces compatible with his preference ordering, i.e. when the marginal disutility of work equals the utility of income earned by the last unit of work. Therefore, even remuneration by piece rate does not do away with the conflict of interests. Aside from the minimization of capital costs per unit of output it is in the interest of the entrepreneur that raw materials are used in an economical way. There is no incentive for the worker to do so no matter what his remuneration scheme. The piece rate system may even encourage a wasteful work practice.

There is one more flaw with the argument that a piece rate system neutralizes the worker-capitalist conflict. Piece rates are a remuneration scheme by output and not by input (worker's effort). This would be no problem if there were a deterministic relationship

between input and output. In reality, there are many sources which may disturb this relationship:

— stochastic disturbances (Stiglitz 1975),
— external effects caused by co-workers, and
— the entrepreneur's actions.

The first item refers to the case when the worker is not responsible for an ill-functioning machine producing either less pieces or pieces of a minor quality so that risk-averse workers may prefer an authority relationship over a piece rate contract. If the entrepreneur is willing to take this risk he can never be sure whether the reduction of output or quality was caused by a stochastic disturbance or by the worker's shirking or carelessness. In this case the entrepreneur prefers an authority relationship.

In the case of external effects leading to a *systematic* "disturbance" of the relationship between the worker's input and output a system of side payments among the workers concerned would have to be installed. The complexity of such a system and the high costs of negotiation may render piece rate contracts infeasible.

Finally the entrepreneur himself may be responsible for influencing the productivity of otherwise homogeneous workers. He may assign machines of different quality (vintage) and reliability to the workers thereby manipulating their income. One may ask whether in this case the relationship between worker and capitalist may still be called a market relationship when the buyer of a good has direct influence on the terms of production. Even in monopsonistic markets this is not possible. The entrepreneur is in control of this possibility independently of the remuneration scheme. Therefore, it is more adequate to distinguish between a power relationship concerning work done and a market relationship when labor power is the object of the transaction.

II. THE BASIS OF POWER

So far only the radical hypothesis concerning the necessity of power withing the labor relation has been discussed. Nothing has yet been said about the concrete forms and the basis of power used by the entrepreneur to gain control over the worker. In the following section, we will describe the historical evolution of the different kinds of power exertion in a capitalist firm (see Edward's exposition, 1981).

II.1. From Personal to Technical Control

In the beginning of the capitalist development, the typical firm was small and therefore easily controlled by a single owner, the entrepreneur. He usually had a good knowledge of the production process and had close contact with his workers. It was the entrepreneur himself who had direct control over them. The production process in small firms is often under *personal (or simple) control* even today.

This control system is rather unstructured and informal. Hiring and firing, payment of premiums, pay cuts or altering work-place characteristics were not tied to formal rules but were left to the entrepreneurs' judgement. The effectiveness of personal control was largely dependent on his charisma.

When firms became larger personal control turned out to be infeasible since it was impossible for a single person to supervise the whole complex structure of an enterprise. The entrepreneur had to delegate some of his power to foremen, thereby creating a *hierarchical control* system which has similarities to the strictly hierarchical organization of an army. The disciplinary power was transferred to an intermediate level of workers located between the entrepreneur and the shop floor. Since this new type of superior were employees themselves, their interests did not necessarily coincide with the entrepreneur's. They often used their authority to reach personal goals. Their arbitrary — sometimes even despotic — disciplinary measures were responsible for strikes, sabotage and high fluctuation rates, causing considerable costs for the firm.

According to Edwards, there were several ways the entrepreneurs reacted to this problem. A relatively effective way out of the loss of control was the so-called *technical control* embedded in the production process itself. The assembly line is one of its most advanced manifestations. The workers could not work according to their own personal rhythm any more, and they had to work at a fixed location. Technical control thus restricted the possibilities for communication and personal contacts among colleagues. Apart from the conveyer belt speed, the management could determine minutely each single task to be performed and their sequence. Technical control rendered the great discretionary power of the entrepreneur and the foremen superfluous. The power necessary for closing the gap between the legal and factual disposition over labor was integrated into the technological structure of the firm. For this reason this type of control may be also called structural control.

Even though technical control could solve the problem of supervising the individual worker, it led to collective resistance. Moreover, even rather small groups of workers were able to bring the production process to a halt and induce high costs to the firm. Therefore, this type of control was not fully satisfactory from the management's point of view. The conveyer belt determined only the speed the employee had to work by and he still had some discretion over the *quality* he produced. When the entrepreneur succeeded in breaking collective resistance, the workers sometimes responded by lowering product quality.

All the types of control described so far can still be found today. Recurring (unorganized) individual or (organized) collective workers' resistance, though, could according to Edward's account prevent the entrepreneur from gaining full factual disposition over labor power.

It has not yet become clear what the basis of the entrepreneur's personal power, often characterized by arbitrariness, was. This is also true for technical control. Because of workers' resistance against these

types of control, entrepreneurs had to look for new ways. But why was it temporarily possible that the entrepreneurs gained — not full but for the survival of the firm sufficient — control over their workers?

II.2. Industrial Reserve Army, Internal Labor Markets, and Disobedience Costs

There are various mechanisms for gaining factual control over the workers. In the United States, the constant flow of immigrating workers may explain to some extent why the control systems worked for a while. But what interests us here are the causes which are generated systematically by economic mechanisms in a capitalist economy and which are not solely dependent on historical coincidences.

Such a cause may be found in the existence of an industrial reserve army. If there were not a pool of unemployed waiting for jobs, dismissal would not be a disciplinary device since the fired worker would be able to find a new job quickly. This mechanism only works if the reserve army is not solely a cyclical phenomenon because then it would only function in a recession. Therefore, theoretical grounds for the existence of some kind of *natural capitalist unemployment rate* resulting from the entrepreneurs' control problem have to be provided. Fortunately, a rigorous theory addressing this issue has recently been developed.

The reasoning will be presented briefly (see Bowles 1985, Fehr 1985c, Gintis/Ishikawa 1984, Shapiro/Stiglitz 1984, Vogt 1985): Contrary to the standard neoclassical model, the entrepreneurs appear as wage-setters even in an atomistic labor market. The possibility and necessity of setting wages is a consequence of the incompletely specified labor contract and imperfect information about the workers' actions. If firm A pays a higher wage than all other firms in the market, the employees will raise their effort because they will lose a part of their income in case of dismissal. Higher wages combined with the threat of dismissal can be used as a disciplinary device if effort is too low. The wage rate maximizing profits for firm A is calculated by equating marginal costs of raising wages with marginal revenues (resulting from rising output caused by rising effort).

If all the firms in the market are identical, this procedure is not only rational for firm A but for all the other firms as well. In equilibrium, all the identical firms will offer the *same* wage rate. But if there are no wage differentials the wage rate loses its function as a disciplinary device. Therefore, the employees will work less, thereby reducing the firm's profitability unless a certain level of involuntary unemployment has been generated by the firms' wage-setting behavior.

In this case, dismissal will lead to a lower income since the fired worker will not be able to find a new job right away.

In this model only underemployment equilibria are possible which can be easily argued in the following way: If all the firms offer the same wage rate and if there is full employment — i.e. the number of

vacancies for homogeneous workers equals the number of people look-ing for a job — a fired worker may find a job at a different firm immediately and without costs. The employed have no reason to fear being layed off. If work is associated with disutility the workers will reduce their effort so that the firms will suffer losses. Thus, full employment cannot be an equilibrium and in equilibrium (with non--negative profits) involuntary unemployment necessarily arises.

Capitalist firms may thus influence their workers' effort by set-ting the wage rate, and gain factual control over them. The crucial point in this argument is the fact that workers cannot leave the firm without cost. In our opinion, this theory of a natural capitalist un-employment rate may be generalized: provided that there are con-flicting interests between capital and labor in the production process, positive costs of disobedience are a necessary and sufficient condition for securing the factual power of disposition over the workers.

This mechanism of generating an industrial reserve army may be viewed as the basis for simple and technical control. From a broader perspective, this mechanism is not the only way of inflicting costs on the worker. There are substitutes for this strategy.

The closest substitute seems to be the payment of premiums, pension and insurance schemes, etc., depending upon the satisfactory behavior of the worker, where the worker loses all claims if he leaves the firm (Lazear 1981). A more elaborate substitute of this kind is *bureaucratic control*, characterized by job ladders within internal labor markets.

These job ladders are accessible only through "ports of entry". Advancement in position and income is usually tied to seniority. In case of dismissal, the worker has to bear mobility costs since he has to start anew at a port of entry in another firm at lower wages. If the job sequel is combined with the acquisition of firm specific human capital, the threat of dismissal becomes even more powerful as firm specific human capital is rendered worthless when leaving the firm. Apart from dismissal, the management may simply deny advancement within the firm, thereby imposing costs on the worker different from mobility costs.

Internal labor markets will not be introduced if one of the fol-lowing conditions holds:

— Low fluctuation costs for the firm. If the production process does not require specific skills the firm may rely on the reserve army mechanism, since hiring and firing is almost costless.

— External mobility barriers. If there are no alternative job faci-lities available or if the wife's mobility is restricted by her husband's job (which is in general providing the larger part of the family's in-come), firms in peripheral areas may pay wages well below the average and do not depend on incentives such as job ladders, that is, simple or technical control suffices.

Everything which has been said so far about types of control and their power base may be tied up with the theory of the segmented labor market. This theory was suggested by empirical findings by Bluestone (1970), Gordon (1972), Doeringer and Piore (1971) who disco-

vered different allocation mechanisms for different groups of workers characterized by sex, age, race, etc. Edwards (S. 191 ff.) views the segmentation of the labor market as a historical process whose result may be ideally described by a specific control system, which is a one--dimensional indicator. The secondary labor market comprises the jobs organized by the principle of simple control, the lower segment of the primary labor market may be described by technical control and the existence of unions. The upper segment of the primary labor market reflects the bureaucratically controlled labor process, that is, the internal labor market. Edwards presumes that the different types of control may not be the only reason for the division of the labor force, but certainly the most important.

Apart from disciplining workers, internal labor markets fulfill other functions as well. Barriers of entry and widely branched job ladders lead to the division of labor into small fragments thereby reducing the incentive for collective action. Individual striving for advancement is encouraged and therefore it is unlikely that the workers will organize themselves and threaten the entrepreneur's authority (Reich, Gordon, Edwards 1973).

In the United States unionists reacted to the growing bureaucratic control by insisting on seniority rules regulating promotion, thereby taking over the management of the internal labor market: they assigned workers to jobs and took disciplinary action against unruly workers. These procedures contributed to the legitimacy of the system (Doeringer and Piore 1971).

The role of the unions may be viewed from a different perspective as well. In order to avoid the firm's disciplinary actions being unjustified in the workers' opinion (and thereby losing their disciplinary power), a system of graduated sanctions (assigment of a different task, pay cuts, dismissal) was introduced. This system was combined with a grievance procedure operated by the unions.

Carter (1982) views internal labor markets as a means of generating an internal reserve army when search and training costs are non trivial and as a means of reducing potential resistance.

Aside from the radical account, a number of neoclassical and neoinstitutionalist authors have treated the subject of internal labor markets. Thurow's (1975) model explains the existence of internal labor markets · by the assertion that specific human capital is created as a joint product in the production process. Fixed wages structures, job ladders and seniority rules guarantee that an experienced worker is willing to share his knowledge with newcomers without having to fear being replaced by them in turn because they work for lower wages and know just as much.

Another reasoning for seniority rules is provided by Lazear (1981). In order to prevent shirking, the firm offers an incentive scheme characterized by rising life earnings profiles. When the worker has just joined the firm his wage is below his marginal product, when he has belonged to the firm for a long time his wage rises above his marginal product. This feature of the payment scheme is compatible with the

radical analysis: These seniority rules inflict mobility costs upon the workers in the case of dismissal.

One of the most interesting contributions is provided by Williamson (1975). The basic feature of his model is the assumption of idiosyncratic job characteristics known only to the job incumbent. Therefore the incumbent enjoys an advantage over otherwise equally qualified competitors enabling him to bargain opportunistically. Complexity and uncertainty call for flexible arrangements. Williamson analyses different types of contracts (contingent claim contracts, recurring spot contracts, Simon's authority relation and internal labor markets) in order to find out which one is optimal in this setting. The individual bargaining modes give rise to higher transaction (contract) costs than the collective bargaining mode (identified with the internal labor market) because the workers' opportunism is alleviated by the internal labor market. By tying the wage to the job and not to the person, individual haggeng over the appropriate wage rate becomes superfluous; job ladders encourage the workers to consummate cooperation; ports of entry restricting newcomers to certain jobs at the bottom of the ladder protect the firm from opportunistic workers who would change jobs for strategic reasons in order to obscure their true productivity; grievance procedures foster a cooperative climate between workers and entrepreneur. Finally, unions facilitate the working of the internal labor market.

We agree with Willman (1982, p. 87) who argues that Williamson analyses only the consequences of worker opportunism: "For internal labor markets to be an acceptably neutral resolution of the problem of bilateral opportunism they would need to constrain the opportunistic tendencies of both sides in equal measure and of course they do not." Internal labor markets and grievance procedures may restrict the entrepreneur's arbitrariness against individual workers but not systematic opportunism against the workers as such. The entrepreneur could use information that the workers have no access to (or only with high costs) to his advantage. Typically, information on product market conditions, technology, production costs, etc. cannot be easily obtained by the workers. What type of contract is able to restrict the entrepreneur's opportunism? Besides, what reasoning can be given for the emergence of unions if labor markets work so satisfactorily for both sides?

These questions can only be answered if the concept of power is not left out from the analysis of industrial relations. Both Williamson's and Thurow's model abstract from power relations, though. Williamson even considers Simon's authority relation (an individual bargaining mode) to be in contrast to internal labor markets (a collective mode). In our opinion the authority relation and internal labor markets are not opposites but rather internal labor markets are a means of securing a functioning authority relation.

III. PROFITABILITY AND EFFICIENCY

In the neoclassical theory of the capitalist firm there is—if perfect competition is assumed — no conflict between the maximization of profits and the achievement of technical efficiency; technical efficiency is even a prerequisite for the choice of technology and work organization. If there were technologies or organization structures that would yield a higher output at the same level of physical inputs than the technology already in use, the entrepreneur would switch to the new technology since his profit would rise. But this reasoning may only be applied if there are no effects of the technological and organizational structure of the firm on the motivation of the workers.

If it is correct that work intensity is not stipulated by contractual arrangements and if the conflict over this variable has to be settled in production then the effects of organizational design on work intensity must be taken into account. When choosing the technology to be used the entrepreneur has to make allowance for his possibilities of control, for the workers' opportunity to get organized, and for the flow of information. Radical theorists stress that these factors are probably responsible for a conflict between profitability and efficiency in a capitalist firm.

III. 1. Inefficient factor proportions

Bowles (1985) shows the possibility for profitable but inefficient technologies in a simple way. The starting point of his model is the fact that different technologies will produce information about worker performance in varying degrees. Conveyor belts, for instance, provide this kind of information as a joint product since the work load is determined by the speed of the belt.

The implications of this idea may be demonstrated by the following profit function:

$$\pi = Y(l, x) - wN - p_x x \quad with \quad L = l(x)N. \tag{1}$$

In this model output price equals one. The wage rate per worker is w, the number of workers is N. Output Y depends on effective work done L, which is work done per worker l times number of workers N, and on other inputs x (capital, raw materials, etc.) with price p_x. The crucial idea is the following: an increase in x supplies the management with more information about the workers' effort which allows for a higher control density and therefore a higher work intensity:

$$\delta l / \delta x = l'(x) > 0.$$

As a consequence, the level of input may be raised to a point of negative marginal products. In order to show this result we have to calculate the first order conditions for a maximum of (1). This condition may be expressed as

$$Y_x/Y_L = p_x/(w/l) - Nl'(x) \tag{2}$$

Y_x designates the marginal product of x,
Y_L designates the marginal product of L, respectively.

In order to attain technical efficiency both Y_x and Y_L have to be positive. Therefore their ratio has to be positive as well. If $l'(x)$ were negative the right hand side of (2) would always be positive. But by assumption $l'(x) > 0$. This means that there are circumstances rendering Y_x/Y_L negative at the maximum profit.

This reasoning may become intuitively clear when rearranging the formula for the case of inefficient factor proportions, $p_x/(w/l) - Nl'(x) < 0$, to

$$(w/l) \, l'(x)N > p_x. \tag{3}$$

w/l is the cost per unit of work intensity and l' (x)N is the marginal quantity of work done by the workers in reaction to a unit rise in x. The left hand side of (3) is an expression for the amount of labor cost saved by a marginal unit of x. If this amount is higher than p_x at the profit maximum it is profitable for the firm to put up with technical inefficiency, since the losses from inefficiency are more than compensated for by the saving of wage cost.

III. 2. Inefficient division of work

Gintus (1976) describes the possibility of inefficiencies resulting from the effects of the division of work on the worker's bargaining power. A worker's productivity may rise with interaction with other workers or with a change in job characteristics. But a concomitant effect of these changes might be a growing solidarity among the workers and a growing opportunity of building coalitions. This, in turn, might enable the workers to carry through higher wages for a given level of effort or a lower level of work intensity for a given level of wages. For this reason it might be more profitable for the firm to fragment the work process to a higher degree by reducing the number of contacts among the workers and by assigning each worker a highly specialized task. A cost minimizing capitalist firm will continue this process of fragmentation until the cost saved by a reduction of horizontal solidarity equals the cost increase due to a reduced efficiency of production.

Reich and Devine (1981) follow a similar line of thought. The crucial variable in their model is the level of work division D. It is assumed that a growing division of work increases output Y at first: $Y_D{}^{*)} > 0$. At a hight level of fragmentation this process is reversed: $Y_D < 0$. The costs of supervision S are assumed to decrease with D, $S_D < 0$, since work tasks become simpler and therefore supervision becomes easier. Output price is taken as one for simplicity.

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* Subscripts designate partial derivatives.

Total increment in profits by a unit of D is a result of the marginal productivity of D *plus* the reduction of supervision costs: $Y_D - S_D$. S — and Y-curves are shown in figure 1.

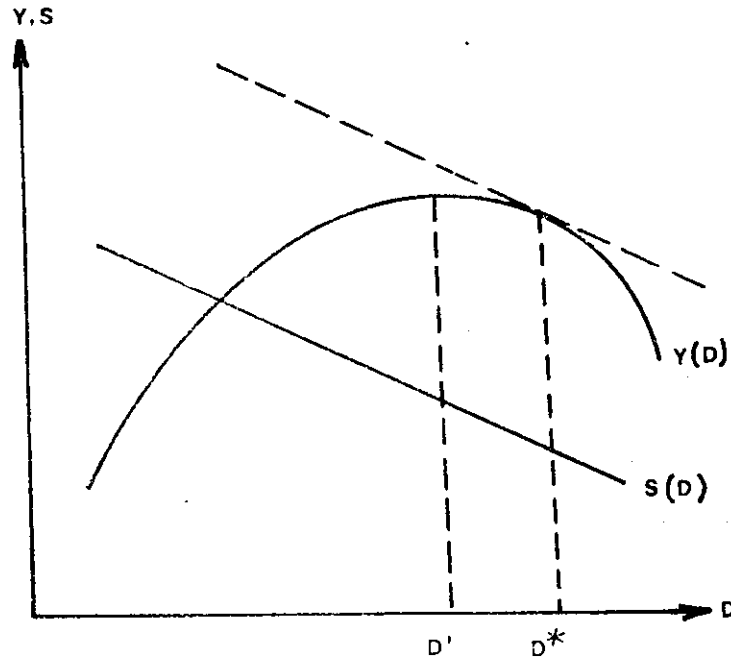*Figure 1*

Profits are given by the vertical distance Y (D) — S (D). With rising D profits rise until D' is reached since Y increases and S decreases. To the right of D' output decreases with D, but supervision costs decrease even more, so that profits still grow until $Y_D = S_D$ is reached which is at D*. To the right of D* profits decrease with D.

The interesting result of this model is the fact that the capitalist firm is willing under the stated assumptions to increase D to such an extent that negative marginal products of the division of work result.

The reason for this in terms of efficiency *too* high level of D is the conflict of interest between labor and capital in the production process. If there were no such antagonism, e. g. as is the case in a labor-managed firm, there would be no necessity for disciplinary action against recalcitrant workers. In accordance with Reich and Devine we conjecture that in a labor-managed firm the processes of specialization and fragmentation are not carried as far as in a capitalist one so that Y_D will be positive at the equilibrium of the firm (see also section IV for a treatment of labor-managed firms). Apart from that, a part of the supervision personnel necessary in a capitalist firm could be used for tasks directly raising output.

The eventuality of higher supervision costs associated with the capitalist firm is a consequence of the workers' incentive to withold information from the management. Due to the conflict of interests, the production and witholding of information is a strategic weapon. The employees of a capitalist firm have in comparison to a labor-managed firm higher incentives and better opportunities to conceal information,

especially about such crucial variables as work motivation, effort, work quality, breaking of rules, possibilities of technological and organizational innovations, standard work time for certain tasks, etc. On the other hand the management of a capitalist firm has an incentive and the opportunity to conceal information, too. Hence we presume that the strategic use, distortion and witholding of information gives rise to an inefficiency of the capitalist firm.

III. 3. Technical progress and efficiency

The antagonism between capital and labor in the production process has also an impact on the technological and organizational arrangement of production and its change. The history of social conflict between capital and labor shows that it was the introduction of new technologies which was often the focus of quarrel (Elbaum/Wilkinson 1979, Lazonick 1979, Wood 1982, Zeitlin 1979). Therefore it is quite likely that considerations of power played a larger role than considerations of efficiency.

III. 3. 1. Assumptions

In order to discuss the problem more thoroughly we consider an atomistic labor market with m identical firms. Labor cost is given as wN (as above), total effective labor input L is equal to lN. The worker's effort l is not dependent on x in this case, but on the implementation of organizational and technological innovations. The level of technical knowledge already in use is supposed to be a continuous variable b. The way b affects l cannot be specified a priori. It is possible that an increase in b either increases l ($l_b > 0$), or decreases l ($l_b < 0$) or does not change l at all ($l_b = 0$). If $l_b > 0$, the introduction of a new technology increases the management's control potential; if $l_b < 0$, it decreases it; if $l_b = 0$, technical progress is neutral.

Of course, technical and organizational innovations do have a cost. The firm either has to have a department of research and development of its own or has to pay licences dues. Moreover, the implementation itself is not costless. Let c be the total cost of attaining and implementing b; with $c_b > 0$, $c_{bb} > 0$. b is supposed to have a direct impact on output Y as well: a marginal unit of b increases Y by Y.

Orthodox theory only takes into account those direct output augmenting effects of technical progress. It implicitly assumes that always $l_b = 0$ holds.

III. 3. 2. The behavior of firms

According to the assumptions made, the profit function may be written as

$$\pi = bY \ (l(b)N) - wN - c(b) \tag{4}$$

The output price is again set to one. The capitalist firm maximizes profits by choosing b and N. Whereas it is plausible that b cannot be changed in the short run, the choice of N is a short run decision.

The profit maximizing value of N is obtained by differentiating (4) partially with respect to N, resulting in the following condition:

$$bY_L l = w. \tag{5}$$

This formula expresses the well-known relationship between marginal productivity and wage rate. Since we have assumed an atomistic market structure w is a parameter for the firm. It can be shown that the demand for workers is a decreasing function of w. Since there are m identical firms in the market the industry's demand for workers may be written as

$$N^d = mN\,(w, b), \quad \delta N^d / \delta w = mN_w < 0 \; (see \; fig. \; 2). \tag{6}$$

We still have to find out which role b plays for the amount of workers demanded. Differentiating π with respect to b renders $\pi_b = = Y + bY_L l_b N - c_b$. If $\pi_b > O$ profits increase with b.

We assume that $\pi_b > 0$ at low levels of b, no matter whether $l_b > 0$ or $l_b \le 0$. From the right hand side of the expression, one can tell immediately that, in the case of $l_b > 0$, the increase of profits is highest since the management is able to supervise the workers more effectively and to extract more labor from them. For this reason, the capitalist firm is not indifferent to the nature of b. Rather it will try to mould technical progress in such a way that $l_b > 0$ results. In other words, capitalist production systematically favors those innovations allowing for an increase in labor done per worker. If labor time is institutionally regulated, an increase of l means an increase of labor productivity per hour. This phenomenon must not be mixed up with an increase of efficiency since the rise of productivity and output is caused by an increased amount of input. An increase in efficiency may only be claimed if output rises with inputs held constant.

In the following we assume that $l_b > 0$. Then the left hand side of (5), the marginal productivity of labor, is an increasing function of b, resulting in an incentive to raise labor demand. Therefore $\delta N^d / \delta b = mN_b > 0$.
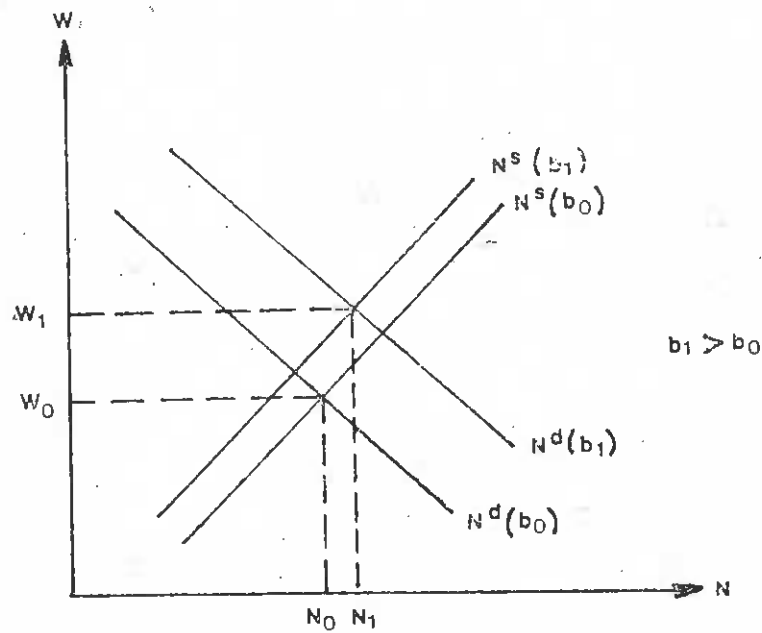
Figure 2

III. 3. 3. The behavior of workers

An increase in b shifts N^d to the right (fig. 2). But what happens to the supply of labor power? We assume that the worker's preferences may be expressed by the following utility function

$$U = U \ (w, \ l(b)) \qquad U_w > 0, \ U_l < 0. \tag{7}$$

The marginal utility of income U_w is positive, whereas the marginal utility of work done U_l is negative. As before, the assumption of a competitive labor market implies that w, the wage rate, is a given parameter. Since $U_w > 0$ the aggregate labor supply function N^S is rising (with b and l kept constant).

What are the effects of b on the workers welfare? Since $l_b > 0$ and $U_l < 0$, $U_l l_b < 0$ holds. Traditional textbook economics *assumes* that the capitalist firms do not have the power to reduce the worker' utility in a competitive environment.

But the *assumption* that the workers' level of welfare is an exogenous parameter for the firm is only justifiable if the level of *all* the factors influencing utility is determined in perfectly competitive markets. In our opinion it is very likely that this strong assumption does not hold in general. For instance, there are by definition no exchange relations in the case of externalities. Only if externalities become the object of negotiations does a market emerge (which is at least a bilateral monopoly).

In our model there is no market for the effective work done per worker. Even if there is no market for labor done one has to analyse what means of power may be used by the parties of the transaction. In

our model the workers only have two options: they may either take a job at a given wage level w and a given level of l or they may be (voluntarily) unemployed. If the reservation utility level $\bar{U}$ is smaller than $U(w, l(b))$ they prefer to work. Since all the firms offer the same terms there is no way to attain a higher utility by changing the employer.

If b rises with w constant, $U(w, l(b))$ decreases, so that there are some workers for whom. U falls below the level of $\bar{U}$. Therefore the aggregate labor supply function shifts to the left (fig. 2).

III. 3. 4. Market behavior

So far we have shown that an effort increasing technical progress shifts the labor supply curve N^s to the left and the labor demand curve N^d to the right. Since b is fixed in the short run, say b_o, the intersection between N^s and N^d is a short run market equilibrium and is denoted by w_0 and N_0 in fig. 2.

Because of $\pi_b > 0$, all firms have an incentive to increase b in the course of time. The immediate effect of $\Delta b > 0$ is an increase of profits and a decrease of workers' utility since innovations cause l to rise and give the managers more power over the workers. Therefore it is rational for the workers to fight against the introduction of the new technology.

If the market structure is atomistic the means for resistance are limited. Hence, it is understandable that there is an incentive for collective action. In this context unions may be viewed as organizations for preventing welfare losses. In the beginning of the labor movement — but presumably even today — the defensive character of workers' coalitions may be their dominant feature. In contrast to this view, orthodox theory treats unions as offensive organizations for enforcing monopoly rents.

When introducing innovations, the entrepreneurs refer verbally to their beneficial effects in the long run. Whether these effects are also beneficial for the workers concerned is an open question. In the short run, innovations clearly reduce the workers' welfare (in disequilibrium). The conflicts resulting therefrom use up resources and have to be viewed as costs of the conflict of interests between capital and labor.

When b_0 rises to b_1 (fig. 2) a new equilibrium position is reached at (N_1, w_1). After all the market reactions have taken place, the workers are compensated for their initial welfare losses. But, of course, we do not know how long this adjustment process takes nor do we know the amount of the wage compensation. Whether the workers are better off at (w_1, b_1) or at (w_0, b_0) cannot be told a priori.

In our opinion this model describes some aspects of capitalist development well. The pressure to exert more effort and the concomitant process of alienation is compensated for (fully?) in the end. But the crucial feature of this process is the fact that it is not governed by the individuals' preferences but by the evolution of the capitalist institutions. The maximization of profits and not the workers' needs is the motor of this process. The preferences are only indirectly — via shifts

of the supply curve — involved. One may therefore conjecture that the individuals would choose a different path if they could choose freely, without restraint.

In the course of time b will be increased until $\pi_b = 0$, say at b^*, will be reached. It can be shown that b^* implies Pareto-inefficiency. For a solution to be Pareto-optimal b has to be chosen in such a way that profits are maximized given U^o.

Maximizing (4) subject to $U(w, l(b)) = U^o$ with respect to b yields

$$\pi_b + \mu U_l l_b = 0. \qquad (8)$$
$$+ \quad - \quad +$$

μ is the (positive) Lagrange multiplier. Since $U_l l_b < 0$, π_b has to be positive at a Pareto-optimum. Therefore the capitalist firm would have to forego possible gains from increasing b still further. Since a profit-maximizing firm would not be content with such a state, one may conclude that the capitalist institutions described above tend to an inefficient level of technical progress. The ultimate reason for this inefficiency is the fact that b is not used to increase the efficiency of production but to strengthen the management's control over the workers.

The following conclusions may be derived from this model:

i) The capitalist institutions discussed above produce a systematic bias in favor of a process allowing the entrepreneur to extract more labor from labor power.

ii) After all the market reactions of shifting supply and demand curves have been concluded, the workers are compensated (only partially?) for their initial welfare losses.

iii) Attempts at founding collective workers' organizations appear to be likely and are motivated by the workers' immediate welfare losses.

iv) In the long run these capitalist institutions tend to a Pareto-inefficient level of innovations and effective work done.

At this point the question arises whether a labor-managed economy may yield a more efficient organization of work than the capitalist institutions.

IV. WORK EFFORT IN A LABOR-MANAGED FIRM

We argued above that the labor contract is incompletely specified and that property rights to labor power are only incompletely transferable. In a labor-managed firm the relationships among the workers are, of course, not regulated by a typical labor contract. Every member of the labor-managed firm has the same formal decision rights and is entitled to his share of the residual.

We assume in the following that the representative worker's utility may be expressed as

$$U = U\ (y,\ l) \qquad U_y > 0,\ U_l < 0, \tag{9}$$

y is total income derived from working for the cooperative. If all the workers supply the same amount of work l, then total effective work is $L = lN$. Output Y is a function of L; f are fixed costs. Optimizing (9) with respect to l subject to the budget constraint $y = (pY\ (lN) - f)/N$ yields

$$- U_l = pY_L U_y. \tag{10}$$

Even though we assume that the workers agree on a certain level of l to be supplied by everyone of them, l is usually not easily measurable. Therefore a labor-managed firm has to use an imperfect indicator for work intensity (e. g. labor time) as well. We argue in the following that the structure of incentives in a labor-managed form differs significantly from the incentives in a capitalist firm.

In a capitalist firm the worker will in general try to shirk if he expects not to be caught. Since the workers of a cooperative have to bear the cost of shirking themselves the incentive to do so is, ceteris paribus, less than in a capitalist firm. The reason for this is the fact that the workers of a labor-managed firm are the residual claimants themselves. Whenever a worker lowers his work done l by one unit revenues are reduced by pY_L. A worker caught shirking in a capitalist firm will still receive his wage w whereas the worker in a labor-managed firm has to bear at least one Nth of the reduction in revenues, pY_L/N, himself. The incentive to shirk is not restricted to the capitalist firm but is larger there than in a cooperative.

But the fact that a worker reducing l has to bear only one Nth of pY_L may lead to a Pareto -inefficient level of l since (10) may be replaced by

$$- U_l = pY_L U_y/N. \tag{10'}$$

This is the condition for an individually optimal choice of l. (10') implies a lower level of $- U_l$ and therefore a lower l. For this reason the workers in a labor-managed firm face the following situation: under the assumption that the workers have agreed to act according to (10), every worker not supervised has the incentive to reduce l to an inefficient amount given the work intensity of his fellow workers. If everyone acts that way an equilibrium will be reached where (10') holds. This equlibrium is inefficient since every worker would be better off if all the workers agreed collectively on raising their work intensity in an observable way; unanimity would lead to $- U_l < (pY_L U_y/N)\ N = pY_L U_y$. This situation corresponds to the well-known Prisoners' Dilemma.

In a capitalist firm the workers (paid by labor time) are not in a Prisoners' Dilemma with respect to fixing l, as nobody is able to raise his utility level when working harder at the same wage rate. This would only raise profits.

Is there a way out of the Prisoners' Dilemma? If individual workers do not know how long they will be members of the cooperative

it is likely that they behave in a way as if they played the Prisoners' Dilemma game infinitely often. If a game is repeated over and over, it is called a supergame. It has been shown that the choice of a non-cooperative strategy in a supergame may lead to the Pareto-efficient solution of each single game (Schotter 1981, p. 52). Crucial for this result is the value of the individuals' rate of time preference. The smaller the rate of time preference the higher will be the present value of future losses if Pareto-inferior non-cooperative equilibria will be attained in the single games; hence the higher will be the incentive to choose strategies leading to Pareto-optima.

One may conjecture that the majority of the members of a labor-managed firm only know that they will belong to the firm for quite a while but that they do not know exactly for how long. It is equally likely that there will always be some workers who know perfectly how long they plan to stay with the firm. But whether they will be able to shirk is questionable.

In this context the density of interaction and communication has to be taken into account since the question whether a cooperative or a non-cooperative game will be played depends crucially on the work place environment. In general, a non-cooperative game is defined by the lack of communication and enforceable agreements among the workers. Since many jobs are of an idiosyncratic kind, it is not realistic to assume that the workers will make explicit contracts over the individual work intensity. But we deem it possible and likely that the workers behave in a way as if they had signed such contracts if the labor-managed firm has a dense structure of communication and interaction. Because in these circumstances every worker is being "watched" by a large number of fellow workers. Moreover, every worker is interested in the others working hard since his remuneration also depends on the work intensity of his coworkers. In other words, the production process generates as a joint product a certain level of horizontal supervision depending on the density of interaction, which in turn depends on the degree of the division of work. The more fragmented the production process the less will be the opportunity to interact and communicate and the smaller will be the amount of horizontal control (FitzRoy/Kraft 1983).

In a capitalist firm there are practically no incentives for horizontal supervision, as the workers' pay is independent of the performance of the others. Therefore one may conjecture that there will be more vertical supervision to make up for the lack of horizontal surveillance. Vertical control will be the more efficacious the higher the level of the division of work, since quantity and quality of simple and highly fragmented tasks is easily observable by supervisors. Hence, as was already argued in section III.2, it is likely that capitalist firms rather implement a technology with a higher degree of work fragmentation than a labor-managed firm.

A presupposition for a non-cooperative solution of the Prisoners' Dilemma game is the individuals' assumption that the other players do not react to their strategy. If the attainment of the non-cooperative equilibrium is interpreted as adjustment process then the workers act

under an assumption which in the course of time turns out to be wrong. This objection often raised against Cournot-Nash strategies is especially relevant in the context of dense interaction and communication structures.

The substitution of vertical control by horizontal control, the lower level of the division of work and a denser network of interaction among the workers of a labor-managed firm are reasons for believing that the workers will rather choose a cooperative strategy in the Prisoners' Dilemma game. Cooperation will be more likely the smaller the number of workers. N. Sacks (1983) reports that in Yugoslavia large firms were divisionalized into smaller units which resulted in higher efficiency.

Finally, there are two more points. Sen (1966) argues that condition (10) will hold if the workers' utility depends upon the welfare of their fellow workers to the same extent as on their own welfare. This situation may be labelled "perfect sympathy". In a capitalist firm perfect sympathy will not lead to higher efficiency, though, since the reduction of l by a worker does not affect the others' welfare. Readers objectioning to the assumption of altruistic preferences may be more sympathetic with Kreps et al. (1982). The authors show that the players who play a Prisoners' Dilemma game a finite number of times will choose the cooperative strategy until shortly before the end of the game if a certain kind of asymmetric information prevails: a player must not be perfectly sure that the other one is a rational player. He must assume with positive probability that the other player does not play rationally. Another possibility of generating a Pareto-optimal strategy up to an instant before the end of the game is the assumption that both players suppose from the beginning that the other one prefers cooperation.

If workers choose cooperation in the Prisoners' Dilemma game, the level of work effort in a labor-managed firm is efficient. There is no reason to suppose that the division of work or technical progress will be implemented in an inefficient way to raise or lower l. Under the realistic conditions discussed above a labor-managed firm will probably be more efficient than a capitalist firm.

There is one more argument for this assertion which reaches beyond the discussion so far. What the radicals (e. g. Bowles 1985) always stress is the nature of the production process as a process of joint production transforming the workers' attitudes, capacities and beliefs. If the assumption of the endogenous nature of workers' preferences is accepted then the following conclusion may by drawn: a more democratic structure of decision-making and a more egalitarian distribution of the firm's revenues might reduce the incentive to shirk. On these grounds a capitalist firm and its command relationships may be judged inefficient.

V. THE RADICAL THEORY OF THE FIRM AS A CRITIQUE OF CAPITALISM

The idea that power and authority are characteristics of the production process can of course be traced to Marx. In this context he introduced the important distinction between circulation sphere and production sphere. In the first, liberty, equality and Bentham prevail (Marx, MEW 23, p. 189), in the latter, capital rules over labor. We share the view of critical contemporaries (e. g. Elster 1985, Vogt 1986) that the Marxian solution to this problem by his objective theory of value is not satisfactory but that the questions he raised still belong to the core of any critical theory of capitalism.

The radical theory of the firm follows the Marxian tradition in the sense that freedom and equality prevail in *atomistic* markets for labor power. The production process, though, is characterized by the exercise of power. In this paper it has been our intention to give reasons for the existence of power. The crucial idea hinges on the following: there *may* be a (atomistic) market for labor power but there is no market for labor. This of course refers to Marx's own distinction between work done and labor power. In contrast to the Marxian tradition we have not accepted this distinction as self-evident and have not used it is axiom, but we have tried to provide a justification for it founded on microeconomic theory.

We have also tried to analyse the different methods of exercising power. The most important result in our opinion is the proposition that the capitalist firm may exercise power even if the labor market is competitive. This judgement in not trivial as there is liberty, equality and Bentham particularly in atomistic markets. In spite of that, the entrepreneurs have the chance to enforce their own will even against resistance (Weber).

Finally, we have shown that the conflicts attributable to the power relationship in the production process may lead to inefficiencies. This means that all the agents' utilities can be raised by a reallocation of resources — but only under different institutional arrangements, to be sure. This is the truly critical feature of our analysis since the sole identification and proof of the existence of power relationships do not suffice.

A critique of capitalist institutions is only complete if it can be shown that there are superior institutional alternatives. In part IV of our paper we have therefore taken a closer look at the labor-managed firm. We draw the conclusion that the inefficiencies typical of capitalist firms (as analyzed in section III) which all stem from the unsolved conflict of interests between capital and labor will not occur in a labor--managed firm. Instead, there is the possibility of an inefficient allocation of individual effort if all workers have egotistical preferences and play non-cooperative Nash strategies. In this context we put forward a number of arguments why it seems unlikely that this possibility will actually occur. Therefore, we suppose that the labor-managed firm is more efficient than the capitalist firm with respect to its internal organization.

Of course, this conjecture does not imply a general superiority of the labor-managed firm such as one can infer from the literature on the supply and the demand behavior of the Illyrian firm. The Illyrian firm, however, is not the only possible way of organizing a cooperative and it can be doubted whether this particular alternative adequately describes the empirical reality of existing labor-managed firms (e.g. in Mondragon and Yougoslavia, see Horvat 1982a and 1986).

The debate over the efficiency of a labor-managed firm (e.g. Ireland/Law 1982) and the arguments we discuss in our paper lead to at least one certain conclusion: the possibility that the labor-managed firm is more efficient than a capitalist one truly exists.

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