RADICAL ORGANIZATION THEORY

AN INCOMPLETE CONTRACT APPROACH TO POWER AND ORGANIZATIONAL DESIGN

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ABSTRACT

A typical argument in Marxist and radical writings on economic organization is that prevailing practices, rather than being the most efficient, have been adopted in order to increase the share of the surplus of capitalists. Using an incomplete contract approach, this article develops a model which demonstrates how and when adopting an inferior economic organization could be profit maximizing. This model makes possible a detailed discussion of the conditions under which Marxist and radical claims about, for example, 'deskilling', can be expected to hold. It is demonstrated that such claims could be derived using standard formal economic arguments. However, the model also shows that these claims are likely to be valid only under certain circumstances.

KEYWORDS • bargaining • deskilling • hold-up • Marxism • organization theory

I. Introduction

Power is one of the more common ideas in sociological discussions of organizations. The distribution of and contest for power are typically seen as important determinants of organizational structure and design. This view is not a recent phenomenon but has a long history. It is a central claim of Marxism that the distributional conflict between capital and labor will cause important economic decisions, such as the choice of technology and the choice of work organization, to be suboptimal from a productivity point of view. Concern with increasing their share of the pie, Marxists and radical scholars argue, will cause capitalists to make decisions biased towards maintaining control. It follows that in order to explain prevailing economic practices and institutions, their control consequences for capitalists have to be examined. Following this general

theoretical strategy, Marxists and radical scholars have examined and tried to provide an explanation for a large variety of economic institutions and organizations. A typical line of argument in this literature has been to claim that prevailing practices, rather than being the most efficient, have been adopted in order to increase the capitalists' share of surplus value.

For example, Marglin (1974) in his paper on 'What Do Bosses Do?' argues that the organization of work, rather than being an efficient adaptation to the requirements of technology, is a result of the distributional conflict between capital and labor:

> It is the contention of this paper that neither of the two decisive steps in depriving the workers control of product and process—(1) the development of the minute division of labor that characterizes the putting-out system and (2) the development of centralized organization that characterizes the factory system—took place primarily for reasons of technical superiority. Rather than providing more output for the same inputs, these innovations in work organization were introduced so that the capitalist got himself a larger share of the pie at the expense of the worker … (Marglin 1974: 62).

Another radical scholar, Braverman, argues in his book *Labor and Monopoly Capital: The Degradation of work in the Twentieth Century* (Braverman 1974) that during the twentieth century there has been a general tendency towards 'deskilling'. This means that the skills of the working man have gradually been divided up into simpler elements such that what control they had becomes vested in management. The tasks of the workers have been routinized and mechanized. The main motivation behind this process of deskilling has, according to Braverman, been the mangement's desire to gain control over the precise manner in which work is to be performed; a control that increases profits but is detrimental to the workers.

During the 1960s and 1970s, arguments about the effects of power spread from Marxist analyses to the broader field of sociology of organizations. Rather than studying organizational designs as responses to the external environment, design was being seen as influenced by internal power distributions (cf. Pfeffer 1978, 1981). For example, the organizational theorist Jeffrey Pfeffer, in his book *Organizational Design* (1978), argued that such design, rather than being simply a rational response to external conditions, is an outcome of power and influence operating within organizations:

> Design is an important factor affecting who controls organizations, who governs. Since there is a contest for control, there is a contest and conflict over organization design (Pfeffer 1978: 4–5).

One result of this contest for control and power is, according to Pfeffer, the routinization of work:

> Since routinization of tasks makes the individual worker much more readily replacable, the individual has much less power in the organization … If this is the case, then routinization serves the interests of higher management by facilitating a further centralization of power … We suggest, therefore, that the choice of technology, measured according to its routinization, is a political choice. It is used to increase the control of management, and it is resisted by those organizational participants who perceive the loss of influence in the organization as a consequence (Pfeffer 1978: 101–102).

It is probably fair to say that arguments of this type have not been taken seriously by most orthodox economists. The reason for this is in part that some of these arguments have been couched in traditional Marxist terminology making use of concepts such as surplus extraction; concepts which are difficult to make sense of if one does not accept Marx's defamed labor theory of value.[1] Other discussions, if not making use of Marxist concepts, rely on notions such that capitalists and management seek 'power' and 'control' and try to avoid 'dependency', but this type of behavior is seldom related to what Marx and neo-classical economists posit as the goal of capitalists, i.e., profit-maximization. Undoubtedly, many sociologists and organization theorists concerned with power would dismiss this argument as unimportant, but this leaves them open to the standard economic criticism of models of power—that even if workers and employers disagree over distribution, they both share an interest in having more to distribute. As a result, both workers and employers would share an interest in making use of the most efficient organizational designs, and if this is true, power would not affect the choice of organizational design, but only the distribution of the output.

In contrast to the sociological literature the present article explicitly addresses this argument. Rather than ignoring or rejecting models based on profit-maximization, I will try to show how the arguments of power-sensitive sociologists can be made consistent with the assumptions of profit-maximization and rationality. To do this, I develop an economic model of the trade-off between efficiency and control in organizational design. Specifically, building upon the literature on hold-up (cf. Grossman and Hart 1986; Grout 1984; Klein et al. 1978; Williamson 1975, 1985), this article develops a formal model of the distributional conflict between a firm and an employee with unique, firm-specific, skills. Using this model, it is possible to demonstrate formally how reduced skill requirements could reduce the rents of skilled workers—an argument suggested in, for example, Williamson (1975), Goldberg

(1980) and Sørensen (1996). The formal model developed in this article also makes possible a more detailed examination of the theoretical and empirical validity of Marxist and radical claims, such as the argument that the routinization of work can be a means for capitalists to avoid becoming dependant on the labor-force.

For the sociologist, the main lesson to be learned from this model is that the arguments of radical scholars on the impact of power can be derived using only standard economic assumptions. However, the model also shows that the argument relies on a number of restrictive assumptions that limit the applicability of the argument. For the economist, the payoff from this exercise is the insight that a Marxist argument can be formulated using the tools of game theory and the standard assumptions of incomplete contracting. By developing the claims of radical organization theory into a formal economic model, this article also introduces an alternative economic explanation of the organization of work. Previous research on the organization of work has focused on the trade-off between the returns to specialization and the need for coordination across tasks (e.g. Becker and Murphy 1992; Bolton and Dewatripont 1994; March and Simon 1958). In this literature, routinization and specialization of work is seen as driven by the efficiencies of division of labor. Another literature, making use of an agency framework, has focused on the implications of measurement problems for the discretion of employees (Holmström and Milgrom 1991). In this literature, the trade-off between broadly and narrowly defined jobs is seen as driven by the possibilities and incentives for the worker to make use his or her time for self-interested purposes. This article presents a model with a different theoretical basis and with different empirical implications.

The structure of the article is as follows. Section II first provides a preliminary discussion of the model of power implicit in the literature on post-contractual hold-up. Subsequently, a formal model is presented. Set in the context of the choice of the organization of work, this model demonstrates how profit maximizing capitalists may find it in their interest to choose an inferior work organization in order to avoid becoming dependent on the labor force. However, since the model could have been adapted to any situation in which a profit maximizing capitalist has to decide between several alternatives, and where choosing the most productive alternative would make the capitalist dependent on the labor force, the model demonstrates more generally that Marxist claims regarding the bias in the behavior of capitalist can be derived using nothing but standard tools. Section III then provides a detailed discussion of the assumptions underlying the model in section II and of the empirical

predictions of the model. Applications to technological change are presented in section IV and section V concludes the article.

It should be noted that the ambition of this article is not to provide a broad discussion of Marxist and radical writings on economic organization. Rather, the ambition is to develop theoretically one theme in this literature. This obviously implies that other themes are ignored. For example, I do not discuss the effect of economic organization on the rate of unionization—an important Marxist and radical theme (cf. Griffin et al. 1986). Moreover, I do not discuss explanations of the routinization and mechanization of production which emphasize the advantages such methods of production provide in monitoring workers, or, to use the terminology of radical scholars, in turning 'labor power' into 'labor'. Such explanations are suggested in, for example, Braverman (1974) and Marglin (1974), are developed more extensively in Gintis (1976) and Edwards (1979), and have recently been developed formally by Bowles (1985). Because of these limitations, the model put forward cannot be regarded as a formalization of the arguments in, for example, Braverman (1974) or Marglin (1974). Rather, it is an attempt to provide a theoretical basis for one aspect of their argumentation.

It should also be noted that the relation between replacement costs and bargaining power follows naturally from game-theoretic models of bargaining (cf. Skillman 1988). Nevertheless, developing the argument using an incomplete contract approach makes it possible to identify all necessary assumptions. Moreover, although certain aspects of organizations, such as investment in sunk capital, have been analyzed using an incomplete contract framework (cf. Baldwin 1983; Grout 1984; Moene 1990; Van Der Ploeg 1987), the present article applies the literature on incomplete contracts to a different and broader range of issues. In addition to being an application of this literature, this article also connects the literature on hold-up and bargaining power to radical and sociological discussions about 'power' and 'dependency'. In this way, the present article takes a step towards relating the economic approach to organizations to other strands within organization theory.

II. Power and Control: An Economic Model

A typical argument in radical and sociological discussions of organizations emphasizes the influence of the contest for power and control. Capitalists' or management's desire for power and control, it is argued, will lead them to adopt inefficient organization structures. The underlying

basis of this argument is seldom analyzed, however. Specifically, few theorists provide an economically acceptable explanation for why profit-maximizing firms would adopt inefficient organizational solutions for the purpose of increasing their power relative to the labor force. From a neo-classical point of view, such tactics make little sense. Even if workers and employers disagree over distribution, they both share an interest in having more to distribute. As a result, both workers and employers would share an interest in making use of the most efficient organizational designs. If this is true, power would not affect the choice of organizational design, but only the distribution of the output. This inability of neo-classical economics to provide an underpinning for sociological and radical views of organizations probably explains why several radical and sociological organization theorists, in order to provide a theoretical basis for their argumentation, have turned to alternative theories including the Marxist labor theory of value.

The main argument of this article is that radical organization theory can be more fruitfully analyzed using standard economic models developed within the literature on the theory of the firm. In this literature, economists such as Williamson (1975, 1985), Klein et al. (1978), Grout (1984), and Grossman and Hart (1986), have developed a series of valuable distinctions for analyzing the trade-off between efficiency and control. To illustrate their reasoning, consider a typical situation analyzed in this literature: a firm A supplies firm B with some input. Now suppose that, in order to produce this input cost-effectively, firm A would have to make an investment in a special type of machine. Assume, further, that this investment is specific in the sense that the value of the machine to anyone else than B is zero. In this situation, after A has invested in the machine, B might take advantage of the situation and by threatening to terminate the relationship temporarily B could reduce the price of the input. Anticipating such opportunistic recontracting, A might be unwilling to invest in the machine. That is, A might be willing to choose a technologically inefficient solution in order to avoid a loss of control.

Abstracting from this specific example, the general structure of this argument in the theory of the firm can be said to be the following: There are two individuals: A and B. In most examples within this literature, B is a producer while A is a supplier to B. Individual A can choose between two investments. Investment I_1 is specific to the A–B relationship while investment I_2 is not. If individual A invests in I_1 individual A becomes dependent upon B in the sense that individual B is the only one for whom investment I_1 is valuable. In the usual example, this implies that B is the only one for which the output from a specific machine would be valu-

able. Taking advantage of this individual B could, by threatening to terminate the relationship temporarily, reduce the compensation A receives from B. Anticipating such opportunistic recontracting, individual A may hesitate to invest in I_1. In fact, to avoid becoming dependent upon B, individual A may invest in I_2 even if this is less productive.

Although this line of argument, common in theories of the firm, does not make use of concepts such as 'power', it does capture an important aspect of the idea of power as used in the literature in sociology and in radical organization theory, viz. the critical role of dependence. In many definitions of power, the power of an actor A over B is defined as the dependence of B on A (cf. Blau 1964; Crozier 1964; Emerson 1962; Pfeffer 1981; Thompson 1967). Moreover, the definition of dependence typically follows that of Emerson (1962):

> The dependence of actor A upon actor B is (1) directly proportional to A's motivational investments in goals mediated by B, and (2) inversely proportional to the availability of those goals outside of the A–B relationship. (Emerson 1962, p. 32).

Applying this to the above example of hold-up, we could say that A, by investing in the machine, becomes dependent upon B in the sense that outside the A–B relationship the value of the machine and its output is zero. Furthermore, if the power of actor B over A is defined as the dependence of A upon B, it follows that we can say that if A invested in the machine, the power of B would increase.

As the above illustrates, arguments about power can be formulated in terms of relation-specific investments. I will now argue that reformulating radical discussions about power, control and organization in this way also makes it possible to provide a more precise analysis of the trade-off between efficiency and control. To illustrate how this could be done, consider the following example. Individual A (the employer) can hire individual B (the employee) to perform some project. When hired, individual B can be given either a broad or a narrow range of responsibility. If given a narrow range of responsibility, completion of the project will be worth 40 to individual A. If B is given a broad range of responsibility, however, it is assumed, for the sake of the argument, that B is better able to perform the project. Specifically, if B is given a broad range of responsibility, completion of the project will be worth 50 to individual A. By giving B a broad range of responsibility, however, A will become dependent on B in the sense that the value of the project will be lower if it has to be completed without B. For simplicity, I here assume that if B has been given a broad range of responsibility, the project will be worth zero if it has to be completed without B. If B is given a narrow range of

responsibility, however, B is easy to replace and completion of the project is assumed to be worth 40 regardless of whether B or someone else completes it. In this situation A may be better off by giving B a narrow range of responsibility. Then A will only have to pay B his or her reservation wage, i.e. the highest wage B could receive at some other job. Suppose that this reservation wage is 10. It follows that by giving B a narrow range of responsibility the 'profit' of A would be 40 – 10 = 30.

Suppose, however, that A had given B a broad range of responsibility. In this case, the project would be worth 50 to A. If A only paid B his or her reservation wage, A's profit would be 50 – 10 = 40. However, if the wage of B had been set at 10 but no binding contract had been written, this wage might be renegotiated once the project has started and A has given B a broad range of responsibility. The reason is that by giving B a broad range of responsibility, A will be dependent upon B in the sense that the project will be worthless without B. B could then make use of this fact to negotiate a higher wage. In effect, B might threaten to postpone completion of the project if he or she does not get a share of the profits. Of course, if B does not complete the project at all, he or she will not get any compensation, and in this respect B is also dependent upon A. However, if B has been given a broad range of responsibility, A is also dependent upon B. Thus, the situation is that of a bilateral monopoly. We would then expect that A and B will each receive some share of the total surplus created by the project, i.e. 50. The specific shares that A and B will receive depends on what assumptions we make about the bargaining process. Several bargaining models, such as the Nash bargaining solution (Nash 1950) and the Rubinstein model of sequential bargaining (Rubinstein 1982), provide solutions to this type of problem. For our purposes, however, we may simply assume that B receives some fraction, β, of the total surplus. In the Rubinstein bargaining model, this fraction, β, can be seen as a summary of all factors that determine the losses a conflict over the division of the total surplus will inflict upon A and B. If we assume that these losses are roughly equal, then $\beta = ½$. In this case, the compensation of B will be 50/2 = 25 and the profit of A will only be 50 – 25 = 25. Since this is less than the profit of A if B is given a narrow range of responsibility, A will prefer to give B a narrow range of responsibility even if this is less productive. More generally, if B has a sufficiently large bargaining power such that $\beta > 20/50$, and if B makes use of this bargaining power in renegotiating the wage, then A will prefer to give B a narrow range of responsibility even if this is less productive. Again, the key to this result is that by giving B a broad range of responsibility, A will become dependent upon B and this dependency can then be

exploited by B in renegotiating the wage. Such renegotiation, however, will not be possible if B is given a narrow range of responsibility. In this case, A will not be dependent upon B and can thus simply replace B if he or she demands a wage higher than 10.

This example provides one illustration of how profit maximizing capitalists may find it in their interest to choose an inferior work organization in order to avoid becoming dependent on the labor force. It relies on a number of simplified assumptions and on a very stylized specification of the value of the project with or without B. Below, I develop the argument more generally by developing a formal model of the trade-off between efficiency and control. In this model, I do not assume that B can be given only a high or a low level of discretion. Rather, I assume that B can be given any level of discretion within some interval. In addition, I do not assume that the value of completing the project without B is zero. Instead, I merely assume that the value of completing the project without B is lower than the value of completing the project with B. Finally, by extending the model I develop below, I will also be able to show what happens if not only A becomes dependent upon B, but also B upon A.

II-A. A Formal Model

To provide a more general statement of the above argument, I develop a simple model, which is a version of that in Grout (1984). The model involves two individuals: A and B. A hires B to perform some project. The Von Neuman–Morgenstern utility of A, U_A, is the value of the project, $f(\bullet)$, less the compensation of B, denoted by C. The Von Neuman–Morgenstern utility of B, U_B, is his or her compensation. The reservation utility of B, i.e. the highest utility B could receive by taking an alternative job, is normalized to zero.

How well B performs working at the project is assumed to be function of how much discretion, $d \in [0, 1]$, B is given. Specifically, the value of the project, $f(\bullet)$, is assumed to be strictly positive for all values of $d \in [0, 1]$ and it is assumed to be a strictly concave function of $d \in [0, 1]$. Denote the value of d that maximizes $f(d)$ by d^*. It is assumed that $d^* \in (0, 1)$.

Although the value of the project is, up to a point, an increasing function of the discretion given to B, it is also the case that the more discretion B is given, the lower is the value of completing the project without B. The interpretation is that if B is given a high level of discretion in determining how the project should be carried out, B will accumulate private information critical for the completion of the project. Specifically, I

assume that the value of completing the project without B, is $h(d) = K - rd$ where $d \in [0, 1]$, $r > 0$ and $K > 1$. These assumptions imply that $h(\bullet)$, is strictly positive for all values of $d \in [0, 1]$. I also assume that $f(\bullet) > h(\bullet)$ for all values of $d \in [0, 1]$. That is, completion of the project without B will always be less valuable than completion of the project with B. Notice that since $h(\bullet)$ is a linear function of d, it thus follows that $f(\bullet) - h(\bullet)$ will be a strictly concave function with an interior maximum at d^*.

Even if this specification of the value of the project is quite general, it relies on a number of assumptions that should be spelled out. First, it assumes that $f(\bullet)$ is a concave function with an interior maximum. That is, it is assumed that, up to a point, the more discretion B is given, the higher is the value of the project, i.e. $f(\bullet)$. This obviously excludes the possibility that the most productive organization of work is an organization that does not give the employee any discretion. This might be the case if, for example, the most productive organization of work is an assembly line. Second, although the assumption that $f(\bullet)$, and thus $f(\bullet) - h(\bullet)$, is a concave function with an interior maximum is convenient, it may not hold. The assumption of concavity essentially implies that, below the optimum, a small decrease in the level of discretion will result in a small decrease in the value of the project. However, it is possible that even a small decrease in the level of discretion would result in a large decrease in the value of the project. That is, although there might be an interior maximum, the function could be convex around this value. Alternatively, the function may be convex over the whole range. In any of these cases, as explained below, it may not be optimal for A to reduce the level of discretion slightly in order to reduce the dependence upon B.

II-B. Analysis

In this model, by giving B more discretion, A becomes more dependent upon B after the project has started in the sense that the value of completing the project without B is lower. If the compensation and performance of B can be contracted upon in advance, this will not have any effect. However, if the compensation and performance of B cannot be contracted upon in advance, B can try to hold A up by threatening to postpone completion of the project if their compensation is not increased. In other words, B can try to renegotiate his or her compensation. In this renegotiation, B is also dependent upon A in the sense that if B leaves the project he or she may not get any compensation at all. However, unlike before the project started, A is now also dependent upon B. Again, this implies that we should expect that, in a renegotiation of the wage after

the project has started, A and B will each receive some share of the total surplus created by the project. In this model, the value of the total surplus to be divided is $f(d) - h(d)$ rather than 50 – 0 as in the example above. Again, we assume that B receives a share, $\beta \in (0, 1)$, of this surplus. In the context of this model, this assumption implies that B's compensation, after renegotiation, will be increasing in $f(d) - h(d)$. This assumption is reasonable whenever postponement of the project will cause a loss to A that is proportional to the difference in the value of having the project completed with B and without B. If this is the case, then the more A is dependent upon B, in the sense that completing the project with B is more valuable than completing the project without B, the more sensitive A will be to a postponement of the project.

If it is assumed that B receives a fraction, β, of $f(d) - h(d)$, it follows that the compensation and utility of B will be $\beta[f(d) - h(d)]$, and, that the utility of A, will be:

$$f(d) - \beta[f(d) - h(d)] = (1 - \beta)f(d) + \beta h(d) \qquad (1)$$

Let the value of d that maximizes this expression be d^u.

Proposition 1. $d^u < d^*$.

Proof. Since d^* is the value of d that maximizes $f(d)$, and since $d^* \in (0, 1)$, it follows that d^* satisfies $f'(d^*) = 0$. Moreover, since $(1 - \beta)f(d) + \beta h(d)$ is a concave function, and assuming that $d^u \in (0, 1)$, it follows that d^u satisfies $(1 - \beta)f'(d) + \beta h'(d) = 0$, which also can be expressed as $(1 - \beta)f'(d) - \beta r = 0$. Since $\beta \in (0, 1)$, and $r > 0$ we have that $(1 - \beta)f'(d) = \beta r > 0$ at d^u. Since we have that $f(d)$ is a strictly concave function with an interior global maximum at d^* it follows that $(1 - \beta)f'(d) > 0$ only if $d < d^*$. *Q.E.D.*

Remark. The proof for Proposition 1 obviously relies on the specification of the value of the project described above. As emphasized above, however, this specification relies on a number of assumptions. It is instructive to see why the above proof would fail when one or several of these assumptions are violated. First, suppose that there is no interior maximum but that $d^* = 0$. That is, suppose that the most productive organization is one in which B is given no discretion. In this case, there would obviously be no reason to reduce the level of discretion given to B. Second, and more interesting, if $f(\bullet) - h(\bullet)$ is convex in some interval

of $d \in [0, 1]$, the above proof would not hold. Informally, the reason is that reducing d may be too costly. That is, although A may achieve a larger share of the total surplus if d is reduced, this gain might be offset by a large reduction in the value the total surplus.

Lemma 1. d^{u} is a decreasing function of r.

Proof. This follows from the fact that d^{u} satisfies $(1 - \beta)f'(d) = \beta r$ and that $f'(d)$ is a decreasing function. *Q.E.D.*

Lemma 2. $f(d^{u})$ is a decreasing function of r.

Proof. Since $f(\bullet)$ is a strictly concave function, we have that $f(\bullet)$ is an increasing function in the domain $[0, d^*)$. This in combination with Lemma 1 establishes the result. *Q.E.D.*

Proposition 2. $f(d^*) - f(d^{u})$ is an increasing function of r.

Proof. This follows from Lemma 2 and from the fact that $f(d^*)$ is independent of r. *Q.E.D.*

Propositions 1 and 2 show that the utility maximizing choice of d is lower than the efficient choice, and that the difference is increasing in r. Specifically, Proposition 1 shows that, in order to maximize profits, A will give B less discretion than what would have maximized technological efficiency, which in this model also would have maximized aggregate social surplus. Proposition 2 shows that the extent of the inefficiency depends on r: a parameter determining the extent to which A will become dependent on B by giving B more discretion.

Proposition 3. U_{A} is a decreasing function of r.

Proof. Let r_i be any $r \in (0, \infty)$. Denote the utility maximizing choice of d, given r_i, by d_i^{u}. The utility of A can then be written:

$$(1 - \beta) f(d_i^{u}) + \beta K - \beta r_i d_i^{u} \tag{2}$$

Consider now the utility of A given r_j, where r_j is any $r < r_i$. Since A is still free to choose $d = d_i^{u}$ and since we have:

$$(1 - \beta) f(d_i^{u}) + \beta K - \beta r_j d_i^{u} > (1 - \beta) f(d_i^{u}) + \beta K - \beta r_i d_i^{u} \tag{3}$$

it must be that the utility of A is higher if $r = r_j$ than the utility of A if $r = r_i$. *Q.E.D.*

Proposition 3 demonstrates that by reducing *r*, A could increase his or her utility. The intuition is that by reducing *r* A would reduce his or her dependence upon B and, as a result, increase his or her share of the available surplus. This also implies that even if by reducing *r*, A would reduce the available surplus, A might still be better off. For example, A might be better off by relying on methods of production which do not require that B develops specialized knowledge, even if such methods are less productive than alternatives. Using such methods of production, A would be less sensitive to the threat of B to leave the project.

II-C. Mutual Dependence

In the above model, it was assumed that A might become dependent upon B but not that B might become dependent upon A. Formally, this was expressed in the assumption that the reservation utility of B was independent of the level of discretion. In certain situations, however, it is more reasonable to assume that B also will become dependent on A if the level of discretion is high. For example, if the level of discretion is high, B might have to invest time in developing skills that are useful only if applied to the current project. Simultaneously, B's skills in other areas might diminish. In this case, if B leaves or postpones the project, his or her utility might be lower than it would have been if they had not been given a high level of discretion.

Formally, this can be incorporated into the above model by assuming that the utility B can receive, if he or she is not working on the project, is a decreasing function of *d*: $-W(d)$ where $W'(d) > 0$. In this case, the total surplus to be divided after the project has started is $f(d) - h(d) + W(d)$. If it is assumed that B receives a fraction β of this, it follows that the compensation and utility of B will be $-W(d) + \beta[f(d) - h(d) + W(d)]$, and, that the utility of A, will be:

$$f(d) - \beta[f(d) - h(d) + W(d)] + W(d)$$

$$= (1-\beta)f(d) + \beta h(d) + (1-\beta)W(d) \qquad (4)$$

Let the value of *d* that maximizes this expression be d^W.

Proposition 4. $d^W > d^u$.

Proof. By construction, d^{u} satisfies $(1-\beta)f'(d) + \beta h'(d) = 0$. Since $W(d)$ is a decreasing function, it follows that $(1-\beta)f'(d) + \beta h'(d) = -(1-\beta)W'(d) < 0$. Since we know that $(1-\beta)f(d) + \beta h(d)$ is a strictly concave function with an interior global maximum at d^{u}, it follows that $(1-\beta)f'(d) + \beta h'(d) < 0$ only if $d > d^{u}$. *Q.E.D.*

As Proposition 4 shows, if B also becomes dependent upon A, the optimal level of discretion for A will be higher. In this situation, the fact that B is also dependent upon A will restrain B from making use of the fact that A is dependent upon him or her. As a result, A can give B a higher level of discretion. Notice, however, that for this to happen the utility of B must be a decreasing function of the level of discretion. Thus, for example, if the utility of B is dependent upon the completion of the project but independent of the level of discretion, then this will not affect the behavior of A.

II-D. An Alternative Hypothesis

In the above model, it was the possibility that B might threaten to postpone the project which resulted in a suboptimal level of discretion. However, even if B never makes use of such a threat, there is always the possibility that B could not complete the work for reasons unrelated to the current project. This could result in an equally low level of discretion. To illustrate this, suppose that the probability that B would have to leave the project is $p \in (0, 1)$. Suppose, further, that the value of the project if B leaves is $h(d)$. The expected utility of A is then:

$$E[U_{A}] = (1-p)f(d) + ph(d) \tag{5}$$

Let the value of d that maximizes this expression be d^{l}.

Proposition 5. $d^{l} < d^{*}$.

Proof. Since d^{*} is the value of d that maximizes $f(\bullet)$, and since we know that $d^{*} \in (0, 1)$, it follows that d^{*} satisfies $f'(d^{*}) = 0$. Moreover, since $(1-p)f(d) + ph(d)$ is a concave function, and assuming that $d^{l} \in (0, 1)$, it follows that d^{l} satisfies $(1-p)f'(d) + ph'(d) = 0$, which also can be expressed as $(1-p)f'(d) - pr = 0$. Since $p \in (0, 1)$ and $r > 0$, we have that $(1-p)f'(d) = pr > 0$ at d^{l}. Since we know that $f(d)$ is a strictly concave function with an interior global maximum at d^{*}, it follows that $(1-p)f'(d) > 0$ only if $d < d^{*}$. *Q.E.D.*

By deriving the same results from different assumptions, Proposition 5 provides an alternative hypothesis to the claims of radical organization theorists that it is the distributional conflict between capital and labor which is responsible for the routinization of work. Proposition 5 demonstrates that even if there is no distributional conflict between A and B, A would choose an equally low level of discretion if there is some probability that B would have to leave the project. In this case, a low level of discretion serves as an insurance policy—protecting the value of the project in the case that B has to leave.

III. Discussion

The model in section II, set in the context of the choice of the organization of work, demonstrates how profit maximizing capitalists may find it in their interest to choose an inferior work organization in order to avoid becoming dependent on the labor force. The model thus illustrates the claim, found in the radical literature on the organization of work, that the routinization of work, instead of increasing productivity, can be a means for capitalists to avoid becoming dependant on the labor-force (cf. Braverman 1974; Pfeffer 1978). The model can also be used to illustrate the claim that hierarchy and the centralization of control, rather than increasing output, may have been adopted in order to increase the 'power' of capitalists (cf. Stone 1973; Marglin 1974; Clawson 1980). To see this, notice that the centralization of control typically reduces the discretion of employees, and, as a result, the employer's dependence upon his or her employees. It follows that the centralization of control can be profitable, even if it does not increase output.

In addition to providing a theoretical ground for these arguments, the above model also makes possible a more detailed discussion of their empirical validity. Instead of making broad and vague claims about the bias in the behavior of capitalist, the above model demonstrates that as a result of distributional conflicts employers will deliberately choose an inefficient organization of work only if the following conditions are satisfied:

1. The employer, by choosing an efficient organization, will risk becoming asymmetrically dependent upon his or her employees.
2. The gains from reducing the level of discretion, and thus reducing the employer's dependency on the employee, are greater than the loss in the value of the project.

3. Complete contingent contracting is unfeasible.
4. The employer and the employee are not involved in repeated transactions or, if they are, concerns for developing a reputation for honesty must be ineffective in restraining opportunistic behavior.
5. The 'means of production' cannot be transferred to the individual(s) performing the work.

This is obviously a select list of assumptions. The model also relies on others—such as the assumption of rationality and self-interest. The conditions listed above, however, have been highlighted in order to pinpoint the differences from standard economic models of organizations. As a result, some of the above conditions may be difficult to appreciate without a knowledge of the standard lines of argumentation within economics. Nevertheless, if the purpose is to provide a thorough examination of possible economic basis for sociological and radical claims about power and organizational design, it is important to list and try to answer a number of possible objections to the model presented here.

Consider then the first condition. The conclusions of above model only hold if A risks becoming dependent upon B, while B, in turn, is more or less independent of A. If this was not the case, there would be no reason for A to avoid giving B a high degree of discretion. This condition has several empirical implications. First, it implies that in situations where B is replaceable, i.e. where the value of completing the project with B is equal to the value of completing the project without B, there is no reason for A to choose an inefficient organization. It follows that in situations where a simple task is to be performed, a task which can be completed by almost anyone, there should be no reason for A to limit the discretion of B. Similarly, it follows that the conclusions of the above model only apply to those aspects of the organization of work which affect the extent to which A could become dependent upon B. Second, it implies that in situations where A and B are mutually dependent, there is no reason to expect that A will choose an inefficient organization structure in order to limit his or her dependence upon B. Third, it implies that the conclusions of the above model only apply to situations in which the most efficient organization is an organization that would make A dependent upon B. This is not always the case, however. Rather, due to the advantages of automated production and division of labor, it is conceivable that the most productive organization of work is to assign workers tasks which provide them with very little discretion. Such advantages obviously provide an alternative explanation of situations where workers are assigned tasks which provide them with very little discretion. Need-

less to say, this has been the dominant explanation of the rise of factory automation, routinization of work and the division of labor. It has also been backed up by considerable evidence demonstrating increases in productivity following the automation of production (cf. Chandler 1977). However, such evidence does not necessarily disconfirm the explanation put forward in this article. The reason is that even if productivity increases have been observed following the automation of production and the routinization of work, this does not exclude the possibility that productivity increases could have been even larger if these measures had been implemented on a more moderate scale. In other words, it is possible that capitalists, motivated by the concerns discussed in this article, have driven the automation of production and the routinization of work too far.

Consider next the second condition, that a profitable reduction in the level of discretion exists. This is the essence of the proof for Proposition 1. As discussed above, however, Proposition 1 only holds for certain specifications of the value of the project. Most important, the proof for Proposition 1 assumes that the value of the project is a concave function of the level of discretion. This implies that a small reduction in the level of discretion leads to a small reduction in the level of the value of the project. If this is the case, Proposition 1 shows that there is always exists a profitable reduction in the level of discretion. The reason is that even if a reduction in the level of discretion reduces the total value of the project, this loss can be made sufficiently small by making a sufficiently small reduction in the level of discretion. This reasoning, however, breaks down if a small reduction in the level of discretion leads to a large loss in the value of the project. In this case, there may not exist a profitable reduction in the level of discretion. Such may be the case, for example, if there are coordination costs. In this case, reducing the level of discretion could not only lead to a loss in the value of the project, but also to increased coordination costs. For example, the optimal amount of discretion may involve giving B a high degree of discretion. Reducing this level of discretion probably then leads to increased coordination costs as A and B have to engage in more coordination. More generally, if there are several employees, reducing the level of discretion for each one of them probably implies that there is a need for additional workers. As a result, coordination costs probably will increase (Becker and Murphy 1992; March and Simon 1958). In this case, when a small reduction in the level of discretion leads to a large increase in coordination costs, there might not exist any profitable reduction in the level of discretion.

Consider then the third condition. Suppose that complete contingent contracting had been possible. That is, suppose that A and B could have written an enforceable contract specifying the performance and compensation of B. In this case, B could not make use of the threat to leave the project. Instead, B would have been forced to comply with the terms of the contract. It follows that if complete contracting had been feasible, opportunistic recontracting would not have been possible and A could, without fear, have chosen the most productive organization of work even if this organization had been an organization that left some discretion to the worker.

Although some may argue that the absence of complete contingent contracting is a restrictive condition, and that it would be a simple matter for A and B to write a contract specifying the performance and compensation of B, the literature on what has come to be called 'incomplete contracting' (cf. Grossman and Hart 1986; Hart 1995; Milgrom and Roberts 1990, 1992; Williamson 1975, 1985) suggests that things may be more complex. First, due to bounded rationality and uncertainty, it may not be possible to foresee all possible contingencies. As a result, any contract between A and B will probably be incomplete, leaving many important contingencies unresolved. For example, if conditions change, it may not be clear from the original contract what an adequate performance would entail. In such cases, even if there is a contract between A and B, B may still be able to threaten to leave the project arguing that he or she has fulfilled his or her obligations. The difficulty of specifying all relevant contingencies also implies that it may not be clear from the original contract what the compensation of B should be. For example, even if the wage of B could be specified in, for example, collective bargaining agreements, or by attaching pay to jobs rather than individuals (cf. Williamson 1975: Ch. 3), the non-wage benefits of B may not have been completely specified. In this case, B could still increase his or her total compensation by threatening to leave the project. Second, even if formulating a complete contract is feasible, enforcing the terms of the contract may not be possible. For example, third parties such as a court may not be able to verify whether there is a breach of contract or not. As a result, even if A and B could formulate a contract specifying the performance and compensation of B, this would not be of any use to A since it could not be used to force B to complete the project.

Even if a complete contingent contract could not be formulated or enforced, it is possible to argue that an efficient outcome would nevertheless be possible if the employer and the employee were involved in repeated transactions. This is the reason for the fourth condition. If this

condition is not satisfied and the employer and the employee are involved in repeated transactions, it could be argued that concerns for developing a reputation for honesty might outweigh the temporary benefits of opportunistic recontracting. Formally, the efficient outcome is then a possible equilibrium in an extended game consisting of the game in section III between A and B repeated infinitely (cf. Kreps 1990b; Van Der Ploeg 1987).

Even if this argument could be made, it should be noted that it is not a very strong one. First, the argument only holds if A and B care sufficiently about the future or, what amounts to the same thing, if the discount rate is sufficiently low (cf. Fudenberg and Maskin 1986). In addition, the extent to which the behavior of A and B is consistent with the 'implicit contract' formed between A and B must be possible to observe with sufficient clarity by both parties (cf. Kreps 1990a). This implies that there must be no real differences in interpretation between A and B. If there are, judging honesty on the basis of past behavior becomes difficult.

These caveats imply that even if the employer and the employee are involved in repeated transactions, the outcome predicted by the model in section II may still hold since reputational concerns may be ineffective. Hence the importance of the second part of the fourth condition. Notice that this also implies that the promise of internal promotions, which Williamson (1975: Ch. 3) suggests could be used to constrain opportunistic behavior, might fail in situations where the performance required for promotion is unclear. In such situations, the employer can argue that the performance of the employee was inadequate for a promotion. Anticipating such opportunistic behavior on the part of the employer, the employee will have no reason to constrain his or her wage demands in exchange for an untenable promise of internal promotion.

The fifth condition, that the 'means of production' cannot be transferred to the individual(s) performing the work, is probably the most important. To illustrate the theoretical significance of this condition, suppose that A owned the factory in which B was supposed to work. Suppose further that A sold this factory to B. In this case, B, perhaps still working with A, would maximize his or her utility by taking on the optimal range of responsibility. In other words, if it was possible for B to buy the 'means of production' from A, then there would be no distributional conflict between A and B and, consequently, there would be no reason for A to choose an inferior organization of work. Thus the argument that A, in order to avoid becoming dependent on B, will choose an inferior work organization, assumes that A in some sense 'owns' the 'the means

of the production' and cannot sell this to B. Formulated differently, one might say that the argument assumes an economic system in which capital is separated from labor.

This assumption is not standard in economics. Rather, within economics, and in particular within the economic literature on hold-up and the theory of the firm, it is often assumed that property rights can be exchanged without restrictions. Indeed, this assumption forms the basis for predicting the pattern of ownership: it is argued that due to frictionless exchange of property rights the resulting pattern of ownership will be the most efficient (cf. Grossman and Hart 1986; Williamson 1985). Thus, in the above example with the factory, the literature on the theory of the firm would have predicted that B would have acquired the factory. In reality, however, this might not be possible. For example, B, being poor, may not be able to acquire the factory. In addition, capital market imperfections may make it impossible for B to borrow the required sum. Thus, even if it was efficient for B to own the factory, or, more generally, the 'means of production', B may still not be able to acquire it. One can also add that in many circumstances it may not be efficient for B to own the 'means of production'. For example, B, being poor, may be too risk-averse to assume the risk of concentrated ownership.

Summarizing, one might say that the model in section II demonstrates that Marxist and radical claims regarding the bias in the behavior of capitalists can be derived using a formal economic model. However, the model also demonstrates that these claims are likely to be valid only under certain circumstances. Specifically, the claims of radical scholars are only likely to be valid in situations where production requires skilled labor for maximal efficiency, but where using skilled labor makes the employer dependent upon his or her employees. Furthermore, production must be sufficiently complex so that complete contingent contracting is unfeasible. In addition, the employment relationship must be temporary, or, if it is not, then reputational considerations must be ineffective. Finally, it must not be possible to cost-effectively transfer the 'means of production' to the individuals performing the work. Although these conditions do not characterize all industries, there does not seem to be any reason to believe that these circumstances do not ever exist. It follows that one cannot exclude the possibility that the bias in the behavior of capitalist identified by Marxist and radical scholars is an empirically significant phenomenon.

However, the model in this article also makes clear that, to identify such phenomena empirically, one cannot simply examine trends in the level of skill and expect a general trend towards 'deskilling' as sug-

gested by, for example, Braverman (1974). Such evidence is inappropriate for at least two reasons. First, the model in this article does not necessarily predict a reduction in the level of skill. Rather, it predicts that, under certain circumstances, the level of skill or discretion of employees will be less than the optimal level. Thus, the model in this article is actually consistent with an increase in the level of skill and discretion. For example, suppose that the optimal level of discretion, d^* increases. In this case d^u, the utility maximizing level of discretion, may also increase—but still be lower than d^*. The second reason why evidence regarding the level of skill in industry is inappropriate is that one cannot expect a general trend towards deskilling. Rather, as the discussion in this section makes clear, deskilling or, more precisely, a suboptimal level of skill and discretion, only occurs under certain circumstances.

In the light of these arguments, it is not surprising that empirical evidence regarding the level of skill in industry usually has failed to demonstrate a general trend towards 'deskilling' (For an overview see Pfeffer 1997: Ch. 7). Rather than examining general trends in the level of skill in industry, relevant empirical research should examine the level of discretion and skill in industries satisfying the above five conditions. However, even such evidence may be irrelevant since the model in this article does not predict a general decrease in the level of discretion. The model only predicts that the level of discretion will be lower than the optimal. Direct tests of this prediction are unlikely to be fruitful, however. First, valid measures of the optimal level of discretion will be difficult to obtain. Second, several alternative hypotheses are consistent with the prediction. Specifically, models emphasizing measurement problems and the model developed above, in which there was some probability that B would leave the project, both predict that the level of discretion will be lower than the optimal.[2]

Instead of testing the prediction that the level of discretion would be lower than the optimal level, it would be more fruitful to examine the difference in the level of skill and discretion in similar jobs in capitalist and worker owned enterprises. The above model predicts that, in capitalist firms, d would be equal to d^u. However, in worker owned enterprises, where there is no distributional conflict, or where the distributional conflict is less severe, the above model would predict that $d = d^* > d^u$. That is, the model presented in this article would predict that the level of discretion is lower in the capitalist firm. In contrast, the model developed above, in which there was some probability that B might leave the project, would predict that there was no systematic difference. However,

it is possible that models emphasizing measurement problems, models that also are driven by the distribution of the surplus value, would predict that the level of discretion is lower in the capitalist firm. To distinguish among these models and the model presented in this article one might therefore examine changes in the level of skill and discretion in an industry which has experienced a change in the loss of value that a departure of a skilled employee would inflict, i.e. in an industry which has experienced an exogenous change in *r*. In this situation, the model presented in this article predicts that, if the conditions discussed in this section hold, and if *r* increases (decreases), then d^{u} would be reduced (increased). In a model emphasizing measurement problems, there does not seem to be any reason why a change in *r* would change the predictions of these models, unless of course such a change was correlated with changes in, for example, the difficulty of measurement.

IV. Technological Change

The above discussion concerned the effects of distributional conflict on organizational design. However, the argument also applies more generally. In this section, I will sketch how the argument could be applied to the area of technological change. The extent to which technological change would be biased has been a frequently discussed subject within economics (cf. Fellner 1961). On this issue, Marx had a distinct view. In the first volume of *Capital* he writes:

> It would be possible to write quite a history of the inventions, made since 1830, for the sole purpose of supplying capital with the weapons against the revolts of the working class (Marx in Elster 1986: 98).

As this quote demonstrates, Marx believed the direction of technological change to be biased. The reason was to be found in the distributional conflict between capital and labor.[3] Concerned with increasing their share of the pie, capitalists would favor technologies that made them less dependent on the labor force. This view of technological change has been further developed by several neo-Marxist scholars. Noble (1978) and Wilkinson (1983), for example, have argued that the invention and expansion in the use of numerically controlled machine tools was motivated by the desire to reduce the power of the skilled machinists. Even though an alternative technology for machine tool automation was available, Record Playback, it was resisted by management since it required a

skilled machinist to make the initial program and any subsequent changes. Numerical Control technology, by contrast, could be programmed by staff engineers. As a result, the argument goes, it was preferred by management.

Using the argument presented in this article it is possible to demonstrate when and how such an intentional bias in the adoption of technology could be profit-maximizing. To illustrate this, consider a capitalist, A, who can choose between adopting two alternative methods of production: M_1 and M_2. Suppose that M_1 involves the use of an employee, B, while M_2 only involves the use of a machine. In this case, to avoid becoming dependent upon B, A may choose M_2 even if this method of production is less productive. Thus, A may choose a labor-saving technology even if this technology is an inferior method of production. More generally, if we let d be the extent to which A relies upon specialized labor, and we let $1 - d$ be the extent to which A relies upon automated production, it follows from Proposition 1 that $d^{u} < d^{*}$. That is, it follows that the utility maximizing choice of d will be lower than the efficient choice. In other words, the extent to which A relies on automated production instead of specialized labor will be sub-optimally high. In this sense, A can be said to favor labor-saving technologies.

Notice that this conclusion is valid only if A, by hiring an employee, would risk becoming dependent upon this employee. Interestingly, this condition would be satisfied if, by choosing to hire an employee, this employee would develop specialized knowledge about operations; knowledge which would be critical for continued operations. In other words, the Marxist argument that 'Machines were, it may be said, the weapon employed by the capitalists to quell the revolt of specialized labour' (Marx in Elster 1983: 171) is indeed consistent with the model developed in this article.[4]

Another interesting implication from the above model is that the distributional conflict between capital and labor will affect not only the *adoption* of technology but also the *development* of technologies. To illustrate this, notice that according to Proposition 3, the utility of A is a decreasing function of r which implies that even if by reducing r, A would reduce the available surplus, A might still be better off. This in turn suggests that A might be willing to spend resources to develop methods of production which reduced r even if such methods of production did not improve productivity. It thus follows that it might be equally profitable for A to spend resources on improving productivity and to spend resources on reducing r even if this does not increase productivity.

V. Concluding Remarks

This article has developed a formal model of the distributional conflict that arises between a firm and an employee with firm-specific skills. Using this model, it has been possible to demonstrate formally how reduced skill requirements, caused by organizational or technological changes, could reduce the rents of skilled workers. The formal model developed in this article also made possible a detailed discussion of the theoretical and empirical validity of Marxist and radical claims such as the argument that the routinization of work can be a means for capitalists to avoid becoming dependant on the labor-force. This discussion showed that the claims of sociologists and radical scholars regarding the effect of power and distributional conflicts could be derived using a formal economic model. However, the discussion also demonstrated that these claims are likely to be valid only under certain circumstances.

Obviously, this article only represents an initial effort to delineate the conditions under which Marxist and radical claims can be expected to hold. Future research is needed to extend and revise these conditions. Moreover, future research is also needed to examine and devise institutional arrangements that could attenuate the inefficiencies arising from the type of distributional conflicts sketched here. Such research is not only of theoretical interest, but also of substantial practical interest. Indeed, it is not implausible to argue that research on the distributional conflicts between employers and employees could provide an important basis for discussions of business strategy. The literature on business strategy and industrial organization is currently replete with discussions of the distribution of rents among owners and suppliers, buyers and producers of complementary products (cf. Nalebuff and Brandenburger 1996; Porter 1980; Teece 1987; Tirole 1988). It has in fact been argued that one of the key issues in business strategy is 'how to position and manage the firm so as to generate, augment, and protect "economic rents"' (Teece 1990: 45). Despite its obvious relevance, however, the distribution of economic rents among owners and employees has not been much discussed in the literature on business strategy.[5] Perhaps this is because the topic has not been considered to be a politically correct one. Alternatively, it might have been that the issue has not been that important; that few positions have required the development of specific knowledge which would have made the owners of the firm dependent upon the employees. Nevertheless, if it is true, as many argue, that knowledge and information are critical inputs in today's economy, then one would expect that owners of firms would become more dependent

upon their employees. As a result, the distributional conflict between employers and employees would become more significant. In this case, one would also expect the distribution of rents among owners and employees to become more important in discussions of business strategy.

NOTES

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1. For important exceptions, see the work of, for example, Lancaster (1973) and Bowles (1985).
2. If the optimum is derived ignoring incentives and the probability that the employee will quit.
3. For a more general discussion of Marx views on technological change, see Elster (1985: Ch. 3).
4. Notice that, in contrast to the model of Grout (1984) and others, this model assumes that an employer, by relying upon automated production, becomes less dependent upon his employees. In the model of Grout (1984), it is assumed that investing in capital-intensive production methods makes a firm more vulnerable to strike threats. Even if this may be so, it is also conceivable that investing in capital-intensive methods of production can make a firm less vulnerable. Consider, for example, the situation of a firm that in period 1 relies on skilled workers. Suppose that in period 2 this firm invests in a machine which performs the same work and can be operated by workers with standardized skills. In this way, the firm reduces its dependence on the skills of specific individuals. Of course, if the men and women operating the machine are members of a union, or organized collectively in some other way, the firm will still be dependent upon its workers since the firm will be vulnerable to the strike threats of its machine operators. However, if few workers are members of a union, the firm will become less dependent upon its workers by replacing skilled workers with less skilled workers.
5. Of course, exceptions exist. For example, many discussions of business strategy mention, but rarely discuss in detail, the effect of the bargaining power of unions on the profitability of the firm. In addition, some informal treatments of the appropriability of economic rents discuss the possibility of extracting part of the rents created by unique employees (cf. Peteraf 1993; Wernerfelt 1989).

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