COWLES FOUNDATION FOR RESEARCH IN ECONOMICS

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COWLES FOUNDATION DISCUSSION PAPER NO. 797

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ABSTRACT

When changing jobs is costly, efficient employment arrangements are characterized by complex contracts, rather than simply wages. Under these contracts, workers are not generally fully compensated for the effects of post-employment events or decisions. As a consequence, if there is a central office executive with discretionary authority to make decisions, employees will be led to waste valuable time in attempts to influence his decisions. Efficient organization design balances these "influence costs" against the benefits of improved appraisal, coordination and planning that such an executive can provide.

Identifying influence costs requires first identifying the kinds of decisions about which employees will care. We identify several: With efficient employment contracts, employees prefer more on-the-job consumption and better opportunities to learn and display their abilities and to acquire human capital. They also prefer to occupy jobs where continuity of employment is particularly important to the employer, because such jobs carry higher wages.

Applications of our perspective, which focuses on influence processes and the trade-off between influence costs and improved decisionmaking, appears to have wide and fruitful application to questions of organization theory, industrial organization, contract theory, and related areas.

QUASIRENTS, INFLUENCE AND ORGANIZATION FORM

Paul R. Milgrom[1]

1. Introduction

No question occupies a more central place in microeconomic theory

than the question of how economic activity can be most efficiently

organized. The answer is important for advising firms on organizational

matters, for explaining the relative success of firms with differing

internal structures, for designing merger and regulatory policies, and

for comparing economic systems. Yet, despite all the attention that has

been lavished on this question and all the words that have been written,

fundamental puzzles remain unresolved. Experience suggests — and most

Western economists believe — that some degree of market-like decentra-

lization of authority is necessary for an economic system to function

efficiently.[2] Yet, the benefits of decentralization are difficult to

[2]A related view combines historical and efficiency arguments. Markets,
because they can arise without central control, represent a primitive
state of affairs. The continued survival of market forms for some kinds
of transactions is then evidence of their efficiency for those transac-
tions. Arrow [1974] takes this point of view, holding that non-market
organizations emerge largely in response to market failures.

pinpoint. Why cannot one always reproduce a decentralized decision process within a centralized organization? Why cannot a firm always improve efficiency by integrating its operations with those of its suppliers and distributors, enhancing coordination and planning without disrupting the well-functioning parts of the relationship? Why is it that markets are perceived to have incentives that, as Williamson [1985] puts it, are more "high-powered" than those in firms?

In rough outline, my thesis is that the existence of a central authority diverts conflicts of interest within an organization into unproductive channels: Employees seek to win the boss's support by influence activities rather than by productive performance. When centralization of authority is desirable to enhance such management activities as coordination, planning, and appraisal, efficiency demands that the organization be structured to reduce conflicts of interest in order to reduce the waste of valuable resources in influence activities. Some "high-powered" incentives, such as those associated with performance competition, are much less valuable when competing parties must lobby a central authority to gather their rewards.

The full thesis consists of two main parts. First, employees are not generally indifferent about non-wage decisions taken by their employers. Indeed, we shall identify predictable biases in employee preferences regarding at least some of the employer's decisions. In pursuit of their individual interests, employees may expend excessive amounts of time trying to influence their employer's decisions. The

time wasted in this way and the losses that result from successful attempts to divert the organization from its best path are two components of what I shall call "influence costs."

Second, the magnitude of any influence costs depends in large part on the employer's policies regarding wages and job assignments and on the organization's "charter," that is, its rules governing how decisions are made. Wage and job assignment policies matter because they determine the actual and potential distributional impact of non-wage decisions. The charter matters because it determines the opportunities that individuals have to gain and exercise influence.

Many readers will, I hope, find the proposition that the non-wage decisions may matter to employees to be obvious from casual observation. Yet, the proposition is not uncontroversial. According to traditional "spot contracting" theories of the labor market, wages are always set so that a worker is just indifferent between the job he occupies and his next best job alternative. In practice, as the traditional theory predicts, wages do depend on job characteristics: Premium wages are commonly paid for hazardous assignments and overseas assignments as well as for weekend work and late night shifts. Why aren't these practices even more extensive, fully compensating employees for all important variations in job characteristics? That question demands an answer here, for if employees *were* fully compensated, they would have no interest in distorting the employer's decisions.

Spot contracting theories of the labor market are based on the assumption that workers are willing and able to change jobs on short

notice, and so won't accept any undesireable assignment without a compensating wage adjustment. To the extent that mobility costs and other labor market frictions limit frequent job changes, there is scope for post-employment decisions to affect worker welfare. If, in addition to these labor market frictions, there are contracting costs that make detailed contingent wage contracts too expensive to execute, wages *cannot* compensate for all the attributes of jobs that matter to employees. That much is unsurprising. What is perhaps surprising is that, as we shall show, even fully efficient wage contracts in the presence of labor market frictions would not generally leave employees indifferent among their employer's decisions. *The theoretical conclusion that employees care about non-wage decisions when there are labor market frictions holds regardless of the level of detail that can be economically incorporated into labor contracts.*

Henceforth, I shall refer to the excess of an employee's welfare at his job over what he could get by moving to a new job as a <u>quasirent</u>.[3] The first part of our thesis can now be usefully restated as follows: Even with optimal wage contracts, the quasirents that an employee enjoys do depend on non-wage decisions that are made after the employee is hired.

The second part of the thesis identifies certain elements that are predicted to have important consequences for an organization's perfor-

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[3]The notion of quasirents is an *ordinal* one but has a natural zero; an employee will quit when the quasirents he earns become negative. We will sometimes measure quasirents in utiles and sometimes in dollars.

mance. To forecast the influence costs that an organization is likely to incur, one looks for policies that lessen the effect of non-wage decisions on employee welfare, or that align employee welfare with the firm's profits, since these tend to reduce conflicts of objectives. However, as shown later, such policies are costly (they force an increase in total wages paid or a loss of productive efficiency), and so will be pursued intensively only when the costs of influence activities are sufficiently high. One also studies the organization's charter to determine *who* may influence *which* decisions. Decisions that are made mechanically (standard operating procedures, rigid bureaucratic rules, promotions based on seniority) allow little scope for personal influence and its associated distortions. However, such mechanical decision procedures are not always feasible (when the cooperation of employees cannot be forced) and they are inflexible and totally unresponsive to the particular circumstances surrounding the decision.

An economic perspective that emphasizes quasirents and influence can illuminate organizational issues that have most often been studied from a behavioral point of view. For example, resistance to change in organizations, often attributed principally to fears and other non-economic factors,[4] might be better explained as consisting primarily of the rational, rent-protecting behavior of people who hold good jobs.

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[4]For example, Chandler [1962, p. 15] holds that executives may resist "administratively desirable changes because because [it threatens] their own personal position, their power, or most important of all, their psychological security."

These alternative explanations of resistance to change have different implications concerning when the phenomenon is most likely to occur: The rational actor theory predicts less resistance to the mostly rent-enhancing changes often associated with growth than to the mostly rent-reducing changes associated with contraction. It also specifies that the resistance to change will be concentrated among those whose rents are threatened, rather than broadly diffused among all affected parties. For another example, power-seeking behavior, which could be viewed as seeking "recognition," might be better seen as seeking influence over decisions for pecuniary gain.

Perhaps the most striking implication of this perspective is its general prediction hinted at earlier: Centralized decisions will be burdened with higher influence costs than decentralized ones. Here, I use the term "centralized decision" in a non-traditional way: I mean decisions in which the decisionmaker relies on the information supplied by (one or several) interested parties. For example, the central planner in a socialist economy who sets resource allocations and production targets on the basis of information provided by local managers is making a highly centralized decision. In contrast, the owner of a small firm in a market economy who hires workers and resources and plans production using his own personal knowledge of local circumstances is making decentralized decisions. The local managers in planned economies and the managers of regulated firms in mixed economies spend large amounts of their time in attempts to influence the centralized decisions that inevitably affect their interests. These influence costs could be avoided if decisionmaking were decentralized.

The rest of this paper is organized as follows. Section 2 is devoted to the study of quasirents in an optimal contracting model. We shall find that, despite optimal contracting, quasirents do generally vary with post-contracting events. This important phenomenon is explored in some detail, with a view to analyzing the determinants of the sizes of quasirents, to showing that optimal wage contracts can actually lead to *greater* variations in quasirents than fixed wage contracts, and to identifying some of the systemmatic preferences among job attributes that many employees will share.

No post-employment decisions are made by the firm in the models studied in section 2, so no influence costs are incurred. Section 3 extends one of the models of section 2 by introducing a job assignment decision and allowing the possibility that an affected employee could provide information to assist in the decision. Because the employee's information is valuable, it is costly to exclude him from the decision process. However, including the employee leads to influence costs; the employee will be tempted to devote too much of his valuable time to thinking up ways to sway the decision. The organization design problem is to choose a charter and a wage policy to maximize profits given that the employee's behavior is governed by pursuit of his own self-interest.

In the job assignment situation just described, we may define the *marginal influence product* of an employee's time to be the increase in the probability of a decision favorable for the employee when the employee spends an extra hour in influence activities. If the marginal influence product increases when the employee's information is given

more weight in the decision and an additional condition is satisfied, then decisions made under the optimal charter do not give full weight to the employee's information: There is some decentralization under the optimal charter.

In section 4, connections are drawn between the theory advanced here and some related literature on economic organization theory.

2. The Prevalence of Quasirents

Following Simon [1951], let us suppose that at the time of contracting neither the employer nor the employee knows the precise conditions that will prevail at the time that work must actually be done. In an academic job market, a new professor may not know who his colleagues will be, which courses he will teach, what his committee and administrative responsibilities will be, which office and secretary will be assigned to him, who his research assistant will be, etc. These characteristics of the job, to be determined after the employment relation begins, will be denoted by x. The employment contract specifies a wage that may be a function of the undetermined characteristic: $w = w(x)$.

To build a simple formal model of this situation, we assume that the possible circumstances $\{x_0, x_1, \ldots, x_N\}$ and their probabilities $\{p_0, p_1, \ldots, p_N\}$ are given exogenously. Let w_i denote the wage paid in circumstances x_i. Suppose that the employee's preferences are given by the von Neumann–Morgenstern utility function $u(x,w)$, where u is twice continuously differentiable in w. For brevity, let us write $u_i(w)$ for $u(x_i,w)$. We assume that each $u_i' > 0$. The employer's expected gross

profits in event x_i are π_i. The employer is assumed to be a risk neutral expected net profit maximizer. Suppose that, at the time of contracting, labor market conditions require the employer to offer the agent an expected utility of at least $\bar{u}$. Further suppose that the employee, after signing the contract and learning that the job is x, will quit and reenter the labor market unless $u(x,w(x))$ is at least some reservation level $\hat{u} < \bar{u}$, where $\bar{u} - \hat{u}$ reflects mobility costs. The employer, however, is assumed always to be bound by the contract. An efficient contract, subject to the employee's "no quitting" constraint, solves:

(CP)
$$\text{Maximize} \sum_{i=0}^{N} p_i(\pi_i - w_i)$$

subject to

$$\sum_i p_i u_i(w_i) \geq \bar{u}$$
$$u_j(w_j) \geq \hat{u} \quad \text{for all } j=0,1,\ldots,N.$$

Let us consider a family of problems like (CP), parameterized by $\bar{u}$. We will need to take $\hat{u}$ to be any function of $\bar{u}$, such that $\hat{u}(\bar{u})$ is always less than $\bar{u}$. At the optimal solution, $u_i(w_i) - \hat{u}$ is a measure of the employee's quasirents, expressed in utiles. The question we ask now is: When does the optimal solution of (CP) equalize quasirents across assignments, so that $u_i(w_i^*) = \bar{u}$ for all i? The answer is given by the following result.

Theorem 1. The solution to (CP) equalizes quasirents across assignments $(u_i(w_i^*) \equiv \bar{u})$ for every $\bar{u}$ if and only if u_0 is concave and there is a job valuation vector $g = (g_0, g_1, \ldots, g_N)$ such that:

(1) $$u_i(w) \equiv u_0(w + g_i) \quad \text{for all } w \text{ and } i.$$

Proof. That the specified conditions imply that the optimal contract equalizes quasirents is routine; we focus attention on the reverse implication. The hypothesis is now that the optimal wage contract w^* as a function of $\bar{u}$ satisfies $w_i^*(\bar{u}) \equiv u_i^{-1}(\bar{u})$ for all i and $\bar{u}$. The first-order necessary conditions for optimality in (CP) imply that, for all i:

(2) $$u_i'(w_i^*(\bar{u})) = u_0'(w_0^*(\bar{u})) \quad \text{for all } \bar{u}.$$

Then, by the Inverse Function Theorem, $w_i^{*'}(\bar{u}) = w_0'(\bar{u})$ for all $\bar{u}$. So, there exists g_i such that $w_0^*(\bar{u}) \equiv w_i^*(\bar{u}) + g_i$. Then, for any fixed w, we have $u_0(w+g_i) = u_0[w_i^*(u_i(w))+g_i] = u_0[w_0^*(u_i(w))] = u_i(w)$, as required.

Given the identity just derived, the second order necessary conditions imply that $u_0''(w_0^*(\bar{u})) \leq 0$ for all $\bar{u}$, which establishes concavity. □

The theorem asserts that two conditions are equivalent. The first condition is that the optimal contracting problem results in the employee being indifferent among job assignments. The second is that the employee is risk averse and has ordinal preferences that can be represented by vertically parallel indifference curves in (x,w) space. This second characterization of preferences is extremely restrictive. When it fails, the optimal contract will not leave the employee indifferent among assignments.

Notice that the optimal contract does not depend at all on the π_i's, because the employer's expected gross profits are by assumption fixed. In general, then, there is no relationship between the employer's ranking of outcomes, determined by $\pi_i - w_i$, and the employee's, determined by $u(x_i, w_i)$. The employee and employer will both generally care about which outcome x occurs, but there is no necessary relationship between their preferences.

Although Theorem 1 establishes the likelihood of quasirents and intra-organization conflicts of interests, it is incomplete in other respects. It doesn't say that quasirents will be large or that wage contracts will not at least tend to equalize the desirability of different job assignments. Because it treats x as exogenous, it leaves open the possibility that jobs might normally be designed to equalize quasirents. It says little about the determinants of the size of quasirents and gives no hint regarding the attributes of desirable job assignments. The examples offered below help to illuminate these issues and questions.

Example 1: On-the-job consumption. Let x denote on-the-job consumption and let w, the wage, be a surrogate for off-the-job consumption. Suppose that the employee's ordinal preferences have the Cobb-Douglas form $x^\alpha w$ and that his coefficient of relative risk aversion for wage gambles is the constant β. These cardinal preferences are represented by $U(x,w) = \alpha \ell n(x) + \ell n(w)$ if $\beta = 1$ and otherwise by $U(x,w) = (x^\alpha w)^{1-\beta}/(1-\beta)$. Suppose $\hat{u} = 0$. Then if the employee is risk-averse $(\beta > 0)$, the solution to the contracting problem (CP) is

$w(x) = \lambda x^{\alpha(1-\beta)/\beta}$ for some constant λ that depends on the parameters α, β, $\bar{u}$, and $(p_1, \ldots, p_N)$. Notice in particular that if $\beta < 1$, then $w(\cdot)$ is actually an increasing function of x: _If employees are not too risk averse, the optimal contract specifies that employees who are lucky enough to receive more on-the-job consumption should also receive a higher wage_! The ordinal utility associated with job x can be measured by $x^{\alpha} w(x) = \lambda x^{\alpha/\beta}$: _Regardless of the level of employee risk aversion, the best jobs as those with high on-the-job-consumption._

The generality of this last conclusion has been established by Bergstrom [1984]. His result, applied to this model, establishes that if on-the-job consumption is a normal good, the optimal wage contract will always lead employees to prefer jobs with higher x.

The existence of gains to contracting in this example do not depend on the employee being risk averse. Indeed, let us assume that $\beta \leq 0$ and that there is a finite number of job assignments and that the x_i's are ordered so that $x_0 < x_1 < \ldots < x_N$. Then the optimal contract specifies that $w_0 = \ldots = w_{N-1} = 0$ and that the wages in task N (where on-the-job-consumption is highest) are $w_N = x^{-\alpha} [\bar{u}(1-\beta)/p_N]^{1/(1-\beta)}$. Thus, whether employees are risk-averse, risk-neutral, or risk-loving, the high x jobs are most favored by employees.

In Example 1, as the coefficient of relative risk aversion β increases, the ordinal utility measure $x^{\alpha} w_{\beta}(x)$ converges to a constant. The same holds, of course, for any other ordinal representation of the employee's preferences that is a continuous function of x and w. Thus, compensating wage variations $c(x|\bar{x})$ defined (relative to an arbitrary

job assignment $\bar{x}$) by $U(x,w(x)+c(x|\bar{x})) = U(\bar{x},w(\bar{x}))$ converge to zero as β grows large. The propositions proved below generalize the example and establish that, for smooth utility functions $U(x,w)$ that are concave in w, increases in risk aversion cause the wages in "poor" jobs to rise and the wages in "good" jobs to fall. Hence, they cause the "dispersion" of quasirents across job assignments to decline.

Let $U(x,w)$ represent the preferences of the less risk averse employee and $V(U(x,w))$ the preferences of the more risk averse employee, where V is a smooth, increasing, concave function. The valuation of market opportunities and the opportunities themselves may differ across agents, depending on their risk aversion. Let us assume that the reservation utility level for the more risk averse agent is $\bar{v}$. Assuming an interior optimum to the contracting problems, the marginal utilities of income across assignments are equalized for each of the two agents: $U_w(x,w(x)) = \lambda$ and $V'(U(x,\hat{w}(x)))U_w(x,\hat{w}(x)) = \mu$ for all x, where $w(\cdot)$ and $\hat{w}(\cdot)$ are the wage schedules of the respective contracting problems.

We show now that for the more risk averse employee, quasirents are increased in the undesirable jobs and reduced in the desirable ones.

<u>Theorem 2.</u> There exists u^* such that for all x, either $u^* \geq U(x,\hat{w}(x)) \geq U(x,w(x))$ or $u^* \leq U(x,\hat{w}(x)) \leq U(x,w(x))$.

<u>Proof.</u> Choose u^* so that $V'(u^*) = \mu/\lambda$ (letting $u^* = +\infty$ if μ/λ is below the range of V' or $-\infty$ if it is above). There are now two cases. If $U(x,\hat{w}(x)) \geq u^*$, then since U_w is positive and V' is decreasing, $\mu = V'(U(x,\hat{w}(x)))U_w(x,\hat{w}(x)) \leq (\mu/\lambda)U_w(x,\hat{w}(x))$. So, $U_w(x,\hat{w}(x)) \geq \lambda =$

$U_w(x,w(x))$, which (since $U_{ww} < 0$) implies that $\hat{w}(x) \leq w(x)$ and hence that $u^* \leq U(x,\hat{w}(x)) \leq U(x,w(x))$. The case for $U(x,\hat{w}(x)) \leq u^*$ is similar. $\square$

Note that the conclusion of Theorem 2 is an ordinal conclusion: The stated inequalities hold for any increasing transformation of U, that is, for any representation of ordinal preferences. The statement that quasirents are "less dispersed" when the employee is more risk averse can be interpreted as one about the probability distributions of the utility levels $U(x,w(x))$ and $U(x,\hat{w}(x))$. By Theorem 2, the distribution functions functions for these random quantities cross at most once, at u^*. If the distributions do not cross at all (that is, if $|u^*| = \infty$), then the relation between the distributions is one of first-order stochastic dominance. Suppose the distribution do cross, that is, that there is no first order stochastic dominance. Then, there are many increasing functions f satisfying the single linear restriction: $E[f(U(x,\hat{w}(x)))] = E[f(U(x,w(x)))]$.[5]

Corollary 3. For every increasing function f such that $f(U(x,w(x)))$ and $f(U(x,\hat{w}(x)))$ have equal expectations, the distribution of the first is a mean-preserving spread of the distribution of the second.

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[5] If there are 2N distinct utility levels $U(x,w(x))$ and $V(U(x,\hat{w}(x)))$, then the manifold of all increasing functions from this domain to $\mathbb{R}$ has dimension 2N. The equal means restriction reduces the dimension by only one; so the relevant set is a manifold of dimension 2N-1.

Proof. The single-crossing of the distribution functions, noted above, is preserved under ordinal transformations, and this together with equal means implies the mean-preserving spread condition [Rothschild and Stiglitz, 1970]. □

Although the mathematics of example 1 has been developed with the interpretation of on-the-job consumption in mind, there are other possible interpretations. For example, x may represent future consumption that results from human capital accumulation. Thus, if x represents second period consumption and w current consumption and if utility takes the form u(w) + v(x), employees will prefer the job with greater human capital accumulations x. A model along these lines is developed more fully below, as Example 2.

Example 2: "Your Big Chance". This is an example in which the particular details of the job x are part of the design problem, and the employee cares only about present and future wages. Our model is a variant of one presented by Harris and Holmstrom [1982].

We suppose that the employee has a two-period life. The marginal product of an employee in his second period job assignment is high (H) with probability p or low (L) with probability 1-p. The employee's expected productivity is M = pH + (1-p)L. Of course, H > M > L. At the beginning of the first period, the worker signs a contract with the firm, and is assigned to task 1 with probability q or task 2 with probability 1-q. In task 1 the worker's ability is learned; in task 2 it is not.

At the end of the first period, the worker is free to quit the firm and go to work elsewhere for a wage equal to his then expected marginal product. This mobility imposes a lower bound on the wage the worker can be paid in the second period. However, there are market frictions: The employee cannot leave during the first period after learning his job assignment. The optimal contracting problem is to minimize the expected wages paid to the worker subject to the initial market utility constraint and the lower bounds on second period wages. The employee is assumed to care only about wages received in the two periods. In terms of our previous analysis, the aspect x of the job that the employee cares about is its probability distribution over second period wages. This distribution is chosen by the employer, subject to constraints.

Let w_1^i be the first period wage in job i. Let w_H^1, w_L^1, and w_2^2 be the wages paid in period 2 in job 1 if the worker has high ability, in job 1 if the worker has low ability, and in job 2 regardless of ability, respectively. The optimal contracting problem, assuming the employer hires workers to the point where expected wages over the two periods equals expected marginal product, is:

(3) Maximize $q[u(w_1^1) + pu(w_H^1) + (1-p)u(w_L^1)] + (1-q)u(w_1^2) + u(w_2^2)]$
   subject to

$$q[w_1^1 + pw_H^1 + (1-p)w_L^1] + (1-q)[w_1^2 + w_2^2] = M$$

$$w_H^1 \geq H$$

$$w_L^1 \geq L$$

$$w_2^2 \geq M$$

where u is some strictly concave function representing the utility of

single period consumption. Let λ_1, λ_2, λ_3, and λ_4 be the Lagrange multipliers on the four constraints. It follows immediately that $u'(w_1^1) = \lambda_1 = u'(w_1^2)$. Checking cases, one finds that only the third constraint is not binding ($\lambda_3 = 0$). So, $u'(w_L^1) = \lambda_1$, and hence:

$$(4) \qquad\qquad w_1^1 = w_1^2 = w_L^1; \quad w_H^1 = H; \quad w_2^2 = M.$$

In job 1, the worker's second period wage is sometimes greater, and never less, than his marginal product, so its expectation exceeds the marginal product. In job 2, the second period wage is equal to expected marginal product. So the expected second period wage is higher in job 1 than in job 2. First period wages are the same for both jobs. So, if the worker is not too risk averse, he will prefer job 1.

Intuitively, job 1 represents the worker's "Big Chance" to demonstrate his ability. According to the model, workers for whom u is not too concave will always prefer such jobs. This occurs even though all the relevant aspects of the jobs (the wages) were designed by the employer.

Example 3: Quasirents and private information.

So far, we have assumed that the employer knows the employee's preferences and outside opportunities and sets the wage contract so that the employee never wants to quit. In this example, we relax the assumption that outside opportunities are known by the employer, and

explore the proposition that employees generally prefer to occupy "critical" jobs in the organization.[6]

To isolate the notion of "critical" jobs, we modify the basic model. Assume that the gross profits earned when x_i occurs are π_i if the employee works and $\pi_i - \Delta_i$ if he does not. The agent's utility is w if he works in job i at wage w, $g + b$ if he is laid off and receives a layoff bonus b, and $g + b_Q$ if he quits and receives bonus b_Q; the employee has no exogenous preferences among assignments. The variable g — the employee's outside opportunities — is privately observed by the employee after the job is assigned, and is drawn from a distribution F with a density function f that is continuous and positive on the interval $(0, \bar{g})$. To insure an interior optimum for our contracting problem, assume that $\bar{g} > \max_i \Delta_i > \min_i \Delta_i > 0$. There is no bonding of employees and the employer cannot penalize the employee for quitting, that is, $b, b_Q \geq 0$.

Assume that the employee will quit if his market opportunities are better for him than staying on the current job, that is, if $w < g + b_Q$. With these assumptions, by standard arguments in the theory of optimal contracts, the firm can (without loss of generality) represent its design problem as follows. The employee, observing the job x_i and his outside opportunity g, reports that his outside opportunity is $\hat{g}$. Prior to receiving the employee's report, the firm commits to a strategy that

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[6]One could assume here that the employee's outside opportunities are known but his preferences over jobs are not, with similar effect.

specifies for each job i and report $\hat{g}$ a wage $w_i(\hat{g})$ and a probability $q_i(\hat{g})$ that the employee will be laid off and paid a bonus of $b_i(\hat{g})$. Employees who quit from job i are paid $b_{iQ}(\hat{g})$. Without loss of generality, we may restrict attention to contracts for which employees never want to quit.[7] The functions w, b, and q are "incentive compatible," that is, they always provide the employee with an incentive to report g truthfully. In this form, the firm's problem is:

$$(5) \quad \max_{w,b,q} \sum_i P_i \left[\pi_i - \int_0^{\bar{g}} [q_i(g)(\Delta_i + b_i(g)) + (1-q_i(g))w_i(g)]f(g)dg \right]$$

subject to

$$(XA\text{-}PC) \quad \sum_i P_i \cdot \int_0^{\bar{g}} U^i(g;g)f(g)dg \geq \bar{u}$$

$$(XP\text{-}PC) \quad w_i(g) \geq g + b_{iQ}(g) \quad \text{for all } i, g.$$

$$(IC) \quad U^i(g;g) \geq U^i(\hat{g};g) \quad \text{for all } i, g, \text{ and } \hat{g}, \text{ and}$$

$$w_i(g), b_i(g), b_{iQ}(g) \geq 0 \quad \text{for all } i \text{ and } g.$$

where

$$(6) \quad U^i(\hat{g};g) = q_i(\hat{g})(g + b_i(\hat{g})) + (1 - q_i(\hat{g}))w_i(\hat{g})$$

Equation (6) defines $U^i(\hat{g};g)$ to be the employee's expected utility when he reports that his outside opportunity is $\hat{g}$ when it is actually g, and the employee does not quit. The firm's objective is one of profit

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[7] Given any contract in which employees sometimes quit, there is an "equivalent" contract without quits. Under the equivalent contract, the employer lays off the employee in just the circumstances when he would have quit under the originally given contract, and pays a layoff bonus equal to the quitting bonus the employee would otherwise have received. The only thing that has changed is the labeling of quits and layoffs.

maximization. Substituting (6) into (5), the objective may be alternatively expressed as the total expected profits and utility minus the employee's expected utility:

$$(5A) \qquad \sum_i P_i \left[\pi_i + \int_0^{\bar{g}} \{q_i(g)[g - \Delta_i] - U^i(g;g)\}f(g)dg \right]$$

The incentive constraints (IC) state that it must be in the employee's interest to tell the truth about g. There are two kinds of participation constraints. The <u>ex ante</u> participation constraint (XA-PC) requires that the employee receive at least the minimum expected utility level; otherwise, he would not agree to the contract. The <u>ex post</u> participation constraints (XP-PC) require that the employee's wage be no worse than his outside opportunity when he is employed; otherwise, he would quit.

<u>Theorem 4.</u> (a) Assume that $g + F(g)/f(g)$ is a nondecreasing function of g. Then there exist wages w_i^* such that an optimal solution to the firm's problem has $w_i(g) = w_i^*$ for all i and g and has $q_i(g)$ equal to zero or one according as $g + b_i(g)$ is less or more than w_i^*. Also, $w_i^* > w_j^*$ if and only if $\Delta_i > \Delta_j$.

(b) Let λ be the Lagrange multiplier on (XA-PC). Always, $\lambda \leq 1$. If $\lambda < 1$, then $b_i(g) = b_{iQ}(g) = 0$ for all i and g. If $\lambda = 1$,[8] then one optimum has $b_i(g) = b_{iQ}(g) = k \geq 0$ and $w_i^* = \Delta_i + k$.

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[8]The case with $\lambda = 1$ is relatively uninteresting, since it has wages in excess of the employee's marginal product Δ_i for all i. In such a case, one would not expect the firm to hire the employee at all.

Proof. Given any feasible solution, increasing both $w_{iL}(g)$ and $w_i(g)$ by any constant k increases the employee's _ex ante_ expected utility by kp_i and reduces the employer's profit by an equal amount; hence λ can never exceed unity.

Let subscripts on U^i denote partial derivatives. In view of (IC), we must have $U_1^i(g;g) = 0$ for all g. Then, using (6), $\frac{d}{dg}U^i(g;g) = U_2^i(g;g) = q_i(g)$. So,

$$(7) \qquad U^i(g;g) = U^i(\bar{g};\bar{g}) - \int_g^{\bar{g}} q_i(s)ds$$

Notice that the constraint (XP-PC), the non-negativity constraint on $b_{iQ}(g)$, and (6) imply that:

$$(8) \qquad U^i(\bar{g};\bar{g}) \geq \bar{g}.$$

Now, we consider a "relaxed" problem: We maximize the objective (5A) subject only to the constraints (XA-PC), (7) and (8). To accomplish that, let $K = \Sigma\, p_i\pi_i$, let λ be the multiplier on (XA-PC), and form the Lagrangian:

$$(9) \qquad K + \sum_i p_i\left[\int_0^{\bar{g}}q_i(g)[g-\Delta_i]f(g)dg + (\lambda-1)\int_0^{\bar{g}}U^i(g;g)f(g)dg\right]$$

which is to be maximized by choice of $q_i(\cdot)$, $w_i(\cdot)$, $b_i(\cdot)$, and $b_{iQ}(\cdot)$. Substituting from (7) and reversing the order of integration for the resulting double integral, the Lagrangian becomes:

$$(10) \qquad K + \sum_i p_i\left[(\lambda-1)U^i(\bar{g};\bar{g}) + \int_0^{\bar{g}}q_i(g)[g - \Delta_i + (1-\lambda)F(g)/f(g)]f(g)dg\right]$$

Let $H_i(g) = g - \Delta_i + (1-\lambda)F(g)/f(g)$. d let $\bar{w}_i$ be the solution of $H_i(w) = 0$. Since $\lambda \leq 1$, the hypothesis that $g + F(g)/f(g)$ is increasing

implies that H_i is increasing. Then, given our hypothesis about the support of F, the equation $H_i(w) = 0$ has a unique solution $\bar{w}_i$ lying in $(0,\bar{g})$. Let $q_i(g) = 0$ for $g \leq \bar{w}_i$ and $q_i(g) = 1$ for $g > \bar{w}_i$.

Consider the the case $\lambda < 1$. Letting $w_i(g) = w_i^* = \bar{w}_i$ and $b_i(g) = b_{iQ}(g) = 0$ for all i and g, the constraints (IC) and (XP-PC) are satisfied by inspection. The definition of λ insures that (XA-PC) is satisfied. These choices lead to $U^i(\bar{g};\bar{g}) = \bar{g}$ for all i, so together with the specified $q_i(\cdot)$ functions they maximize (9) by inspection. Since this optimal solution of the relaxed problem satisfies all the constraints of the original problem, it is an optimal solution of the original problem.

Next consider the case $\lambda = 1$. Set $w_i(g) = w_i^* = \Delta_i + k$ and $b_i(g) = k$, where:

$$k = \bar{u} - \sum_i p_i \int_0^{\bar{g}} \max(\Delta_i, g) f(g) dg .$$

By inspection, the specified choice of q is the unconstrained expected surplus maximizing choice. Also, the constraint (XA-PC) is satisfied with equality, and the other constraints are satisfied as well. It follows that the firm's expected profits have been maximized.

In each case, w_i^* is increasing with Δ_i, since $\bar{w}_i$ is. $\square$

There are three observations to emphasize. First, the employee's wage at the optimal contract depends only on his job, so no actual reporting of outside offers need be made. Second, the wage, and therefore the employee's welfare, is higher when he occupies a job of more critical importance to his employer. The reason is simple and

intuitive: The employer raises the wage more the more it stands to lose if the employee quits. Finally, there is no necessary relationship between the employer's preferences over outcomes i and the employees. Indeed, the wages in the optimal contract do not depend on the π_i's, because the π_i's are only as a constant in the optimization problem. The employer's preferences ove outcomes, however, may be predominantly determined by these same π_i's.

One interesting interpretation of the jobs in this example is that they vary according to the amount of capital managed. For suppose that the rate of return on a division's capital falls by a fixed percentage during a period when a manager is being replaced. Then, Δ_i will be proportional to the amount of capital being managed. So wages (and quasirents) will be greater the greater is the amount of capital being managed.

To summarize this section, the following conclusions have emerged from our analysis. First, in the presence of labor market frictions optimal wage contracts do not generally leave employees indifferent among post-contractual non-wage outcomes, such as job attributes. There is no assurance that wage contracts will even tend to compensate for differences among jobs; the best jobs may also carry the highest wages. Second, in the absence of private information about the desirability of jobs, quasirents tend to be more varied across jobs when workers are less risk averse. Third, even when the employee has no direct preferences with regard to job attributes and cares only about wages, it is still the case that quasirents may vary across job assignments. And

last, the three examples have identified certain characteristic attributes of good jobs. Employees prefer jobs with more on-the-job consumption (provided that on-the-job consumption is a normal good) and greater opportunities to test and demonstrate their abilities (provided they are not too risk averse). Employees also prefer jobs in which their continued employment is especially valuable to the employer — for example jobs in which they control large sums of capital — because the employment contract will then specify a high wage to ensure that the employee does not quit.

3. Influence and Endogenous Incentive Problems.

The next part of the argument is that, since employees have a personal interest in many of the decisions that are made in the day-to-day operation of their organization, they will seek to influence and, perhaps, distort organizational decisions. Organizational decision processes proceed though a series of phases. Employees — especially managerial employees — search the environment for opportunities to be exploited, generate a list of alternatives to be considered, identify the dimensions along which alternatives can be evaluated, contribute information useful for evaluating the alternatives along those dimensions, draw these elements together to reach a decision, and finally work to make the decision successful. Each of these elements is important for effective decisionmaking and subject to manipulation by employees whose interests differ from those of the organization.

The costs associated with manipulations of information, which I shall call "influence costs," can be reduced in two general ways. The first is by adopting standard operating procedures, promoting on the basis of seniority or other objective standards, relying relatively more on externally generated information than on employee suggestions and information, and in general by instituting rules that reduce the scope for employees to influence the organization's decisions. The second is by rotating employees through any especially desirable or undesirable positions, paying compensating wage differentials for performing unpleasant tasks, providing incentive pay that is linked to the organization's performance, and in general by reducing the distributional consequences of decisions and aligning the employees' personal interests more closely with those of the organization.

Each of the measures just described is costly. For example, incentive pay often leads employees to bear risks that the organization is better suited to bear; rotating employees sacrifices the advantages of specialization; and spurning employee provided information in favor of, say, rigid seniority rules leads to a poorer matching of workers to jobs.

Influence costs are costs of decisionmaking, and general economic reasoning implies that the firm ought to be willing to incur those costs to the point where the marginal value of permitted influence in terms of improved decisionmaking is just equal to its marginal cost. When increasing employee influence leads both to better information for decisionmaking and to higher "influence" costs, an organization will do

best to operate at a point where the marginal value of influence for improved decisionmaking is positive: <u>Some degree of decentralization will be optimal.</u> The model developed below investigates, confirms, and refines this intuition in a particularly simple decision setting.

An employee-manager works for an employer for two periods. In the first period, he works job 0, managing some unit for the employer and earning a wage w_0. In the second, he is assigned to either job 1 or 2. No information about the manager's performance in job 0 is available until after the job assignment decision must be made, but the wage paid in the second period can be made contingent both on the job assignment and on the manager's first period performance.

The manager's von Neumann-Morgenstern utilities for job i with wage w is $u_i(w)$, with $u_i' > 0$ and $u_i'' < 0$. His outside opportunities at the time of contracting provide a utility level of $\bar{u} + u_0(w_0)$ to the manager. Since the wage w_0 does not directly affect incentives, we omit it from the formulation.

Notice that, according to the specified preferences, the employee has no exogenously specified "disutility of effort." The difficulty is not one of getting the manager to work. Rather, it is one of getting him to allocate his efforts in the desired way. The incentive problem is endogenous: Its severity depends on parameters of the organization design that are subject to choice.

We will assume that job 1 would be at least as desirable as job 2 at the solution to problem (CP) of section 2. This means that whenever wages are set to equate the marginal utilities of income in the two

jobs, the worker would prefer to hold job 1:

(11)   For all w and $\hat{w}$, if $u_1'(w) = u_2'(\hat{w})$ then $u_1(w) \geq u_2(\hat{w})$.

During the first period of his employment, the manager spends time t_M managing his unit and time t_I gathering information, identifying issues, evaluating alternatives, etc. From these, as in the analysis of he makes selective reports to the employer that will be used by the employer to determine is the employee should be assigned to job 1 or job 2. Milgrom and Roberts [1986] have provided a model of selective reporting of alternatives, issues, and information; here a reduced form derived from their model is employed.

Let α denote the "weight" given to the employee-provided information in the job-assignment decision. Values of $\alpha < 1$ correspond to underweighting the information relative to the optimum, while values of $\alpha > 1$ corresponding to overweighting.

In general, the way the employer interprets any information reported by the employee will depend on all the parameters of the problem, since these determine how the employer "thinks" the employee has spent his time. For our reduced form, let $\hat{t}_I$ be the time the employer expects the employee to spend on influence activities. Let $f(t_I, \hat{t}_I, \alpha)$ denote the probability that the employee will be found qualified. We refer to $\partial f/\partial t_I$ as the marginal influence product, and assume that it is zero when $\alpha = 0$ (the employee's information gets "no weight") and positive otherwise.

For example, suppose that the firm asks the employee to submit a sample of size M of observations on his own qualifications. Of these M, αM will be selected at random for close consideration. Suppose the sample observations are statistically independent, that reported sample information can be verified, and that the size of the sample from which the employee selectively reports the most favorable observations[9] is proportional to t_I. Then, if the employee's report can influence the outcome, our assumptions about f are satisfied.

The probability that the unit managed will have a successful outcome is $g(t_M)$; we assume that $g' > 0$. The quality of the employer's decision, measured in dollars of expected profits, is $h(t_I, \hat{t}_I, \alpha)$. We assume that h is smooth and that for all t_I, $h(t_I, \hat{t}_I, \cdot)$ is maximized at $\alpha = 1$; the latter is just a normalization that eases the interpretation of the mathematical results. The total time available for the manager to allocate is unity: $t_M + t_I \leq 1$.

The manager is faced with a wage schedule $w = (w_{1S}, w_{1F}, w_{2S}, w_{2F})$ that specifies wages to be paid in job 1 (w_{1S} if the first period outcome is a success, w_{1F} if it's a failure) and job 2 (w_{2S} or w_{2F}). The corresponding utility levels are denoted by u_{1S}, u_{1F}, u_{2S}, and u_{2F}. Then, the manager's problem is to:

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[9]See Milgrom [1981] for a precise treatment of "more favorable" information, and the conditions under which an interested party can be expected to report the most favorable information.

(MP)   Maximize $f(t_I, \hat{t}_I, \alpha)[g(t_M)u_{1S} + (1-g(t_M))u_{1F}]$
t_M, t_I

$$+ (1-f(t_I, \hat{t}_I, \alpha))[g(t_M)u_{2S} + (1-g(t_M))u_{2F}]$$

subject to $t_M + t_I \leq 1$, $t_M, t_I \geq 0$.

When (t_M^*, t_I^*) solves (MP) with optimal value u^*, we shall say that the utility schedule u <u>implements</u> (t_M^*, t_I^*), given α and $\hat{t}_I$, <u>with value u^*</u>. Let $v_1 = u_1^{-1}$ and $v_2 = u_2^{-1}$. If the owner wishes to implement the particular choice (t_M, t_I) with value $\bar{u}$ given α and $\hat{t}_I = t_I$, the minimum expected wage cost of doing so is $c(\alpha; t_M, t_I, \bar{u})$, which is the optimal value of the Implementation Problem:

(IP)   Minimize $g(t_M)f(t_I, \hat{t}_I, \alpha)v_1(u_{1S}) + (1-g(t_M))f(t_I, \hat{t}_I, \alpha)v_1(u_{1F})$
           u

$$+ g(t_M)[1-f(t_I, \hat{t}_I, \alpha)]v_2(u_{2S}) + (1-g(t_M))[1-f(t_I, \hat{t}_I, \alpha)]v_2(u_{2F})$$

        subject to

(IC)   u implements (t_M, t_I) given α and t_I

(PC)   with value $\bar{u}$.

Here (IC) is the incentive constraint and (PC) is the participation constraint.

Let π be the extra profit earned by the owner if the first period management is successful. Then the owner's problem is to:

(OP)   Maximize $g(t_M)\pi + h(t_I, t_I, \alpha) - c(\alpha; t_M, t_I, \bar{u})$
t_M, t_I, α

<u>Theorem 4.</u> If there is some $k \geq 0$ such that $u_1(w) \equiv u_2(w+k)$, then at the solution to (OP), $\alpha = 1$ and t_M and t_I solve the total surplus maximization problem:

(12) $$\underset{t_M, t_I \geq 0}{\text{Max}} \quad g(t_M)\pi + h(t_I, t_I, \alpha) + f(t_I, t_I, \alpha)k$$

subject to $t_M + t_I \leq 1$.

In the corresponding implementation problem parameterized by (t_M, t_I) and $\alpha = 1$, the optimal solution is: $u_{ij} \equiv \bar{u}$ for $i=1,2$ and $j=S,F$.

<u>Proof.</u> The specified utilities implement <u>any</u> (t_M, t_I) with value $\bar{u}$, since they make the employee indifferent among outcomes. Moreover, by our previous analysis of (CP), these utilities minimize the expected wage cost in the relaxed problem obtained from (IP) by omitting the incentive constraint. Hence, they also solve the constrained problem (IP) for all t_M, t_I, and α. Then, $c(\alpha; t_M, t_I, \bar{u}) = w_{2S} - f(t_I, t_I, \alpha)k$, and the result follows. □

According to Theorem 4, with quasilinear, risk averse preferences, the incentive constraints do not bind. The employer arranges the manager's compensation so that he is indifferent among job assignments and outcomes, and the manager goes along with the employer's wishes (out of indifference). The employer then chooses t_M and t_I to maximize total surplus, consisting of the employer's profits plus the value of the job assignment to the employee.

The interpretation of Theorem 4 is eased by the fact that with quasilinear employee preferences, the first-best has $\alpha = 1$. When

preferences are not quasilinear, it is not generally true that the first best has $\alpha = 1$, because varying α changes the job assignment probabilities in a way that cannot be perfectly offset by varying wages. Henceforth, we shall assume that $\frac{\partial}{\partial\alpha}f(t_I, t_I, \alpha)$ is zero, that is, that when the employer correctly anticipates the employee's incentives, giving more weight to the employee's information does not bias the decision. With this condition, α does not affect the job assignment probabilities and so, at the first-best, one always has $\alpha = 1$.

Theorem 4 deals with the very special case of quasilinear preferences. For the general case (in which (11) may be strict), the result is as follows.

<u>Theorem 5.</u> Suppose (α, t_M, t_I) is an optimal solution to (OP) with $t_M, t_I > 0$ and let u be a corresponding optimal solution to the implementation problem. Then,

(i) If $\partial h/\partial t_I > 0$, then the manager does not shirk: $t_1 + t_2 = 1$.

(ii) Job 1, with its wage, is more desirable than job 2:

$$g(t_M)u_{1S} + (1-g(t_M))u_{1F} \geq g(t_M)u_{2S} + (1-g(t_M))u_{2F}$$

(iii) Success is rewarded:

$$f(t_I, t_I, \alpha)(u_{1S}-u_{1F}) + (1-f(t_I, t_I, \alpha))(u_{2S}-u_{2F}) \geq 0$$

(iv) If $\partial c/\partial \alpha > 0$, then $\alpha < 1$.

<u>Proof.</u> If (iii) did not hold, t_M would be set to zero, contrary to our hypothesis. If, then, (i) did not hold, a better solution to (OP) would be $(\alpha, 1-t_I, t_I, u)$, since it satisfies the constraints (because the original solution did) and raises the objective value for the firm.

If (ii) did not hold, then a better solution to (OP) would be to leave t_M, t_I, and α unaltered but set $u_{1S} = u_{2S} = u_{1F} = u_{2F} = \bar{u}$, because the latter entails lower expected wages. We now show that. Note that the inverse utility functions v_1 and v_2 are increasing and convex. So, the expected wages under the original scheme are (suppressing some arguments and using Jensen's inequality twice):

$$fgv_1(u_{1S}) + f(1-g)v_1(u_{1F}) + (1-f)gv_2(u_{2S}) + (1-f)gv_2(u_{2F})$$
$$\geq fv_1[gu_{1S}+(1-g)u_{1F}] + (1-f)v_2[gu_{2S}+(1-g)u_{2F}]$$

By (11), v_1' is everywhere less than v_2'. So, assuming (ii) is false, the last expression is:

$$> fv_1(\bar{u}) + (1-f)v_2(\bar{u}) .$$

For (iv), note that α must maximize $h(t_I, t_I, \alpha) - c(\alpha; t_M, t_I)$. Since $h(t_I, t_I, \cdot)$ is maximized at $\alpha = 1$ and $\partial c/\partial \alpha$ is positive, the maximum must occur at $\alpha \leq 1$. It cannot occur at $\alpha = 1$ because $\partial(h-c)/\partial \alpha$ is negative there. □

Parts (i)-(iii) of Theorem 5 confirm that the basic properties of our model conform to the intuitive analysis. According to (i), under stated conditions, the employee does not shirk. He has no exogenous reason to do so; the moral hazard problem comes entirely from the time allocation decision. According to (ii), condition (11), which characterized the good job in the contracting problem (CP) without moral hazard, continues to characterize the good job in the present richer structure. We have interpreted the moral hazard problem to be that the employee is tempted to spend too much time on influence activities and

not enough working. The conclusion (iii) that success is rewarded validates that interpretation, by finding that it is necessary to provide an incentive for the employee to spend more time managing. The crux of the matter, however, is conclusion (iv), which identifies circumstances in which some decentralization is optimal. Its condition that $\partial c/\partial \alpha$ is positive cannot be expected to hold always. It might well fail, for example, if the marginal influence product is decreasing in the weight accorded to the employee ($\partial^2 f/\partial t_I \partial \alpha < 0$), for then increasing α reduces his marginal payoff to time spent in influence. Intuitively, an extremely influential employee has little need to engage in extensive politicking. What might be conjectured is that if $\partial^2 f/\partial t_I \partial \alpha$ is positive, then $\partial c/\partial \alpha$ is also. Subject to one extra condition, this intuition is born out.

<u>Theorem 6.</u> Fix any t_M, t_I, $\bar{u}$, and $\bar{\alpha}$. Let u^* be the corresponding solution of the implementation problem (IP). If the manager's problem with parameters u^*, $\bar{\alpha}$ and $\hat{t}_I = t_I$ has (t_M, t_I) as its <u>unique</u> solution and if $\frac{\partial}{\partial \alpha} f(t_I, t_I, \alpha) = 0$ and $\partial^2 f/\partial t_I \partial \alpha > 0$, then $\frac{\partial}{\partial \alpha} c(\bar{\alpha}; t_M, t_I, \bar{u}) > 0$.

<u>Proof.</u> By the hypothesis, there is a neighborhood of u^* such that u^* is an optimal solution for the implementation problem (IP) over that neighborhood when the incentive constraint (IC) is replaced by the first order condition or "local incentive constraint" for the agent's problem. Let $f' = \partial f/\partial t_I$ and $g' = \partial g/\partial t_M$. Then the local incentive constraint is:

(LIC) $f'[fgu_{1S} + f(1-g)u_{1F} - (1-f)gu_{2S} - (1-f)(1-g)u_{2F}]$

         $- g'[fgu_{1S} - f(1-g)u_{1F} + (1-f)gu_{2S} - (1-f)(1-g)u_{2F}] = 0$.

Let λ be the Lagrange multiplier for this local incentive constraint and let μ be the multiplier for the participation constraint (PC) in this "local implementation problem." The first-order necessary conditions for optimality obtained by differentiating with respect to u_{1S}, u_{2S}, u_{1F}, and u_{2F} are:

(13) $v_1'(u_{1S}) + \lambda(f'-g') - \mu = 0$

(14) $v_1'(u_{1F}) + \lambda(f'+g') - \mu = 0$

(15) $v_2'(u_{2S}) - \lambda(f'+g') - \mu = 0$ and

(16) $v_2'(u_{2F}) - \lambda(f'-g') - \mu = 0$.

It follows that:

(17) $v_1'(u_{1S}) - v_1'(u_{1F}) = -2\lambda g' = v_2'(u_{2S}) - v_2'(u_{2F})$.

By part (iii) of Theorem 5, either $u_{1S} > u_{1F}$ or $u_{2S} > u_{2F}$. So by (17) and the convexity of v_1 and v_2, $\lambda < 0$. By the conditions on the derivatives of f, the left-hand side of (LIC) is increasing in α and the participation constraint (PC) is unaffected by changes in α. So the derivative of the minimum cost of local implementation in α is opposite in sign to λ. However, the unique implementation hypothesis implies that a local implementation (using u near u^*) of (t_M, t_I) for a value of α near $\bar{\alpha}$ is also a solution for the global implementation problem. Hence, $\partial c/\partial\alpha > 0$. □

The condition that $\partial^2 f/\partial\alpha\partial t_I$ is positive has the interpretation that increases in the weight accorded to information lead to increases in the effectiveness for the employee of influence activities. Intuitively, this makes it more expensive to implement a given behavior

when α increases. Hence, the optimum organization charter sets $\alpha < 1$. Our example illustrates that both the compensation policy and the charter may optimally be used for reducing the employee's incentive to spend excessive time attempting to influence decisions.

Thus, finally, we have established the logical possibility that some degree of decentralization, in the sense heretofore defined, may be required in an optimally designed organization. The case for decentralization in the sense of setting $\alpha < 1$ can be converted into a case for setting $\alpha = 0$ when the temptation to engage in influence is great and the value of the employee's information is small. There is another case, as well, in which $\alpha = 0$ may be the optimal solution.

Typically, it is hard to commit to any value of α strictly between zero and one. The problem is that the weight accorded to information is difficult to quantify and therefore subject to dispute. Moreover, the decisionmaker, who is responsible for making an appropriate decision, will be tempted to use any information he receives to best advantage (raising α if $\alpha < 1$), perhaps secretly so if (as is often the case) his decision process is difficult to monitor. For these reasons, committing to values of α strictly between zero and one may be impossible. Then, the charter is limited to setting either $\alpha = 0$ or $\alpha = 1$, and each of these choices will sometimes be optimal.

4. Relation to the Recent Economics Literature.

The question of why, holding transactions fixed, the way a firm is governed should affect the firm's performance received its first careful economic treatment half a century ago in the work of Coase [1937].

Noting that firms do not often use price-mediated trades to conduct their internal business, Coase asked why price-mediated trading was not more common.   It is a question that seems strange to many of the historians, sociologists, and psychologists who study organizations. Being less impressed than economists by the properties of competitive markets, some of them would answer that it is because price-mediated trading does not work very well.[10]   Given this skepticism and the current state of economic knowledge about organizations, it is important to ask and answer the reverse question: Why should any decentralized form of organization — including market-like forms — be expected to perform as well as a centrally planned and controlled form, such as the forms that are sometimes used by firms and in planned economies?

A promising framework for analyzing these questions is the New Institutional Economics, as developed at length in Williamson [1985]. Williamson's theory posits that relationships often function more economically when the parties sink *relationship-specific investments*, that is, investments that would lose much of their value if the relationship were terminated.   Once such an investment has been irreversibly made, however, the investor's bargaining position may be weakened, leading farsighted investors to make inefficiently low levels of

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[10]That answer is not unrelated to Coase's own.   He found that a price-mediated mechanism of exchange has operating costs that may be higher than the transactions costs associated with other forms.

investment.[11]   Consequently, the parties may wish to enter into a contract beforehand that specifies how they plan to conduct their affairs and how the fruits of their cooperation will be shared. However, contracts that anticipate even a small fraction of the many the relevant planning contingencies are prohibitively expensive to write. So, an efficient contract must specify a procedure, or *governance structure*, by which future decisions are to be made and disputes resolved.   The focus of Williamson's economic analysis is on the properties of alternative governance structures.

Williamson's focus on asset specificities only serves to reinforce the advantages of centralized forms of organization over decentralized and market forms. Although his work does rely on the notion that market organization has certain advantages in providing incentives, its offers no economic explanation for why a centralized organization cannot mimic the incentives of the market.

In a study of the problem of vertical and lateral integration, Grossman and Hart [1986] have argued that there are identifiable diseconomies of joint ownership.   They contend that, because it is impossible for the parties to a contract to forsee all possible contingencies, they must assign the unspecified or *residual* decision rights to one party, who may be called the *owner* of the firm.   With this definition of ownership, if decisions have unavoidable externalities, the

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[11]These ideas have also been given a formal treatment by Grout [1984] and Tirole [1986].

identity of the owner can certainly affect the decision that is made. Depending on circumstances, decisionmaking may be most efficient if the residual decision rights of upstream and downstream operations are in the same hands or in different hands. Thus, the efficiency or inefficiency of integration depends on specific circumstances. However, because this theory equates ownership with full control of residual decision rights, it is better suited to the analysis of owner-managed firms than to large modern corporations, with their separation of ownership and control and their dispersal of authority among hundreds of managers.

The approach adopted here, like Williamson's and Grossman and Hart's, focuses on *ex post* decisionmaking in continuing relationships. Unlike Grossman and Hart [1986], where the focus is on the behavior of owners, the focus in this paper is on the behavior of workers and managers. Our emphasis has been on the distribution of influence, rather than decision rights, and we have studied governance structures in which more than one individual exerts some influence over decisions.

The proposed approach continues the modern economic tradition of emphasizing individual incentive problems, but the incentive problems scrutinized here are those that arise in connection with decisionmaking activities that are subject to influence. We ask: Which opportunities for the firm will be sought out by its managers? Which alternatives proposed? Which issues identified? What information will be reported? How faithfully will employees implement the decisions of the higher-ups? We have argued that compensation policy and the organization "charter"

are key determinants of employee behavior in these influence problems, and therefore of the effectiveness of the organization in achieving its goals.

The proposed approach points to economic explanations and analyses for some of the phenomena noted by students of organizations and some of the issues and problems of organization theory. Included are the phenomena of resistance to change,[12] bureaucratic rigidities,[13] and power seeking behavior,[14] and certain aspects of corporate culture,[15] as well as many traditional economic issues where problems of influence and control are paramount. These include vertical integration,[16] corporate

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[12]Those with the best jobs oppose losing their economic rents.

[13]Detailed rules, rigidly enforced, reduce influence costs. Of course, they incur other costs, by calling for actions that are inappropriate in many circumstances.

[14]Employees seek power because those with more control over decisions enjoy higher quasirents.

[15]An egalitarian approach of equalizing quasirents, though it results in higher average wage costs, homogenizes employee interests and facilitates teamwork and effective decisionmaking.

[16]When suppliers are oligopolistic and profitable, they incur excessive selling costs to garner the rents on their sales. Selling costs, of course, are influence costs.

capital structure,[17] takeover bids,[18] tort law,[19] and even comparative systems. John Roberts and I are presently investigating these applications and hope to provide a unified treatment of them in a future manuscript.

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[17] Short term debt financing gives the lender the opportunity to withdraw capital from the firm, which limits the control of the firm's managers. Long term debt, especially debt issued in connection with major construction projects (power plants, oil pipelines, etc.) limits the managers' ability to reinvest the proceeds of earlier investments. Equity capital is comparatively unrestricted.

[18] Analyses of this problem have often focused on the rents lost by the management of acquired firms. A fuller analysis would also consider the rents gained by the managers of the acquiring firm.

[19] A court trial is a highly centralized decision process, in which the disputants often incur enormous influence costs in order to alter a distribution of rents.

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