Influence Costs, Structural Inertia, and Organizational Change

Scott Schaefer

Management and Strategy Department
Kellogg Graduate School of Management
Northwestern University
2001 Sheridan Road
Evanston, IL 60208-2013
s-schaefer@nwu.edu

This paper builds an economic model of the relationship between influence activity and resistance to change in organizations. I show that influence activity can create harmful barriers to change and that the influence costs of change are positively related to the firm's prospects. The model rationalizes the widely held view that firms often must endure a survival-threatening crisis before meaningful change can be achieved. I show that employees' choices of whether to engage in influence activity can depend on their beliefs as to whether the firm will choose to change its organizational form. If employees expect change, their best response is to try to affect the form of the change in their favor.

1. Introduction

In numerous instances, it seems that organizational and strategic changes that would improve performance are avoided, finally to be adopted only when the firm is in a survival-threatening crisis. Sears, Roebuck and General Motors are but two of many recent examples. In these cases, it seemed both insiders and outsiders were able to identify crucial changes necessary to improve performance well in advance of the changes actually being implemented. Analysts in the business press recommended the closure of the troubled Sears catalogue operation for years before the actual event (Scussel, 1991). General Motors, plagued by a product design process that failed to meet cost and quality targets, was extremely slow to respond (Keller,

I wish to thank Rachel Hayes, Ed Lazear, Jeff Zwiebel, and especially John Roberts. Various seminar participants, a coeditor, and two referees made suggestions that greatly improved this paper. I gratefully acknowledge financial support from the National Science Foundation and the State Farm Companies Foundation.

Journal of Economics & Management Strategy, Volume 7, Number 2, Summer 1998, 237–263

1993). In the meantime, these firms continued to lose market share and pile up substantial losses. Only when the firms' prospects worsened to the point that the very survival of the organization was threatened did the necessary changes take place.

While it is difficult to locate systematic evidence in favor of the proposition that severe crisis is necessary before change can be achieved, the idea is found in both the popular press and academic literature.[1] If true, this notion presents a challenge to economists interested in organizations. What are the barriers to change in organizations? What role does crisis play in reducing these impediments?

In early research on organizations, March and Simon (1958) and Cyert and March (1963) argue that organizations change in response to abnormally poor performance. Their theory of failure-induced change posits that performance below organizational expectations causes managers to search for potential improvements. Poor performance, especially relative to competitors, is an indication that there exists an alternative organizational form with expected performance higher than current realized performance. While this reasoning generates a clear link between crisis and change, it cannot explain why desirable changes, once identified, often apparently cannot be implemented.

More recently, Hannan and Freeman (1989) assert that organizations are subject to structural inertia. Organizational resistance to change, they claim, may enhance performance by increasing the reliability and accountability of the organization. Competition therefore acts as a selection mechanism that favors organizations designed to be inert with respect to small changes in the environment. In response to large changes in the environment, however, this immutability can be destructive. If the organizational barriers to change are significant, then organizations can get stuck in forms that would not be chosen if the organization were to be started from scratch.

This paper builds an economic model of resistance to change in a large organization. I assert that a particular distribution of quasi rents is embodied in an organization's formal and informal rules, policies and procedures. At times when these rules are to be changed, the incentives for individual employees to try to affect the form of the change are very strong. This influence activity distracts employees from their normal activities and represents one important cost of implementing change. The return to an employee from engaging in

1. See, for example, clinical research on changes made at O.M. Scott & Sons Company and Sealed Air Corporation by Baker and Wruck (1989) and Wruck (1994), respectively.

influence activity in an attempt to affect the distribution of quasi rents depends on how long the resulting distribution is to remain in effect. In particular, if insolvency results in either a high probability of the employee being fired or a high likelihood of the firm being reorganized (yet again altering the distribution of quasi rents), then the marginal return to engaging in influence activity will be lower when the firm's prospects are poor. Hence, the level of influence activity induced by change and the resultant costs to the firm are lower when the firm's prospects are poor.

This simple intuition is captured in a model in which a firm first chooses whether or not to adopt a particular change and then employees choose their levels of influence activity. I extend this basic setting by permitting employees to engage in influence activity at two times. In the first period, employees, taking their conjectures as to whether the firm will change its organizational form as given, decide how much influence activity to exert. If employees think change is likely, they can attempt to position themselves to benefit should the firm's rules and policies be changed. The firm observes the aggregate level of influence activity in the first period, considers the influence costs of change stemming from second-period influence activity, and decides whether or not to make the change. If the firm announces an intention to change, it must then solicit information from employees in order to select the appropriate form of change. This solicitation of information permits a second round of influence activity.

This extended model permits insight as to how a firm and its employees interact when there exists the possibility of significant change. Under the assumption that first- and second-period influence activity are weak substitutes in employees' objective functions, I show that first-period influence, the inverse of second-period influence, and choosing an alternative organizational form are strategic complements (Bulow et al., 1985). As is common in games with strategic complementaries, there can be many equilibria in this model. If the employees expect change to occur, they engage in influence activity in the first period. This damages the firm's prospects, reducing the influence costs of change in the second period and making the change more attractive. Thus, if employees believe change will occur, they engage in influence activity that guarantees the change will occur. If employees do not think change will occur, no influence activity takes place, and the firm chooses not to bear the second-period influence costs of change. Employees' expectations regarding change can form a self-fulfilling prophecy.

As in other models of influence activity [see Milgrom (1988) or Rotemberg and Saloner (1995)], the firm in this case may be able to make itself better off by committing to ignore information provided by employees in making decisions. Given the possibility of multiple equilibria in the employees' choice of first-period influence, the firm might like to commit not to change in order to affect employees' beliefs. This observation supports Hannan and Freeman's claim that barriers to change can in some cases improve performance.

The remainder of the paper is structured as follows: In Section 2, I attempt to motivate the model by discussing types of influence activity one might expect to occur in large organizations during times of change. I introduce a simple model of organizational change in Section 3 and present a set of results concerning the relationship between influence and change in Section 4. I offer concluding remarks in Section 5.

2. Influence Activity during Times of Change

Organizations are characterized by fixed rules, policies, and procedures. Job assignments, lines of authority, promotion and compensation policies, and budgets are not typically sensitive to small changes in a firm's environment. One explanation for this stylized fact is offered by Milgrom and Roberts (1988), who argue that firms limit managerial discretion over decisions that have distributional implications but have little effect on the firm's objectives. If managers retain discretion over such choices, then employees will have an incentive to spend a great deal of time and energy attempting to influence the decision, since the distributional consequences are significant. Since the impact of these decisions on the firm's overall objectives is small, the value of any information generated from employees' attempts to influence the decision is likely to be small. Hence, the level of influence activity surrounding such decisions is likely to exceed the first best.

A notable feature of significant change in organizations is that rules and policies that are normally fixed go up for grabs. I assert that firms attempting to restructure their manufacturing operations, redesign product development processes, or ''reengineer'' their top management cannot do so without eliminating old budgets, creating new task assignments, or rerouting chains of command. Managers who would normally commit to avoid making decisions with distributive consequences are prevented from doing so during times of change. In that situation, employees have opportunities to influence many attributes of work conditions that they usually cannot affect. If significant change implies a redistribution of quasi rents among a firm's employees, then incentives for influence activity will be particularly strong around times of change.

I study a setting in which, once a firm decides to make a change in its organizational structure, each of the firm's employees attempts to affect the *form* of the change in their favor. As noted in the introduction, I permit employees to engage in influence activity at two times. Second-period influence activity can be thought of as corresponding to an implementation of change stage, in which the firm solicits information from employees in order to select the appropriate form of change. I presume that a firm's employees possess local knowledge that the firm would like to use in order to implement change and that the firm cannot obtain this information without allowing employees an opportunity to engage in influence activity. I add first-period influence activity to permit employees to attempt to position themselves to benefit should a change be adopted.

I assume the firm has many employees and that the employees cannot individually affect the firm's decision as to whether to make a change. This conception of influence activity clearly precludes direct resistance to change on the part of the employees, since in such a case, influence activity aimed at directly preventing change is not individually rational. Hence, the model provides an analysis of organizational resistance to change without relying on resistance to change by individuals.[2] The analysis applies best to a large organization with a decentralized work force. Since the model concentrates on the costs of wrangling over quasi rents made available as a result of the change, it applies equally well to Pareto-improving changes and changes that make employees worse off. Even in situations where *all* of a firm's employees are to be made better off as a result of a particular change but which ones will gain most is not preordained, costs stemming from influence activity of the type I have described will be present.

The result that influence activity decreases as the firm's prospects worsen differs from the findings presented in Meyer et al. (1992), and it is important to note the differences between the two models. In the model I present, two key assumptions generate the

2. Note, however, that the model would apply to a situation in which an employee engages in influence activity to retain the same budget or task assignment as she had prior to the change. Such activity, which might be termed resistance to change, is intended to secure quasi rents given the change and not to affect the firm's decision on whether to implement change.

positive relationship between the firm's prospects and employees' levels of influence activity. First, I assume the value of employees' job-related quasi rents is increasing in the employees' level of influence activity. Second, I assume the value of these job-related quasi rents is increasing in the firm's prospects. This *job value effect*—that a worsening of the firm's prospects reduces the available job-related quasi rents and thus reduces incentives for influence activity—was identified by Meyer et al. Their analysis, however, focuses on the case in which this effect is negligible.

Meyer et al. study a multidivisional firm's interaction with the management of a single division of the firm. They assume the marginal return to employing divisional managers is an increasing function of the division's prospects. By exerting more influence activity at the margin than is expected, the division managers can improve the firm's perception of the division's prospects and reduce the likelihood of layoffs. Their main result is that the level of influence activity is higher when the firm's prospects are poorer. This is because the marginal effect of influence activity on the firm's decision is greater when the firm's prospects are poorer. In deriving this result, Meyer et al. assume the magnitude of the division managers' job-related quasi rents do not depend on the firm's prospects. They do note that explicit consideration of the job value effect would upset their unambiguous comparative static.

A crucial difference between their analysis and mine is the conception of what influence activity is meant to accomplish. In their model, influence activity by a division's management affects the firm's decision directly. The model presented here focuses on attempts by individual employees in a large firm to affect the form of change in their favor—individual employees cannot affect the firm's decision as to whether to change. In such a case, the effect studied by Meyer et al., namely that the marginal return to affecting the firm's decision increases as the firm's prospects decline, is completely absent.

3. The Model

3.1 The Firm

A firm has two potential organizational forms: the status quo, Y; and the alternative, Z. If the firm chooses the status quo, it receives a random payoff, net of wages, that I denote by $\tilde{x}_{\text{Y}}$. If the firm chooses the alternative, its payoff is denoted by $\tilde{x}_{\text{Z}}$. The firm has a debt level, denoted by D, so shareholders receive $\max[\tilde{x}_{\text{A}} - D, 0]$, where $\text{A} \in \{\text{Y}, \text{Z}\}$.

3.2 The Employees

The firm employs a continuum of identical employees with each employee represented by a point on the unit interval. A crucial assumption is that changes in organizational form affect the distribution of quasi rents among the employees. Under the status quo Y, the organization's formal and informal rules and procedures are fixed. Should the firm switch to the alternative Z, a new set of rules and procedures will be adopted. Since their utility is directly affected by these rules and procedures, employees have an incentive to try to affect the new organizational form in ways that benefit them. I assume wages do not adjust in response to changes in organizational form.[3]

I allow employees to engage in influence activity at two times, both before and after the decision whether to implement Z has been made by the firm. Prior to the firm's decision, the employees can lobby for pet projects or favorable assignments in the event that the firm decides to reorganize. Once the firm has made the decision to switch to the alternative organizational form, the employees still have an opportunity to affect the resulting distribution of quasi rents. For example, suppose that, after the firm's decision, it still must solicit information from employees about how best to implement Z. If the firm chooses to retain the status quo Y, then the employee does not engage in additional influence activity. I denote a particular employee's ($w \in [0, 1]$) level of influence activity prior to (after) the firm's decision as i_{w1} (i_{w2}). Employees are assumed to choose each period's level of influence activity from the interval $[0, \bar{\imath}]$. I define the aggregate levels influence activity as

$$I_1 = \int_0^1 i_{w1}\, dw,$$

$$I_2 = \int_0^1 i_{w2}\, dw.$$

Note that this implies the effect of any individual employee's influence activity on the aggregate is negligible.

The benefits accruing to a particular employee from his influence activity in the event the firm adopts the alternative are denoted by $B(i_{w1}, i_{w2}, I_1, I_2)$, which I assume to be weakly increasing in i_{w1}

3. This assumption, which could perhaps be justified by the difficulty of writing complete contracts, simplifies the analysis by allowing me to ignore the full contracting problem faced by the firm and its employees. However, relaxing this assumption would not alter the results, as long as individuals' levels of influence activity are unverifiable.

and i_{w2} and weakly decreasing in I_1 and I_2. If the firm does not adopt the alternative, the employee receives no benefits from influence activity.

As noted above, the assertion that the marginal benefits from opportunism in the form of influence activity are smaller when the firm's prospects are poorer is central to my analysis. Why might one expect this to be true? First, one might think that the likelihood of an employee losing his job is higher in the event of insolvency. A second explanation might be that insolvency leads to a change in control causing further reorganization that upsets the distribution of quasi rents embodied in the alternative organizational form z. I assert that in the event of insolvency, the employee receives $\alpha B(i_{w1}, i_{w2}, I_1, I_2)$, where $0 \leq \alpha < 1$. For simplicity, I will assume $\alpha = 0$.[4] Each employee trades off the benefits from his influence activity with the personal cost of influence, which I denote as $C(i_{w1}, i_{w2})$. This cost represents a direct cost to the employee of distorting information or lobbying. An employee bears these costs whether the firm chooses the alternative or the status quo.

A key result later in the paper will be that higher levels of aggregate influence in the first period I_1 imply lower levels of influence I_2 should the firm choose to adopt z. To guarantee this, I need to insure that i_{w1} and i_{w2} are not complements in an individual employee's utility function, and also that i_{wj} is not complementary to I_k for $j \neq k$.

Assumption 1: *First- and second-period influence activity are not complements in employees' objective functions*:

$$\frac{\partial^2}{\partial i_{w1}\, \partial i_{w2}} B \leq 0,$$
$$\frac{\partial^2}{\partial i_{w1}\, \partial i_{w2}} C \geq 0,$$
$$\frac{\partial^2}{\partial i_{w1}\, \partial I_2} B \leq 0,$$
$$\frac{\partial^2}{\partial I_1\, \partial i_{w2}} B \leq 0.$$

4. Higher values of α would imply higher influence costs of change, since employees are more likely to receive some benefit from their influence activity. However, the main results of this analysis, that poorer prospects mitigate influence activity and that employees' expectations regarding change can be important, are unaffected by the particular value of α as long as it is less than one.

Economically, this assumption means that the returns to investing in influence activity in period 2 are lower when the employee has invested in higher levels of influence activity in the first period. This assumption is akin to assuming decreasing returns to individual influence activity. I place a similar condition on the relationships between i_{wj} and I_k for $j \neq k$. In words, I assume the marginal return to an individual employee from second (first) period influence is weakly lower when aggregate first (second) period influence is higher. The assumption further implies that, at the margin, the return to engaging in influence activity is lower when there is more influence activity on the part of the other employees.

This assumption does place an important restriction on the types of influence activity the model considers. If, for example, influence activity consists of spending time doing research to substantiate a claim that one's division's prospects are good, then the assertion of decreasing returns appears justified. However, other reasonable conceptions of the ''influence technology'' might violate the assumption. For instance, suppose the efficacy of second-period influence activity depends on the strength of an employee's relationship with a decision maker. If first-period influence activity is aimed at building such a relationship, then first- and second-period influence activity may be modeled as complements.

The role of the assumption is to guarantee that any direct effect of I_1 or i_{w1} on an employee's choice of i_{w2} (through the functions B or C) is in the same direction as the indirect effect stemming from I_1's impact on the firm's prospects. Thus, it is crucial to the later result that i_{w1} and i_{w2} are strategic substitutes. If this assumption is violated, the direct and indirect effects work in opposite directions, leaving the direction of the effect of first-period influence activity on second ambiguous.

3.3 Information and Timing

Figure 1 depicts the timing of moves in this two-period game. At the beginning of the first period, nature chooses values for two independent random variables and these values become common knowledge among the employees and the firm. The first, $\theta \in [\theta_1, \theta_2]$, parametrizes the firm's prospects, while the second, $z \in [z_1, z_2]$, parametrizes the attractiveness of the alternative Z relative to the status quo Y. After θ and z are observed, the employees choose noncooperatively their levels of first-period influence activity i_{w1}. These choices then aggregate to give the level of first-period influence I_1.

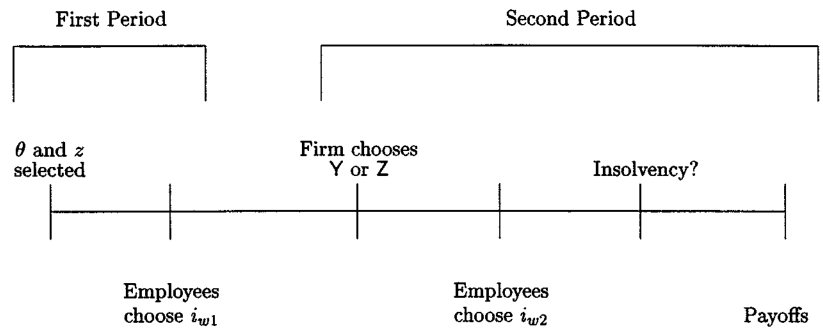

FIGURE 1. TIMELINE

At the beginning of the second period, the firm chooses whether to retain the status quo organizational form Y or switch to the alternative Z. If the firm chooses Z, then the employees individually choose i_{w2}. The gross payoff to the firm ($\tilde{x}_{Y}$ if the status quo is retained, $\tilde{x}_{Z}$ otherwise) is then realized. If the payoff exceeds D, then the firm is solvent. The shareholders receive $\tilde{x}_{A} - D$ and each employee receives the fruits of his influence activity $B(i_{w1}, i_{w2}, I_1, I_2) - C(i_{w1}, i_{w2})$. If the payoff is less than D, the shareholders receive nothing and the employees each get $-C(i_{w1}, i_{w2})$.

I assume that $\tilde{x}_{Y}$ ($\tilde{x}_{Z}$) is distributed on the interval $[x_{Y1}, x_{Y2}]$ ($[x_{Z1}, x_{Z2}]$) with cumulative distribution function F_{Y} (F_{Z}). I further assume that θ and I_1 affect the distribution of $\tilde{x}_{Y}$, while θ, z, I_1, and I_2 affect the distribution of $\tilde{x}_{Z}$. Since θ parametrizes the firm's overall prospects, a natural assumption is that higher values of θ indicate higher distributions of gross payoffs to the firm in the sense of first-order stochastic dominance.

Assumption 2: *For all z, I_1, and I_2, $\theta > \theta'$ implies*

$$\tilde{x}_{Y}(\theta, I_1) \succ_{\text{FOSD}} \tilde{x}_{Y}(\theta', I_1),$$

$$\tilde{x}_{Z}(\theta, z, I_1, I_2) \succ_{\text{FOSD}} \tilde{x}_{Z}(\theta', z, I_1, I_2).$$

Similarly, higher values of z imply that Z becomes more attractive in comparison to the status quo.

Assumption 3: *For all θ, I_1, and I_2, $z > z'$ implies*

$$\tilde{x}_{Z}(\theta, z, I_1, I_2) \succ_{\text{FOSD}} \tilde{x}_{Z}(\theta, z', I_1, I_2).$$

To capture the notion that influence activity is costly to the firm, I assume the distribution of the firm's payoff is lower for higher levels of influence.[5]

Assumption 4: *For θ, z, and I_2 fixed, $I_1 > I_1'$ implies*

$$\tilde{x}_Y(\theta, I_1') \succ_{\text{FOSD}} \tilde{x}_Y(\theta, I_1),$$

$$\tilde{x}_Z(\theta, z, I_1', I_2) \succ_{\text{FOSD}} \tilde{x}_Z(\theta, z, I_1, I_2).$$

Similarly, for θ, z, and I_1 fixed, $I_2 > I_2'$ implies

$$\tilde{x}_Z(\theta, z, I_1, I_2') \succ_{\text{FOSD}} \tilde{x}_Z(\theta, z, I_1, I_2).$$

My next assumption imposes a type of technological independence on θ and z. I assert that the change in the distribution of the firm's payoff from switching to the alternative does not depend on θ or I_1. Similarly, the change in the distribution of the firm's payoff from second-period influence activity I_2 does not depend on θ or I_1. While one might naturally think that the payoff to switching regimes would be higher when the firm's prospects are poor, I make this assumption to show that the relationship between firm prospects and influence activity generates a link between crisis and change even with this independence condition. As an example, one might think of a change in input prices as a shock that affects a firm's prospects while being orthogonal to its optimal organizational form.

Assumption 5: *Fix arbitrary z and I_2. Then for all $\theta \neq \theta'$, $I_1 \neq I_1'$, and x,*

$$F_Z(x; \theta, z, I_1, I_2) - F_Y(x; \theta, I_1) = F_Z(x; \theta', z, I_1', I_2) - F_Y(x; \theta', I_1'). \tag{1}$$

In addition, there exists $\hat{z} \in [z_1, z_2]$ such that for all x, θ, and I_1,

$$F_Z(x; \theta, \hat{z}, I_1, 0) = F_Y(x; \theta, I_1)$$

5. The model does not explicitly consider the possibility that influence activity may uncover potentially valuable information. I assume the level of influence activity surrounding the change always exceeds the first best. For the case where the firm must change rules and procedures that are normally fixed (so as to limit influence activity), this assumption seems justified. See Rotemberg and Saloner (1995) for an analysis of the information gathered by employees in the process of attempting to affect a firm's decisions.

Recall from Assumptions 2 and 4 that increases in θ and $-I_1$ shift the distributions of x_Y and x_Z upward in the sense of first-order stochastic dominance. Equation (1) implies that an increase in θ (or $-I_1$) shifts the distributions of x_Y and x_Z upward at the same rate. It is easy to show that this assumption implies the increase in the expected payoff to the shareholders from choosing the alternative rather than the status quo given levels of z and I_2 does not depend on θ or I_1. That is,

$$E\{\max[\tilde{x}_Z(\theta, z, I_1, I_2) - D, 0]\} - E\{\max[\tilde{x}_Y(\theta, I_1) - D, 0]\}$$

does not depend on θ or I_1. Hence, in the first-best case where the firm can prohibit influence activity, the firm's choice of organizational form is determined solely by the draw of z.

The last condition in Assumption 5 ensures that the alternative is sufficiently good that the firm would sometimes wish to choose it. In the first-best, no-influence case, if z exceeds the cutoff value $\hat{z}$, then the firm is best off choosing the alternative over the status quo. Note that the first part of Assumption 5 implies that $\hat{z}$ does not depend on θ or I_1.

4. Analysis

4.1 Firm Prospects and Influence

I begin by analyzing employees' choices of i_{w2} in the case where the firm has decided to adopt the alternative organizational form. Each employee chooses i_{w2} to maximize his expected payoff given his personal influence activity in the first period i_{w1}, the aggregate level of influence activity in the first period I_1 and his conjecture on I_2, which I denote as $\hat{I}_2$. The employee receives B only if the firm remains solvent, but pays the personal cost of influence regardless. Hence, each employee solves

$$\max_{i_{w2} \in [0, \bar{\imath}]} B\left(i_{w1}, i_{w2}, I_1, \hat{I}_2\right)\Pr[\text{solvency}] - C(i_{w1}, i_{w2}).$$

The probability of solvency is the probability that $\tilde{x}_Z(\theta, z, I_1, \hat{I}_2) > D$, so the employee solves

$$\max_{i_{w2} \in [0, \bar{\imath}]} B\left(i_{w1}, i_{w2}, I_1, \hat{I}_2\right)\int_D^{x_{Z2}} dF_Z\left(\theta, z, I_1, \hat{I}_2\right) - C(i_{w1}, i_{w2}). \tag{2}$$

Note that an individual employee's choice of second-period influence depends on the actions of all other employees in the second period. Higher values of aggregate influence activity make it more likely the firm becomes insolvent, therefore reducing the incentives for an individual employee to engage in second-period influence activity. A symmetric (across employees) Nash equilibrium is characterized by the following three conditions:

1. Each employee must optimize over i_{w2} taking i_{w1}, I_1, and $\hat{I}_2$ as given.
2. Employees' choices are identical: $(i_{w1}, i_{w2}) = (i_1, i_2)$ for all w.
3. Employees' conjectures on I_2 must be correct. That is,

$$\hat{I}_2 = I_2 = \int_0^1 i_{w2}\, dw = i_{w2}.$$

My first proposition is a comparative statics result showing how the equilibrium second-period influence level varies with parameters in the model. To apply theorems on the comparative statics of Nash equilibria, I need the following additional assumption.

Assumption 6: *The functions B and $-C$ are strictly concave and continuous in i_{w2}. In addition, B and F_z are continuous in I_2.*

Because the employee's best response function may be upward sloping in I_2 (if i_{w2} and I_2 are complements in B), for a given set of parameters there may be multiple equilibria in the employees' choices of i_{w2}.

Proposition 1: *Under Assumptions 1–6, the aggregate levels of second-period influence activity corresponding to the lowest and highest symmetric Nash equilibria are weakly increasing in θ, z, $-I_1$, and $-D$.*

(See Appendix for proofs.)

I focus on the equilibrium featuring the lowest level of influence activity, since this is Pareto-preferred by the employees. The intuition for this result is as follows: if the firm is insolvent, there are no quasi rents for the employees to capture. A higher likelihood of insolvency reduces the marginal benefits to influence activity. Since higher values of θ, z, $-I_1$, and $-D$ imply a higher likelihood that the firm remains solvent, employees try harder to affect the form of change as these variables increase.

With the basic model in place, I can be more precise about how the model presented here differs from the analysis of Meyer et al. Suppose a manager receives $v + q$ if she is retained and v if she is laid off. Then, retaining the notation that θ represents prospects and i influence, suppose $r(i, \theta)$ is the probability a manager is retained.[6] A division manager chooses i to maximize

$$v + r(i, \theta)q - c(i),$$

where $c(i)$ is the personal cost of influence activity. In the model of Meyer et al., the function r is shown to have the property that the marginal return to influence is weakly decreasing in the firm's prospects ($r_{12} \leq 0$), which implies that the optimal choice of i is weakly decreasing in θ. An important assumption of their model is that the benefits from staying employed (q) do not depend on the division's prospects. Meyer et al. note that if q increases with θ, then an inverse relationship between i and θ cannot be expected in general. In their model, they eliminate this job value effect by assuming the firm's environment is stationary and the division managers' wages are set each period by a competitive labor market.

In the derivation of the result presented here, the job value effect is central to the analysis. In my model, the employee's expected quasi rents are given by $r(\theta)q(i_{w2})$. Since $r(\theta)$ and $q(i_{w2})$ are both weakly decreasing functions, the cross partial derivative of the employee's objective is positive, and therefore the optimal choice of i_{w2} is weakly increasing in θ. This can be seen clearly by examining equation (2).

4.2 Prospects and Organizational Form

Given Proposition 1, I can now study how the firm's choice of whether to switch from organizational form Y to Z depends on θ, I_1, and D. If the firm chooses to retain the status quo, it receives

$$\int_D^{x_{Y2}} x\, dF_Y(x; \theta, I_1) \tag{3}$$

in expectation. If instead the firm chooses the alternative organizational form, its expected payoff is

$$\int_D^{x_{Z2}} x\, dF_Z(x; \theta, z, I_1, I_2(\theta, z, I_1, D)), \tag{4}$$

6. I have simplified Meyer et al.'s analysis considerably to emphasize the important differences between their model and the one presented here.

where $I_2(\theta, z, I_1, D))$ is the aggregate second-period influence level corresponding to the lowest Nash equilibrium in employees' choices of i_{w2}.

For fixed values of θ, I_1, and D, I denote the maximum value of z for which the firm weakly prefers the status quo by z^*. Note that in the first-best (no influence) case, $z^* = \hat{z}$. If influence activity cannot be prevented, however, then the fact that the distribution of $\tilde{x}_{\mathrm{z}}$ is weakly increasing in z but weakly decreasing in I_2 implies that $z^* > \hat{z}$. In addition, since the I_2 corresponding to the lowest Nash equilibrium is weakly increasing in θ, $-I_1$, and $-D$, it must be that z^* increases weakly with θ, $-I_1$, and $-D$.

Proposition 2: *Suppose Assumptions 1–6 hold. Then for all θ and I_1, $z^*(\theta, I_1, D) \geq \hat{z}$. Moreover, $z^*(\theta, I_1, D)$ is weakly increasing in θ, $-I_1$, and $-D$.*

This result states that, even if the direct benefits from organizational redesign are the same across firms, firms with poor prospects will engage in organizational redesign while firms with good prospects will not. This is because the costs of organizational redesign are increasing in the likelihood that the firm survives. In firms that are more likely to fail, the marginal benefit to the employee of trying to affect the form of change in his favor are smaller. Hence, higher probability of insolvency leads to lower levels of influence activity and lower costs of change. Figure 2 plots θ vs. z holding I_1 and D fixed and shows the values of θ and z for which the firm chooses to switch to z.

Proposition 2 provides a connection between structural inertia and crisis-induced change. One source of inertia is the organization's reluctance to bear the influence costs of change. The extent to which employees are willing to engage in influence activity in turn depends on the quasi rents that accrue to them. If these quasi rents are diminished in the event of insolvency, then the returns to influence activity are lowest when the likelihood of insolvency is highest. Hence, crisis reduces barriers to change.

The result explains why firms are unable to make seemingly obvious changes until the survival of the organization is seriously threatened. Organizational forms that would not be adopted if the firm were to start from scratch can be retained because of the desire to avoid the influence costs of change. As an example, consider the differences in product development processes between General Motors and Toyota. For years prior to 1991, auto-industry analysts had

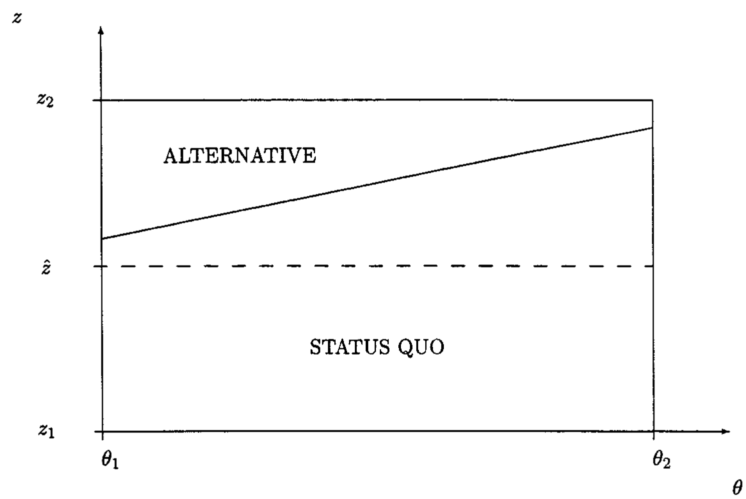

FIGURE 2. EFFECT OF SECOND-PERIOD INFLUENCE ACTIVITY ON RELATIONSHIP BETWEEN PROSPECTS AND CHANGE

highlighted Toyota's insistence on "design for manufacturability" as an important cost-saving device. GM, although burdened with the highest costs and slowest product development processes in the industry, retained an organizational structure in which the design group operated autonomously. Only after record-breaking losses of $4.5 billion in 1991 and $23.5 billion in 1992 did GM undertake a series of changes that forced designers to report directly to engineering.[7] Note that these changes in decision rights would have the effect of reallocating quasi rents in the organization.

4.3 Choices of First-Period Influence

Having established a relationship between crisis and organizational change, I now turn my attention to the question of how employees' choices of first-period influence activity can affect the firm's decision of whether to undertake change. The fundamental insight is that high levels of first-period influence activity reduce the returns to second-period influence activity, as shown in Proposition 1. Intuitively,

7. The 1992 loss was largely due to an accounting change that affected the way firms must account for unfunded pension liability.

first-period influence activity worsens the firm's prospects, making it less likely employees will receive the full benefits from second-period influence.

The primary result of this section is that higher levels of first-period influence, lower levels of second-period influence, and higher likelihood that the firm chooses the alternative organizational form are strategic complements (Bulow et al., 1985). As is well known, games with strategic complementarities often have multiple Nash equilibria. In this model, I will show that one important source of multiplicity of equilibria is employees' beliefs about the firm's plans. In one equilibrium, the employees conjecture that change will not take place in the second period. If there is to be no change, there is no benefit to first-period influence activity, so each employee chooses $i_{w1} = 0$. In another equilibrium, the employees conjecture that change will occur with probability one. In this case, employees set i_{w1} to equate the marginal benefit of influence to the marginal cost of influence, taking into account their second-period choice of i_{w2}. In equilibrium, of course, it must be that the employees' conjectures are correct. Since the distribution of the firm's payoffs is weakly decreasing (in the sense of first-order stochastic dominance) in the aggregate level of first-period influence I_1, the probability of insolvency is weakly increasing in I_1. Higher I_1 therefore implies lower I_2, since I_2 is weakly decreasing in the likelihood of insolvency. Because the firm makes its choice after I_1 is sunk, it considers only the second-period influence costs of change when making its decision.[8]

Working backwards, if the firm chooses the alternative Z, then an employee solves (2), taking i_{w1}, I_1, and $\hat{I}_2$ as given. I denote the employee's optimal choice of i_{w2} as a function of i_{w1}, I_1, and $\hat{I}_2$ by $i^*_{w2}(i_{w1}, I_1, \hat{I}_2)$.

The firm, having observed I_1, selects the probability of adopting the alternative (which I denote by p_{Z}) taking its beliefs on I_2 (denoted by $\check{I}_2$) as given:

$$\max_{p_{\mathsf{Z}} \in [0,1]} p_{\mathsf{Z}} \int_D^{x_{\mathsf{Z}2}} x \, dF_{\mathsf{Z}}\left(x; \theta, z, I_1, \check{I}_2\right) + (1 - p_{\mathsf{Z}}) \int_D^{x_{\mathsf{Y}2}} x \, dF_{\mathsf{Y}}(x; \theta, I_1). \tag{5}$$

8. It is here that the third and fourth conditions of Assumption 1, namely that $(\partial^2/\partial i_{w1}\, \partial I_2)B \leq 0$ and $(\partial^2/\partial I_1\, \partial i_{w2})B \leq 0$, are important. If the direct effect (via B) of increasing I_1 is to *increase* i_{w2}, then this will work against the indirect effect on i_{w2} through the worsening of the firm's prospects from higher I_1. The conditions in Assumption 1 are sufficient, but not necessary; as long as the indirect effect dominates, the results of this section are unchanged.

Having observed θ and z, employees solve the following problem, taking their beliefs on I_1, I_2, and p_z as given[9]:

$$\max_{i_{w1}\in[0,\bar{\imath}]} \Big\{ \hat{p}_z \Big[B\Big(i_{w1}, i^*_{w2}\Big(i_{w1}, \hat{I}_1, \hat{I}_2\Big), \hat{I}_1, \hat{I}_2\Big)\Pr[\text{solvency}]$$

$$-C\Big(i_{w1}, i^*_{w2}\Big(i_{w1}, \hat{I}_1, \hat{I}_2\Big)\Big)\Big] - (1-\hat{p}_z)C(i_{w1}, 0)\Big\}. \tag{6}$$

A symmetric (across employees), subgame perfect Nash equilibrium satisfies the following conditions:

1. Each employee solves (2) given i_{w1}, I_1, and $\hat{I}_2$.
2. The firm solves (5) given $\check{I}_2$.
3. Each employee solves (6) given $\hat{I}_1$, $\hat{I}_2$, and $\hat{p}_z$.
4. Employees' choices are identical: $(i_{w1}, i_{w2}) = (i_1, i_2)$ for all w.
5. Conjectures are correct. That is,

$$\hat{I}_1 = I_1 = \int_0^1 i_{w1}\, dw,$$

$$\check{I}_2 = \hat{I}_2 = I_2 = \int_0^1 i_{w2}\, dw,$$

$$p_z = \hat{p}_z.$$

To guarantee well-behaved solutions to (2) and (6), I need the following:

Assumption 7: *The functions B and $-C$ are strictly concave and continuous in (i_{w1}, i_{w2}). In addition, B and F_z are continuous in I_1 and I_2.*

Proposition 3: *Under Assumptions 1–5 and 7, $(I_1, -I_2, p_z)$ are strategic complements. The game between the employees and the firm has at least one symmetric, subgame-perfect Nash equilibrium, and among the equilibria there is one with the lowest values of I_1, p_z, and $-I_2$ as well as one with the highest values of these variables.*

The statement of the proposition implies that multiple equilibria can exist in this model and if so, then among them are one featuring the highest values of I_1, $-I_2$, and p_z and one with the lowest values.

9. Employees' beliefs on I_1 and p_z are denoted by $\hat{I}_1$ and $\hat{p}_z$.

If there is an equilibrium with $p_z = 1$, then the aggregate level of first-period influence activity I_1 corresponding to that equilibrium is higher than in any other equilibrium, and the level of second-period influence activity corresponding to that equilibrium is lower than in any other equilibrium. Similarly, if there is an equilibrium with $p_z = 0$, the levels of first- and second-period influence activity are lower and higher, respectively, than in any other equilibrium. Of course, in this case, the second-period influence activity is not realized, since the firm does not change.

To further characterize the highest and lowest equilibria, consider again the timeline shown in Figure 1. The employees' choices of i_{w1} are observed by the firm prior to the firm's decision of which organizational form to adopt. There may be a range of values for z and θ such that if I_1 is high, then the firm's best response is to choose the alternative z.[10] Otherwise, the firm retains the status quo. Since the employees' decisions depend on the firm's actions but must be made before the firm acts, the employees' expectations play a crucial role in determining which equilibrium will be played. If the employees expect change, then the marginal return to trying to affect the change is high. Influence activity is then high and the firm elects to change. If employees expect the status quo to be retained, then the returns to influence activity are low. There is little first-period influence activity, and the firm does not change its organizational form.

4.4 Discussion of Equilibria

Given that there are multiple equilibria, how is the equilibrium to be chosen? From the above discussion, it is clear that employees' expectations can take the form of self-fulfilling prophecies. If employees expect change, they take actions that guarantee change will occur. To see more clearly how expectations matter in this model, recall that the firm's cutoff value for z given θ and D is weakly decreasing in I_1. That is, the minimum value of z for which the firm weakly prefers the status quo is lower for higher I_1. I invert this relationship to characterize the largest value of I_1 for which the firm weakly prefers the status quo. I refer to this value as I_1^* and note that it is weakly increasing in θ and weakly decreasing in z and D.

10. Multiple equilibria may exist for intermediate values of z and θ. If z is high or θ is low, the net returns to change may be sufficiently high that the firm wishes to change whether employees engage in first period influence activity or not. If z is low or θ is high, the net returns to change are low, so the firm chooses to retain the status quo regardless of the employees' actions in the first period.

Proposition 4: *Under Assumptions 1–6, $I_1^*(\theta, z, D)$ is weakly increasing in θ and weakly decreasing in z and D.*

Holding z and D fixed, I plot I_1^* vs. θ in Figure 3. If the actual value of I_1 is above the curve, then the firm's best response is to choose Z; if I_1 is below the curve, the firm chooses Y.

Now suppose employees conjecture that $p_Z = 0$, so employees believe the firm will always retain the status quo. Then it is clear from the employees' problem in (6) that the marginal returns to i_{w1} are zero. Similarly, if the employees conjecture that $p_Z = 1$ (so that the firm always chooses Z), then the marginal returns to i_{w1} are positive. Then if the cost function C is continuous and has the property that $(\partial/\partial i_{w1})C(0, i_{w2}) = 0$ for all i_{w2}, I have that the employee chooses $i_{w1} > 0$ when $p_Z = 1$. I denote the aggregate first-period influence level when $p_Z = 1$ ($p_Z = 0$) as I_1^Z (I_1^Y). In Figure 3, I_1^Z is plotted along with I_1^* against θ for fixed z and D.

In the figure, θ^* denotes the value of θ for which the firm is indifferent between the status quo and the alternative when $I_1 = 0$. For $\theta < \theta^*$ (i.e., when the firm's prospects are sufficiently poor), there is a unique Nash equilibrium. In it, the firm adopts the alternative. Even if the employees conjecture $p_Z = 0$ and set $I_1 = 0$, the firm's best response is to choose Z. Hence, the only consistent conjecture for employees to hold is $p_Z = 1$, which implies that employees should choose $I_1 > 0$. For $\theta > \theta^{**}$, the unique Nash equilibrium features $I_1 = 0$. Even if the employees believe a change will occur, their resulting choice of I_1 is not high enough to trigger change. If $\theta^* \leq \theta \leq \theta^{**}$, then employees' expectations matter. In this region, both $p_Z = 0$ and $p_Z = 1$ are conjectures consistent with equilibrium.[11] If the employees think change will occur, they choose $I_1 = I_1^Z$. Since $I_1^Z > I_1^*$ on this region, the high level of first-period aggregate influence is enough to trigger change. If the employees think change will not occur, they set $I_1 = 0$, which is less than I_1^*.

Under what conditions will a region of multiple equilibria like $[\theta^*, \theta^{**}]$ exist? Note that if $I_1^Z > 0$ and $I_1^Y = 0$ for all θ, z, and D, and I_1^* is continuous, then there must exist a neighborhood of θ^* for which multiple equilibria are a possibility. While I have drawn Figure 3 depicting I_1^* as a continuous function of θ, there is nothing in the model to guarantee this will be the case. In particular, if the

11. Note that there may also exist mixed-strategy equilibria in which employees choose $I_1 = I_1^*$ and the firm is indifferent between the status quo and the alternative.

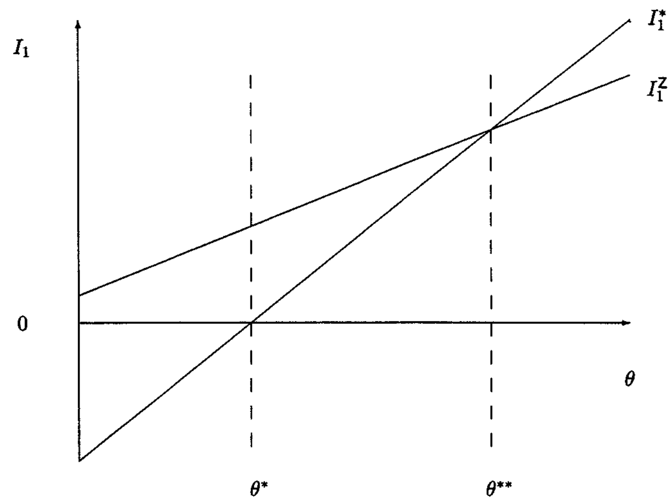

FIGURE 3. I_1^* *AND* I_1^Z *VS.* θ

employee's choice of second-period aggregate influence is not continuous in θ, z, and D, then I_1^* need not be continuous. It is possible for I_1^* to "jump" over I_1^z, implying a unique choice of I_1 for each θ.

4.5 Are Barriers to Change Performance-Improving?

Proposition 1 above establishes that, while influence activity can act as a barrier to change, the firm is better off if it can constrain the employees not to engage in influence activity. This result would seem to contradict Hannan and Freeman's (1989) arguments that organizational forms containing strong barriers to change perform better. However, the importance of employees' expectations in determining the equilibrium as outlined in the previous subsection offers an explanation for how *other* forms of resistance to change can be beneficial to organizational performance. If the firm prefers the no-influence–no-change equilibrium, then it may be in the firm's interests to make a credible commitment *not* to change. Such a commitment would affect the actions of the firm's employees in a way that benefits the firm.

Does the firm prefer the no-influence–no-change equilibrium? In the model as specified, there is not enough structure to guarantee that equilibrium is best for the firm. To see this, first note that if no-influence–no-change is an equilibrium, then

$$\int_D^{x_{Y2}} x\, dF_Y(x;\theta,0) > \int_D^{x_{Z2}} x\, dF_Z(x;\theta,z,0,I_2(\theta,z,0,D)). \tag{7}$$

If there also exists an equilibrium in which $p_Z = 1$ and $I_1 = I_1^Z$, then the firm's payoff is given by

$$\int_D^{x_{Z2}} x\, dF_Z\big(x;\theta,z,I_1^Z,I_2(\theta,z,I_1^Z,D)\big).$$

If the total derivative of $\int_D^{x_{Z2}} x\, dF_Z(x;\theta,z,I_1,I_2(\theta,z,I_1,D))$ with respect to I_1 is nonpositive, then the no-influence–no-change equilibrium is best for the firm, since this implies

$$\int_D^{x_{Y2}} x\, dF_Y(x;\theta,0) > \int_D^{x_{Z2}} x\, dF_Z\big(x;\theta,z,I_1^Z,I_2(\theta,z,I_1^Z,D)\big).$$

Note that since the distribution of $\tilde{x}_Z$ is weakly decreasing in the sense of first-order stochastic dominance in I_1, the direct effect of an increase in I_1 works in the proper direction. However, the indirect effect of I_1 (in reducing I_2) works in the opposite direction. The question as to which of these effects will dominate is further complicated by the possibility that I_2 may not be a continuous function of I_1.[12]

As the model is written, it is not the case that $\int_D^{x_{Z2}} x\, dF_Z(x;\theta,z,I_1,I_2(\theta,z,I_1,D))$ must be weakly decreasing in I_1. However, this condition is true under a variety of special cases. For example, note that if F_Z is differentiable and

$$\frac{\partial^2 F_Z}{\partial x\,\partial I_1} = \frac{\partial^2 F_Z}{\partial x\,\partial I_2}, \tag{8}$$

and $I_2(\theta,z,I_1,D)$ is differentiable with

$$-1 < \frac{\partial I_2}{\partial I_1} \le 0, \tag{9}$$

12. As noted above, for specified values of θ, z, D, and I_1, there can be multiple equilibria in employees' choices of i_{w2}. Changes in I_1 can have the effect of causing one of the equilibria to cease to exist, leading to a "jump" in I_2.

then the total derivative of $\int_D^{x_{z2}} x\, dF_z(x; \theta, z, I_1, I_2(\theta, z, I_1, D))$ with respect to I_1 is negative. In this case, the firm always prefers the no-influence–no-change equilibrium.

5. Conclusion

This paper studies the relationships between influence costs, structural inertia, and organizational change. The fundamental premise of the analysis is that changes in an organization's rules, policies, or procedures open up new opportunities for influence activity. During corporate reorganizations, employees can face strong incentives to attempt to affect the new organizational form to their benefit. However, this barrier to change can be mitigated by the possibility that the benefits from influence activity will be partially or entirely forfeited if the firm becomes insolvent. I use this connection between the likelihood of insolvency and the incentives to engage in influence activity to explain why seemingly obvious performance-improving changes are often not undertaken until an organization faces a survival-threatening crisis. The crisis reduces the influence costs of change by militating against the incentives for influence activity.

To analyze how incentives for influence activity can change over time, I then study a dynamic model of influence and organizational change in which employees can attempt to position themselves to benefit from change both before and after the firm decides to adopt an alternative organizational form. The primary result from this analysis is that employees' first-period influence activity, the firm's choice to engage in reorganization, and the inverse of employees' second-period influence activity are strategic complements. I show how multiple equilibria can arise in this model and describe the crucial role of employees' expectations about the firm's future actions in determining the equilibrium. If employees expect the firm to reorganize, then the returns to first-period influence activity are high. This influence activity is detrimental to firm performance, increasing the likelihood of eventual insolvency. In turn, this effect reduces the returns to second-period influence, which makes reorganization a more attractive alternative. While barriers to change stemming from influence activity do not improve organizational performance, the firm can benefit by making credible commitments not to change its organizational forms if those commitments affect employees' expectations.

A more complete theory of the relationship between influence activity and change could usefully consider how a firm would want to release information regarding possible changes in organizational form. Might a firm want to maintain secrecy regarding potential changes? Are influence costs best controlled by implementing change rapidly, or is a more gradual approach preferred? Explicit consideration of other sources of resistance to change in organizations would also improve the theory. For example, how would the existence of sunk costs or limits to information flows affect the analysis? How might a firm contract with a manager to whom it delegates authority in order to achieve commitment not to switch from the status quo? These or other extensions to the model presented above would move us in the direction of an economic theory of change in organizations.

Appendix

Proof of Proposition 1. Define $\Gamma(\hat{I}_2; \theta, z, I_1, D)$ as the solution of

$$\arg \max_{i_{w2} \in [0, \bar{i}]} \left(B\left(i_{w1}, i_{w2}, I_1, \hat{I}_2\right) \int_D^{x_{Y2}} dF_Z\left(\theta, z, I_1, \hat{I}_2\right) - C(i_{w1}, i_{w2}) \right).$$

A Nash equilibrium aggregate influence level is a fixed point of Γ. I first show that, for fixed values of θ, z, I_1, and D, Γ is a continuous function of $\hat{I}_2$. Note that the employee's objective function is continuous and strictly concave in i_{w2}, by Assumption 6. Since i_{w2} is chosen from a compact set, there is a unique solution to (2). By Assumption 6, the employee's objective function is continuous in $\hat{I}_2$. The theorem of the maximum therefore implies that Γ is upper semicontinuous. Since the maximum is unique, Γ is a continuous function of $\hat{I}_2$.

Since the distribution of $\tilde{x}_Z$ is weakly increasing in θ, z, $-I_1$, and $-D$, Γ is weakly increasing as well. By Milgrom and Roberts's (1994) Theorem 1, this implies that the highest and lowest equilibrium levels of influence are weakly increasing in θ, z, $-I_1$, and $-D$. □

Proof of Proposition 2. I first establish that $z^*(\theta, I_1, D) \geq \hat{z}$. Fix θ, I_1, and D. From the definition of $z^*(\theta, I_1, D)$, it must be that for all $z \geq z^*(\theta, I_1, D)$,

$$\int_D^{x_{Y2}} x \, dF_Y(x; \theta, I_1) \leq \int_D^{x_{Z2}} x \, dF_Z(x; \theta, z^*, I_1, I_2(\theta, z^*, I_1, D)). \qquad (10)$$

Suppose $z^*(\theta, I_1, D) \leq \hat{z}$. Then (10) holds for $z = \hat{z}$. From the definition of $\hat{z}$,

$$\int_D^{x_{Y2}} x\, dF_Y(x;\theta, I_1) = \int_D^{x_{Z2}} x\, dF_Z(x;\theta, \hat{z}, I_1, 0). \tag{11}$$

Since F_Z is weakly increasing in I_2 for all x, I have that

$$\int_D^{x_{Z2}} x\, dF_Z(x;\theta, \hat{z}, I_1, 0) \geq \int_D^{x_{Z2}} x\, dF_Z(x;\theta, \hat{z}, I_1, I_2(\theta, \hat{z}, I_1, D)). \tag{12}$$

Together, (11) and (12) imply

$$\int_D^{x_{Y2}} x\, dF_Y(x;\theta, I_1) \geq \int_D^{x_{Z2}} x\, dF_Z(x;\theta, \hat{z}, I_1, I_2(\theta, \hat{z}, I_1, D)),$$

which contradicts (10). Therefore, $z^*(\theta, I_1, D) \geq \hat{z}$.

I now show that $z^*(\theta, I_1, D)$ is weakly increasing in θ, $-I_1$, and $-D$. First note that Assumption 4 implies that there is no direct dependence of z^* on θ, I_1, or D. Fix $I_2' \geq I_2''$. Then for fixed z,

$$\int_D^{x_{Z2}} x\, dF_Z(x;\theta, z, I_1, I_2') \leq \int_D^{x_{Z2}} x\, dF_Z(x;\theta, z, I_1, I_2'').$$

Since the distribution of $\tilde{x}_Z$ is weakly increasing in z, it must be that if

$$\int_D^{x_{Z2}} x\, dF_Z(x;\theta, z', I_1, I_2') = \int_D^{x_{Z2}} x\, dF_Z(x;\theta, z'', I_1, I_2''),$$

then $z' \geq z''$. Thus, z^* is weakly increasing in I_2. From Proposition 1, I have that I_2 is weakly increasing in $(\theta, -I_1, -D)$. Considering z^* as a function of these variables directly, then, I have that $z^*(\theta, I_1, D)$ is weakly increasing in $(\theta, -I_1, -D)$. □

Proof of Proposition 3. For fixed values of θ, z, and D, define a mapping T that takes any initial specification of the triple $(I_1, -I_2, p_Z)$ into another such specification as follows: Let the first variable be determined by a solution to (6) taking $(I_1, -I_2, p_Z)$ as the employee's conjectures. Let the second variable be determined by a solution to (2) for I_1 and $-I_2$. Let the third variable be a solution to (5) taking I_1 and I_2 as given. By construction, a fixed point of this mapping is a symmetric, subgame-perfect Nash equilibrium of the game involving the firm and its employees.

By Assumption 7, there are unique solutions to (2) and (6), and, applying the maximum theorem, these solutions are continuous in I_1 and I_2.

To apply Milgrom and Roberts's (1994) Theorem 4, define the function $t_1(I_1, -I_2, p_Z): [0, \bar{\imath}] \times [-\bar{\imath}, 0] \times [0, 1] \mapsto [0, \bar{\imath}]$ as an employee's optimum choice of i_{w1} given I_1, $-I_2$, and p_Z. Note that this function is continuous in I_1. Since (6) has weakly increasing differences in $(i_{w1}, -I_2)$ and (i_{w1}, p_Z), t_1 is weakly increasing in $-I_2$ and p_Z.

Similarly, define $t_2(I_1, -I_2, p_Z): [0, \bar{\imath}] \times [-\bar{\imath}, 0] \times [0, 1] \mapsto [-\bar{\imath}, 0]$ as the choice of $-i_{w2}$ solving (2) given I_1 and $-I_2$. Note that this function is continuous in $-I_2$ and weakly increasing in I_1 and p_Z.

Finally, let $t_3(I_1, -I_2, p_Z): [0, \bar{\imath}] \times [-\bar{\imath}, 0] \times [0, 1] \mapsto [0, 1]$ as the firm's optimal choice of p_Z given I_1 and $-I_2$. Note that this function is weakly increasing in I_1 and $-I_2$.

These best-response functions t_1, t_2, and t_3 are upward sloping, which means that $(I_1, -I_2, p_Z)$ are strategic complements. Milgrom and Roberts's (1994) Theorem 4 implies that there exist highest and lowest fixed points of T. □

Proof of Proposition 4. I first show $I_1^*(\theta, z, D)$ is weakly increasing in θ. Fix z, D, and $\theta' \geq \theta''$. Suppose $I_1' = I_1^*(\theta', z, D)$. By definition,

$$\int_D^{x_{Y2}} x\, dF_Y(x; \theta', I_1') = \int_D^{x_{Z2}} x\, dF_Z(x; \theta', z, I_1', I_2(\theta', I_1', D)).$$

Then by Assumption 5,

$$\int_D^{x_{Y2}} x\, dF_Y(x; \theta'', I_1'') = \int_D^{x_{Z2}} x\, dF_Z(x; \theta'', z, I_1'', I_2(\theta', I_1', D)).$$

Now suppose $I_1'' \geq I_1'$. Then $I_2(\theta', I_1', D) \geq I_2(\theta'', I_1'', D)$ which means that

$$\int_D^{x_{Y2}} x\, dF_Y(x; \theta'', I_1'') \leq \int_D^{x_{Z2}} x\, dF_Z(x; \theta'', z, I_1'', I_2(\theta'', I_1'', D)).$$

Hence $I_1'' \neq I_1^*(\theta'', z, D)$. Therefore, it must be that $I_1^*(\theta', z, D) \geq I_1^*(\theta'', z, D)$.

The proof that I_1^* is weakly decreasing in D is analogous, while the fact that I_1^* is weakly decreasing in z follows directly from Proposition 2. □

References

Baker, G.P. and K.H. Wruck, 1989, ''Organizational Changes and Value Creation in Leveraged Buyouts,'' *Journal of Financial Economics*, 25, 163–190.

Bulow, J., J. Geanakoplos, and P. Klemperer, 1985, ''Multimarket Oligopoly: Strategic Substitutes and Complements,'' *Journal of Political Economy*, 93, 488–511.

Cyert, R.M. and J.G. March, 1963, *A Behavioral Theory of the Firm*, Blackwell.

Hannan, M.T. and J. Freeman, 1989, *Organizational Ecology*, Harvard University Press.

Keller, M., 1993, *Collision*, Doubleday.

March, J.G. and H.A. Simon, 1958, *Organizations*, Wiley.

Meyer, M., P.R. Milgrom, and J. Roberts, 1992, ''Organizational Prospects, Influence Costs and Ownership Changes,'' *Journal of Economics and Management Strategy*, 1, 9–35.

Milgrom, P.R., 1988, ''Employment Contracts, Influence Activities and Efficient Organization Design,'' *Journal of Political Economy*, 96, 42–60.

—— and J. Roberts, 1988, ''An Economic Approach to Influence Activities in Organizations,'' *American Journal of Sociology*, 94 (suppl.), S154–S179.

—— and ——, 1994, ''Comparing Equilibria,'' *American Economic Review*, 84, 441–459.

Rotemberg, J.J. and G. Saloner, 1995, ''Overt Interfunctional Conflict (and Its Reduction through Business Strategy),'' *Rand Journal of Economics*, 26, 630–653.

Scussel, P.A., 1991, ''Can Sears' catalog be saved?,'' *Catalog Age*, 8, 5.

Wruck, K.H., 1994, ''Financial Policy, Internal Control and Performance: Sealed Air Corporation's Leveraged Special Dividend,'' *Journal of Financial Economics*, 36, 157–192.