

Does empowerment lead to higher quality and profitability?

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Received 8 July 1996; accepted 21 October 1997

Abstract

This paper examines the implications of alternative empowerment regimes on a firm's product quality and profitability when ownership and management of the firm are separated and it faces environmental uncertainties. The analyses of a three-stage game highlight the circumstances under which empowering a manager to make quality investment decisions results in higher profitability and/or product quality. When delegation reduces a manager's disutility, either monitored or complete empowerment arise as the preferred management system. If delegation increases the manager's disutility of effort, and uncertainties about consumers' preferences are small, forcing may become the preferred management system. © 1998 Elsevier Science B.V. All rights reserved

Keywords: Empowerment; Firm profitability; Informational rents; Monitoring; Principal-agent model; Product quality; Uncertainty

1. Introduction

Empowerment has recently become one of the most celebrated managerial remedies. It is often referred to in the context of self-managed cross-functional teams in the 're-engineered organization,' and is frequently viewed as an essential condition for success of 'Total Quality Management' programs. While empowerment is thought to be a vital element of effective modern management, its meaning and impact on the quality of a firm's products and on firm profitability remain unclear. In this study, we seek to anchor

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theoretically the circumstances under which various forms of empowerment become desirable modes of governance. To do this, we examine the implications of alternative empowerment regimes on product quality and firm profitability.

The numerous benefits of employee empowerment are hailed by management practitioners. Empowerment can help companies keep their best people by giving them better training, more responsibility, and a greater role in determining their firm's destiny. Efficiency and productivity increases, restoration of individual and corporate vitality, quality improvements, and an ability to respond faster to changes in the market place are also thought to be outcomes of an empowerment culture in a corporation (Baukol, 1991; Bowen and Lawler, 1992; Frey, 1993, 1994; Nelson, 1994; Treece, 1994; Spreitzer, 1995, 1996). Frohman and Johnson (1992) suggest that empowering managers to take risks and innovate facilitates 'leading from the middle,' which can overcome the middle management crisis in America. Interestingly, it has also been noted that few organizations are able to capture these benefits because of the inherent paradox of empowerment: letting go while taking control. As Baker (1994) points out, abdicators fail because they let go but do not take control, while meddlers fail because they grab control but cannot let go. We attempt to shed some light on this paradox by focusing on the tradeoffs that owners should consider in deciding whether or not to empower their managers.

The benefits of empowerment are also highlighted in human resources and organizational behavior literature (Conger and Kanungo, 1988). Some authors examine empowerment as a relational construct (e.g., Pfeffer, 1981; Liden and Tewksbury, 1995) and point to potential advantages that may emerge from sharing power (or authority) over organizational resources. Others perceive empowerment as a motivational construct (e.g., McClelland, 1975). The literature (e.g., Deci, 1975; Bandura, 1977; Thomas and Velthouse, 1990; Liden and Arad, 1996; Eylon, 1998) suggests that empowerment enhances the manager's personal efficacy by making her feel more powerful. We incorporate such behavioral consideration into an analytical model by assuming that the manager's disutility of effort may depend on whether or not decision powers are delegated to her.

The literature in economics, managerial accounting, and marketing science has long considered the contracting implications of delegating decision making in the context of principal-agent models (Holmstrom, 1979; Grossman and Hart, 1983; Lal, 1986; Melumad et al., 1987, 1992). To take advantage of information that is dispersed throughout an organization, principals must either elicit this information through costly communication, or delegate decision making. However, delegation creates opportunities for managers to appropriate informational rents by withholding information from the owners who make resource allocation decisions. Since managerial efforts cannot be easily observed when ownership and management are separated, moral hazard issues arise when managers are empowered. In the presence of environmental uncertainty (Gal-Or, 1995), empowerment becomes an issue for owners if managers must be compensated with their reservation utility even in the worst realization of the firm's uncertain environment. When decision making is decentralized, monitoring can be introduced to facilitate communication and thereby eliminate the adverse effects of information asymmetries.

The analysis in this paper differs from the current literature on delegation in several ways. The most important difference is that we consider two independent sources of uncertainty within a principal-agent modeling framework, rather than one as in Melumad

et al., 1987) or Lal (1986). Such modeling allows us to consider the case in which signaling enables only partial communication between the manager and the owner on some, but not all, of the random variables. In contrast to models with a single source of uncertainty, our formulation precludes obtaining first best investment decisions even when the behavior of the manager is monitored. Hence, separation between ownership and management in an environment characterized by partial communication concerning multiple sources of uncertainty yields sub-optimal decision making irrespective of the management system selected by the owner. The second difference between our formulation and earlier models is that we introduce the case of empowerment with costly monitoring in which only *some* of the agency costs are eliminated. The circumstances that make that form of governance desirable are investigated and compared to a regime of empowerment without monitoring, and to a regime in which managers are not empowered. We demonstrate that the relative precision of the communicable and non-communicable signals observed privately by the manager is crucial in determining the benefit that accrues from monitored empowerment. Third, our analysis differs from most of the literature on delegation in that we explicitly consider a range of psychological benefits (or costs) that managers might derive from empowerment. Fourth, unlike the cited literature, we assume a limited liability environment in which managers cannot earn less than their opportunity costs, an assumption that limits the extent of penalties that can be imposed on the manager by the owner.

Section 2 presents a simple model that allows for an analysis of the tradeoffs that must be considered by a firm's owner in the decision to empower managers to make quality investment decisions. The analyses in Section 3 to Section 6 emphasize the behavioral and economic circumstances under which various forms of empowerment are likely to lead to higher product quality and/or higher firm profitability.

2. The model

Consider the owner of a firm who hires a manager to coordinate and control production of its product. We assume that the owner has neither the skill nor the time to run the company himself. A separation between ownership and management is thus the optimal organizational form. The manager may be empowered to determine the resources to be invested in upgrading the quality of the product, as well as how to allocate those resources among the different dimensions of quality appreciated by consumers (e.g., convenience of use and the durability of the product). Specifically, assume that there are only two dimensions of quality that affect consumers' perceptions. Let q_1 and q_2 denote the magnitude of investment in the first and second dimensions of quality, respectively. For simplicity we assume a linear production function that translates the effort levels, q_1 and q_2 , into the quality level q , as perceived by the consumers.

Specifically,

$$q = \alpha q_1 + \beta q_2 \quad (1)$$

where $\alpha, \beta > 0$. While the value of the quality parameter, α , in Eq. (1), is assumed to be known with certainty, the value of the parameter β is stochastic. The randomness of β captures the idea that it may be difficult for marketing experts to synthesize some of the

information about consumers' valuation of different product characteristics into a meaningful measure of 'overall' quality. For simplicity, assume that β can take one of two values, $\underline{\beta}$ and $\bar{\beta}$, with equal probability. The manager's interaction with consumers provides her with some information about the value of the uncertain parameter β . The signal about β , which is privately observed by the manager, is denoted by $u \in \{\underline{\beta}, \bar{\beta}\}$. The precision of this signal is specified by the following posterior probability function:

$$\Pr(\beta | u) = \begin{cases} \frac{1}{2} + f & \text{if } u = \beta \\ \frac{1}{2} - f & \text{if } u \neq \beta \end{cases} \quad (2)$$

where $f \in [0, \frac{1}{2}]$, is exogeneously given. Higher values of the parameter f indicate a more precise signal of the quality parameter β . In particular, when $f = 1/2$, u is a perfect signal of β . We assume that the signal u is observed privately by the manager and cannot be communicated to the owner. This assumption captures the idea that some observations are too qualitative in nature to allow for meaningful communication among parties (Sah and Stiglitz, 1986).

The owner cannot verify the investment levels in the various attributes of quality that are selected by the manager unless he allocates funds to monitor the manager's behavior. We designate these monitoring costs by K . Such monitoring permits the owner to observe the levels of q_1 and q_2 that are chosen by the manager but does not allow him to observe the state of any other uncertainty that is confronting the quality decision (concerning β or u , for instance²). If the owner dictates the quality investment decision to the manager, he must incur monitoring costs to guarantee that the manager executes the dictated investment levels. Even when the owner decides to delegate the investment decision to the manager, he may still monitor the selected choice of the manager if by doing so he can increase his expected payoff.

We assume that all costs related to enhancing quality are incurred by the manager. These costs depend on whether or not the manager is empowered to make decisions regarding the investment in quality. Specifically, let $TC_i(q_1, q_2)$ with $i \in \{E, NE\}$ designate the cost of quality investment. Costs here include the private disutility of effort when the manager is empowered to make the decision (E) or when the owner dictates this decision to the manager (NE). Consider the following quadratic cost function of investment in quality:³

$$TC_i(q_1, q_2) = c_i(q_1^2 + q_2^2) \quad \text{with } i = E, NE \quad (3)$$

We further assume that the owner can never verify the total cost of the investment that is incurred by the manager as a result of quality enhancement.

² If monitoring allows the owner to observe the realization of the random variables, then agency costs can be eliminated and the 'first best' outcome is possible.

³ Notice that the separability of the cost function Eq. (3) is necessary here so that we always obtain positive investment levels in both attributes of quality irrespective of the values of α , β , and c_i (in a deterministic environment, for instance when $p(q) = q\sigma$, then $q_1 = \alpha\sigma/2c_i$ and $q_2 = \beta\sigma/2c_i$. If the cost function is nonseparable it is possible that investment in a single attribute is optimal (for instance, when $TC_i = c_i(q_1 + q_2)^2$ and α is larger than the estimate of β , then investment in only q_1 may be optimal). In addition, note that the marginal cost of a given quality attribute at zero equals zero, regardless of the level of the other quality attributes. Also, the assumption that the marginal costs of both quality attributes is the same is made for simplification. It guarantees that attributes differ only in the manner in which consumers value them.

As pointed out in the behavioral literature (e.g., Thomas and Velthouse, 1990), the empowerment of managers may improve their productivity by enhancing self-efficacy. Such enhanced efficiency is captured in the above formulation by assuming that $c_E < c_{NE}$. In contrast, others (e.g., Hofstede, 1993) have argued that the success of empowerment as a motivational construct may be culturally dependent. Eylon and Au (1995) summarize these differences by suggesting that individuals from high power-distance cultures are more accustomed to centralized and paternal leadership, whereas those from low power-distance cultures prefer delegated and autonomous leadership and are more comfortable with relatively equal power distribution. In high power-distance societies, empowerment can inflict additional disutility on employees. In the context of our model, this would imply that $c_E > c_{NE}$. Because of the ambiguous implications of empowerment on the extent of disutility that is incurred by the manager, we do not impose any restrictions on the relative values of the coefficients c_E and c_{NE} . The formulation in Eq. (3) implies that the disutility of effort depends on the extent of empowerment of the manager but not on her behavior being monitored. An alternative assumption may be that both the extent of empowerment and the extent of monitoring affect the manager's disutility. We will consider this alternative assumption in the sequel.

The firm also faces uncertainty regarding consumers' willingness to pay for higher-quality products. We designate the consumers' willingness to pay for a product of quality q by $p(q)$ and specify it as follows:

$$p(q) = q\sigma \quad (4)$$

where σ is a random variable that can take one of the two values, $\underline{\sigma}$ or $\bar{\sigma}$, with equal probabilities, and $\bar{\sigma} > \underline{\sigma}$. We assume that the random variables β and σ are independently distributed.⁴

The manager's interaction with consumers provides her with a signal about the willingness to pay parameter, σ . We designate this signal by s , and make the following distributional assumption concerning the posterior probability function:

$$\Pr(\sigma | s) = \begin{cases} \frac{1}{2} + a & \text{if } s = \sigma, \\ \frac{1}{2} - a & \text{if } s \neq \sigma, \text{ where } a \in [0, \frac{1}{2}]. \end{cases} \quad (5)$$

The parameter a , which is exogenously given, measures the precision of the signal about consumers' willingness to pay for quality that is observed by the manager. When $a=1/2$, this signal is perfectly precise; when $a=0$ it is completely uninformative.

In contrast to the signal u , we allow for meaningful communication between the manager and the owner about consumers' willingness to pay. We designate by $\hat{s} \in \{\underline{\sigma}, \bar{\sigma}\}$ the report about consumers' willingness to pay that is delivered by the manager. Essentially, we assume that the manager can report to the owner that her interaction with potential consumers indicates that they are willing to pay, say an extra \$X, for a product they perceive to be of higher quality.

⁴ If β and σ are correlated, the difficulties that arise as a result of the non-communicability of the private signal about β are less significant since information about the random variable σ can be used by the owner to infer information about the random variable β as well.

We assume that the uncertainty concerning willingness to pay, σ , is resolved prior to the uncertainty concerning the relative importance of the quality attributes to consumers. When communication concerning willingness to pay takes place, the manager is unaware of the value of u . Hence both the signal $\hat{s}$ and the report are determined before the manager has observed the signal u .⁵

The preceding discussion highlights three possible implications of empowerment. Empowering the manager to make the quality investment decision herself may allow the owner to save on the monitoring costs necessary when the owner dictates investment decisions to the manager. It may also affect the extent of disutility the manager incurs when allocating resources to quality enhancement. Finally, empowerment may have informational consequences since it permits the manager to condition quality-investment decisions upon information that is non-communicable. When the owner forces investment decisions upon the manager, he is unable to condition choices upon some dimensions of the uncertainty even though a signal of these dimensions may be available to the manager. Our analysis demonstrates, however, that the improved match between the investment decision in quality and the state of the stochastic environment that is facilitated by empowerment may be obtained at the cost of informational rents that the manager can extract by manipulating information that she makes available to the owner.

In the discussion that follows we present three management systems that differ in the extent to which the manager is empowered as well as the extent of monitoring undertaken by the owner. In the *complete empowerment regime*, the owner empowers the manager with decision powers and does not monitor her choices. In the *monitored empowerment regime*, the manager is empowered to make quality investment decisions but her selected choice is monitored by the owner. Finally, in the *forcing regime*, the owner dictates investment levels to the manager. This regime requires monitoring of the investment levels.

To perform the analyses, we consider a three-stage game. In the first stage, the owner decides on the type of organization in terms of the extent of empowerment and monitoring of the manager's behavior. This decision, as well as the terms of the manager's compensation, are specified by a contract. In the second stage, the manager privately observes the signal s about consumers' willingness to pay for quality, and sends a message, $\hat{s}$, about this signal to the owner. The manager then privately observes the signal u about the relative importance to consumers of the quality dimensions. This signal cannot be communicated to the owner. In the third stage either the manager (with empowerment) or the owner (with forcing) chooses the levels of investment in quality. Monitoring of the investment decision takes place contingent upon the management system that has been selected earlier by the owner. If the manager is empowered to make the quality investment decisions herself, she can condition this choice on the additional information that became available to her in the second stage in the form of the signal u . However, if the owner mandates the level of investment in quality, such a contingency is not feasible. In the analysis that follows, we derive only the sub-game perfect equilibria of this three-stage game. The time line of the empowerment game is illustrated by Fig. 1.

⁵ While the sequence in which the two-dimensional uncertainty is resolved is not material to our qualitative results, the derivations depend upon such sequencing. It can easily be demonstrated that if s and u were observed simultaneously by the manager, she would be able to extract more significant informational rents than with sequential observability.

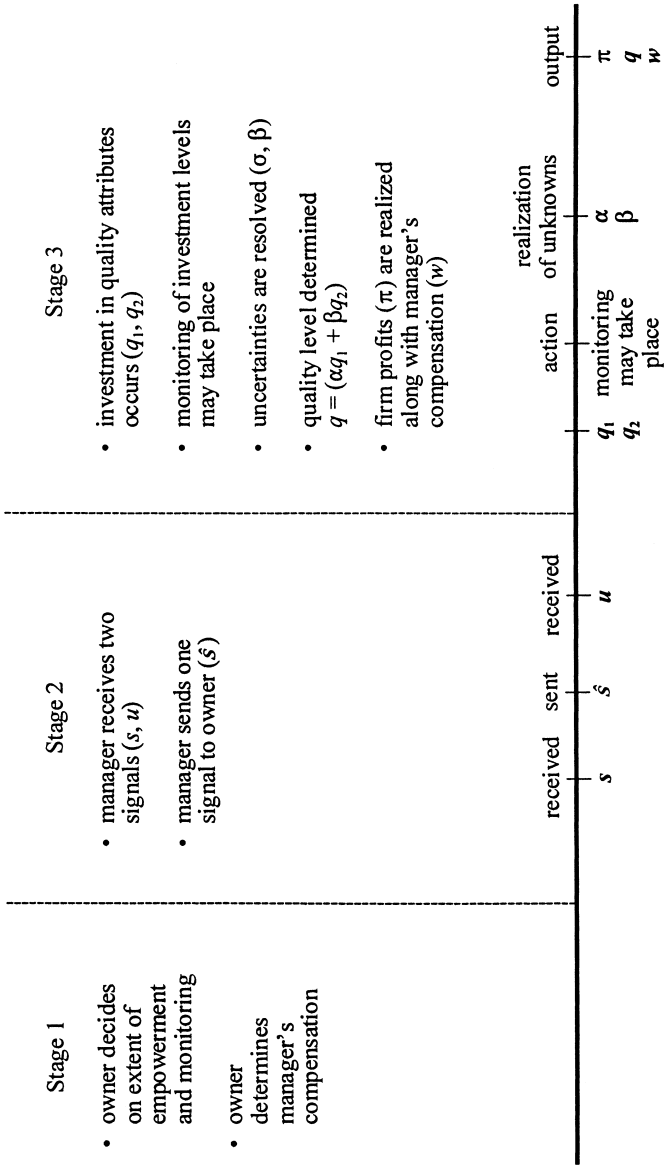


Fig. 1. The empowerment game.

The manager's compensation can be selected contingent upon only those variables that are observable and verifiable by both the owner and the manager. If the owner does not monitor the investment decision, we assume that he can observe only the firm's revenues. However, if the owner does monitor, then both the firm's revenues and the investment levels in quality attributes (q_1 and q_2) are observable. In the absence of monitoring, we specify the manager's compensation scheme in terms of a variable component B , which denotes the share of the firm's revenues that accrues to the manager, and a fixed compensation J . This fixed compensation consists of the manager's fixed salary and the budget that the owner allocates to the manager to cover the capital costs of investing in quality.

When there is monitoring of the quality investment levels, the owner can condition the manager's compensation on these monitored levels. Specifically, we assume that the manager's compensation may depend linearly upon q_1 and q_2 ; we designate by A_1 and A_2 the coefficients of this linear compensation scheme. Hence, with monitoring the owner can use the fixed compensation J , the revenue-contingent instrument B , and the quality-contingent instruments A_1 and A_2 , to provide appropriate incentives to the manager.⁶ The instruments B , J , A_1 and A_2 can be selected contingent upon the manager's report $\hat{s}$; thus

$$B : \{\underline{\sigma}, \bar{\sigma}\} \rightarrow [0, 1], \quad J : \{\underline{\sigma}, \bar{\sigma}\} \rightarrow R, \quad A_i : \{\underline{\sigma}, \bar{\sigma}\} \rightarrow R, \quad i = 1, 2.$$

Further, the total compensation has to guarantee the manager's opportunity cost, which is normalized to zero. This implies that the manager's compensation must be non-negative regardless of the realization of the signals about the consumer's evaluation of quality. In other words, for each realization of the signals, (s or u), the manager's worst payoff is receiving her opportunity costs. For payoffs above opportunity costs, we assume that the manager is risk neutral.

Before considering the various decision making regimes available to the owner, we derive the optimal, first best solution to the problem in the absence of separation between ownership and management. That is, we examine the case in which the owner can manage the firm himself, and therefore, observe the signals s and u , as well as the selected investment levels in quality without having to rely upon communication or monitoring. The first best analysis provides benchmark levels of profit and quality, to which we can compare regimes characterized by separation between ownership and management. We assume that in the absence of separation between ownership and management, the owner incurs the same disutility of effort as an empowered manager; that is, the cost parameter c_E in Eq. (3) applies.

3. 'First best' solution

Given the realization of the signals s and u , the owner selects investment levels in quality so as to maximize expected profits:

$$\max_{q_1, q_2} \Pi(q_1, q_2; s, u) = E_{\sigma, \beta} \{ [\sigma(\alpha q_1 + \beta q_2) - c_E(q_1^2 + q_2^2) \mid s, u] \}. \quad (6)$$

⁶ A proof that a linear compensation rule is optimal and therefore such a restriction can be made without any loss of generality is available from the authors upon request.

Solving Eq. (6) yields

$$\begin{aligned} E[\sigma\alpha - 2c_E q_1] &= 0 \Rightarrow q_1(s, u) = \frac{\alpha E(\sigma | s)}{2c_E}, \\ E[\sigma\beta - 2c_E q_2] &= 0 \Rightarrow q_2(s, u) = \frac{E(\sigma | s)E(\beta | u)}{2c_E}, \end{aligned} \quad (7)$$

where

$$\begin{aligned} E(\sigma | \bar{\sigma}) &= \frac{\bar{\sigma} + \underline{\sigma}}{2} + a(\bar{\sigma} - \underline{\sigma}) & E(\sigma | \underline{\sigma}) &= \frac{\bar{\sigma} + \underline{\sigma}}{2} - a(\bar{\sigma} - \underline{\sigma}), \\ E(\beta | \bar{\beta}) &= \frac{\bar{\beta} + \underline{\beta}}{2} + f(\bar{\beta} - \underline{\beta}) & E(\beta | \underline{\beta}) &= \frac{\bar{\beta} + \underline{\beta}}{2} - f(\bar{\beta} - \underline{\beta}). \end{aligned} \quad (8)$$

Substituting the optimal investment decisions in quality, Eq. (7), into the owner's objective function (Eq. (6)), allows us to compute the ex-ante payoffs to the owner before the realization of the signals. The prior expectation over the signals s and u thus yields the following maximized payoff:

$$E(\Pi^*) = \frac{1}{4c_E} \left[\frac{(\bar{\sigma} + \underline{\sigma})^2}{4} + a^2(\bar{\sigma} - \underline{\sigma})^2 \right] \Delta \quad \text{where } \Delta \equiv \left[\alpha^2 + \frac{(\bar{\beta} + \underline{\beta})^2}{4} + f^2(\bar{\beta} - \underline{\beta})^2 \right]. \quad (9)$$

We can also compute the ex-ante average quality of the product under the first best outcome as follows:

$$E(q^*) = E[\alpha q_1(s, u) + \beta q_2(s, u)] = \frac{(\bar{\sigma} + \underline{\sigma})}{4c_E} \Delta. \quad (10)$$

Notice that both expected profitability and expected quality of the product are increasing functions of the parameter f . A more precise signal permits the firm to adjust its investment in the quality attributes in a manner more consistent with the preferences of consumers, thereby leading to an overall rise in the perceived average quality of the product. On the other hand, higher values of the parameter a raise profitability but have no impact on average quality. Furthermore, the marginal profitability of increased precision of one of the signals (s or u) is higher the more precise the remaining signal is. The signals s and u can be viewed, therefore, as complementary sources of information about the two-dimensional uncertainty that is associated with the quality-investment decision. In addition, note that the expected profitability of the firm increases with the spread of the uncertainties $(\bar{\sigma} - \underline{\sigma})$ and $(\bar{\beta} - \underline{\beta})$. The availability of information about the uncertainty can be viewed as an 'option' to adjust investment decisions. The value of this option is higher the greater the extent of uncertainty about the environment.

4. The forcing regime

We now turn to governance regimes under which ownership and management are separated. We start with the regime in which the manager is 'disempowered.' Under this

regime, investment decisions are made by the owner who forces the manager to execute the mandated quality investment levels. Such a management system requires the owner to allocate resources to monitor the manager's choice to verify that the mandated investment levels are implemented. Based on the manager's report $\hat{s}$, the owner chooses investment levels $q_1(\hat{s})$ and $q_2(\hat{s})$ as well as the manager's compensation scheme ($J(\hat{s})$, $B(\hat{s})$, $A_1(\hat{s})$, $A_2(\hat{s})$). The manager, in turn, chooses her report to maximize her payoff as follows:

$$\max_s W(\hat{s}; s) = E_{\sigma, \beta} \{ B(\hat{s}) \sigma [\alpha q_1(\hat{s}) + \beta q_2(\hat{s})] + J(\hat{s}) + A_1(\hat{s}) q_1(\hat{s}) + A_2(\hat{s}) q_2(\hat{s}) - C_{NE}[q_1^2(\hat{s}) + q_2^2(\hat{s})] \mid s \}. \quad (11)$$

Designate by $w(s)$ the net payoff to the manager at the equilibrium with truthful revelation. This payoff schedule corresponds to the interim payoff of the manager after the observation of the signal s , but before u has been realized. In economic models with a similar two-state stochastic environment (e.g., Laffont, 1990; Laffont and Tirole, 1990) it has been demonstrated that the individual rationality (IR) constraint is binding only for the low state of nature (in our case the 'bad state' $\underline{\sigma}$), and the incentive compatibility (IC) constraint is binding only for the high state of nature (the 'good state' $\bar{\sigma}$). Using these earlier results in our model yields

$$w(\bar{\sigma}) = B(\underline{\sigma}) E(\sigma \mid \underline{\sigma}) f(\bar{\beta} - \underline{\beta}) q_2(\underline{\sigma}) \quad (\text{IR}), \quad (12)$$

$$w(\bar{\sigma}) = w(\underline{\sigma}) + 2B(\underline{\sigma}) \left[\alpha q_1(\sigma) + \frac{\bar{\beta} + \underline{\beta}}{2} q_2(\underline{\sigma}) \right] a(\bar{\sigma} - \underline{\sigma}) \quad (\text{IC}). \quad (13)$$

The IR constraint Eq. (12), which is derived from the first term⁷ of the RHS of Eq. (11), guarantees that the manager earns just her opportunity cost of zero, if after observing $\underline{\sigma}$, she also observes the bad signal $\underline{\beta}$. Her payoff, however, is twice as big as the expression on the RHS of Eq. (12) if $\bar{\beta}$ is observed. In expectation, therefore, the payoff is given by Eq. (12). The IC constraint Eq. (13) guarantees that a manager who observes the 'good news' $\bar{\sigma}$ does not misrepresent the data and report $\underline{\sigma}$ instead. The forcing program solved by the owner can be formulated, therefore, as follows:

$$\max_{B(s), q_1(s), q_2(s)} \Pi = E_{s, y} E_{\sigma, \beta} \{ \sigma (\alpha q_1 + \beta q_2) - c_{NE}(q_1^2 + q_2^2) - w(s) \mid s \} - K,$$

subject to the condition that $w(s)$ solves Eqs. (12) and (13), and $s \in \{\underline{\sigma}, \bar{\sigma}\}$.

It is easy to show that under the forcing regime, the manager's compensation is set so that she does not capture any informational rents. By choosing $B(\underline{\sigma}) = 0$ it follows from Eqs. (12) and (13) that $w(\underline{\sigma}) = w(\bar{\sigma}) = 0$. The level of investment in quality is determined by

$$q_1(s) = \frac{\alpha E(\sigma \mid s)}{2c_{NE}} \quad \text{and} \quad q_2(s) = \left(\frac{\bar{\beta} + \underline{\beta}}{2} \right) \frac{E(\sigma \mid s)}{2c_{NE}} \quad s \in \{\underline{\sigma}, \bar{\sigma}\},$$

⁷ This is the only term in Eq. (11) that includes the random variable β .

which leads to the following expected quality level

$$E(q^*) = \frac{(\bar{\sigma} + \underline{\sigma})}{4c_{NE}} \left(\alpha^2 + \frac{(\bar{\beta} + \underline{\beta})}{4} \right) = \frac{(\bar{\sigma} + \underline{\sigma})\Delta}{4c_{NE}} - \frac{(\bar{\sigma} + \underline{\sigma})f^2(\bar{\beta} - \underline{\beta})^2}{4c_{NE}}. \quad (14)$$

The profits that accrue to the owner are:

$$E(\Pi^*) = \frac{\Delta}{4c_{NE}} \left[\frac{(\bar{\sigma} + \underline{\sigma})^2}{4} + a^2(\bar{\sigma} - \underline{\sigma})^2 \right] - \frac{f^2(\bar{\beta} - \underline{\beta})^2}{4c_{NE}} \left[\frac{(\bar{\sigma} + \underline{\sigma})^2}{4} + a^2(\bar{\sigma} - \underline{\sigma})^2 \right] - K. \quad (15)$$

A comparison of the forcing regime with the first best outcome indicates that even when $c_{NE} = c_E$ and the cost of monitoring, K , is zero, the average quality and profits are lower under forcing than under the first best outcome. Since the owner cannot observe the private signal of the consumers' relative evaluation of the attributes of quality, he cannot adjust investment levels to correspond more closely to consumers' tastes. As a result, average quality and profitability decline. In fact, the more informative the signal u and the larger the extent of prior uncertainty concerning consumers' relative valuation (as reflected by large values of $f(\bar{\beta} - \underline{\beta})$), the more significant the foregone profits resulting from disempowering the manager. Disempowerment can attain the first best outcome only if $f=0$, the cost of effort does not increase with disempowerment (i.e., $c_{NE} = c_E$), and monitoring is costless.

Note that if both signals s and u were communicable, then forcing could achieve first best levels of investment in quality (if $c_{NE} = c_E$). By dictating the investment levels specified in Eq. (7) and designing a fixed budget that is exactly sufficient to compensate the manager for her disutility of effort the first best could be attained.

5. The monitored empowerment regime

Under this regime, the owner delegates to the manager decision powers concerning investment in quality, but allocates resources to monitor the selected choice. Notice that the monitoring of q_1 and q_2 does not fully remove the uncertainty concerning σ , s , β or u since the owner can *not* observe the overall quality level q as perceived by the consumers. Given the revenue-contingent instrument $B(\hat{s})$, the investment-contingent instruments $A_1(\hat{s})$ and $A_2(\hat{s})$, and the fixed component of her compensation $J(\hat{s})$, the manager chooses investment levels and her report to maximize her expected payoff as follows:

$$\max_{q_1, q_2, \hat{s}} V = E_{s,u} E_{\sigma,\beta} \{ B(\hat{s}) \sigma [\alpha q_1 + \beta q_2] + A_1(\hat{s}) q_1 + A_2(\hat{s}) q_2 + J(\hat{s}) - C_E(q_1^2 + q_2^2) \mid s, u \}.$$

Optimizing the manager's objective with respect to quality investment yields

$$q_1(\hat{s}, s) = \frac{\alpha B(\hat{s}) E(\sigma \mid s) + A_1(\hat{s})}{2c_E}, \quad (16a)$$

$$q_2(\hat{s}, u, s) = \frac{E(\beta | u)B(\hat{s})E(\sigma | s) + A_2(\hat{s})}{2c_E}. \quad (16b)$$

The manager's payoff can be expressed conditionally upon the private information s , u , and $\hat{s}$ by substituting Eqs. (16a) and (16b) into her objective function yielding

$$W(\hat{s}; s, u) = \frac{[\alpha B(\hat{s})E(\sigma | s) + A_1(\hat{s})]^2}{4c_E} + \frac{[E(\beta | u)B(\hat{s})E(\sigma | s) + A_2(\hat{s})]^2}{4c_E} + J(\hat{s}). \quad (17)$$

Designating, once again, the net interim payoff of the manager at the equilibrium with truthful revelation by $w(s)$ yields from Eq. (17) the following expressions

$$w(\underline{\sigma}) = \frac{f(\bar{\beta} - \underline{\beta})B(\underline{\sigma})E(\sigma | \underline{\sigma})[B(\underline{\sigma})E(\sigma | \underline{\sigma})(\bar{\beta} + \underline{\beta}) + 2A_2(\underline{\sigma})]}{4c_E}, \quad (\text{IR})$$

$$w(\bar{\sigma}) = w(\underline{\sigma}) + \frac{a(\bar{\sigma} - \underline{\sigma})B(\underline{\sigma})[B(\underline{\sigma})(\bar{\sigma} + \underline{\sigma})\Delta + 2(\alpha A_1(\underline{\sigma}) + \frac{(\bar{\beta} + \underline{\beta})}{2}A_2(\underline{\sigma}))]}{2c_E}. \quad (\text{IC})$$

Recall that the expected payments to the manager amount to the sum of the disutility she incurs and the informational rents she extracts. Thus, the owner solves the following problem:

$$\begin{aligned} \max_{B(s), A_1(s), A_2(s)} \Pi = & \frac{1}{2} \sum_s \left\{ \frac{1}{4c_E} \left[\Delta E^2(\sigma | s)B(s)(2 - B(s)) + 2(1 - B(s))E(\sigma | s) \right. \right. \\ & \left. \left. \times \left(\alpha A_1(s) + \frac{\bar{\beta} + \underline{\beta}}{2}A_2(s) \right) - A_1^2(s) - A_2^2(s) \right] - w(s) \right\} - K, \end{aligned}$$

subject to the condition that $w(s)$ solves Eq. (18) and $s \in \{\underline{\sigma}, \bar{\sigma}\}$.

Notice from Eq. (18) that if the manager's compensation in the bad state of nature is chosen independently of the firm's revenues, so that $B(\underline{\sigma}) = 0$ the manager is unable to extract any information rents since $w(\underline{\sigma}) = w(\bar{\sigma}) = 0$. Such a compensation rule may, nevertheless, lead to positive levels of investment in quality, even with empowerment, since q_1 and q_2 are positive as long as A_1 and A_2 are positive. Solving the monitored empowerment program yields the following compensation rule, physical investment levels, and average quality:⁸

$$\begin{aligned} B(\underline{\sigma}) &= 0, \quad A_1(\underline{\sigma}) = \alpha E(\sigma | \underline{\sigma}), \quad A_2(\bar{\sigma}) = \frac{(\bar{\beta} + \underline{\beta})}{2}E(\sigma | \underline{\sigma}), \\ B(\bar{\sigma}) &= 1, \quad A_1(\bar{\sigma}) = 0, \quad A_2(\bar{\sigma}) = 0. \\ q_1(s) &= \frac{\alpha E(\sigma | s)}{2c_E}, \quad s \in \{\underline{\sigma}, \bar{\sigma}\}, \\ q_2(\underline{\sigma}, u) &= \frac{(\bar{\beta} + \underline{\beta})}{4c_E}E(\sigma | \underline{\sigma}), \\ q_2(\bar{\sigma}, u) &= \frac{E(\beta | u)E(\sigma | \bar{\sigma})}{2c_E} \quad u \in \{\underline{\beta}, \bar{\beta}\}. \\ E(q^*) &= \frac{(\bar{\sigma} + \underline{\sigma})\Delta}{4c_E} - \frac{f^2(\bar{\beta} - \underline{\beta})^2 E(\sigma | \underline{\sigma})}{4c_E}. \end{aligned} \quad (19)$$

⁸ It can be shown that the selected compensation scheme satisfies second-order conditions for truthful revelation.

The expected profits that accrue to the owner are given by

$$E(\Pi^*) = \frac{\Delta}{4c_E} \left[\frac{(\bar{\sigma} + \underline{\sigma})^2}{4} + a^2(\bar{\sigma} - \underline{\sigma})^2 \right] - \frac{f^2(\bar{\beta} - \underline{\beta})^2}{8c_E} E^2(\sigma | \underline{\sigma}) - K. \quad (20)$$

If the good state of nature is reported by the manager (i.e., $\bar{\sigma}$), she obtains the complete claim to revenues, thus leading to optimal investment levels in quality. If the bad state of nature is reported (i.e., $\underline{\sigma}$), the owner conditions the manager's compensation upon observed investment levels but not upon revenues. Since $B(\underline{\sigma}) = 0$ the manager is unable to extract rents.⁹ However, the absence of a revenue bonus in this case implies that the manager has no incentive to adjust the investment in q_2 to the realization of the signal u . If this signal were communicable, then the owner could condition the compensation coefficient A_2 upon the communicated values of both s and u . By choosing $A_2(\underline{\sigma}, \hat{u}) = E(\sigma | \underline{\sigma})E(\beta | \hat{u})$ and $B(\underline{\sigma}, \hat{u}) = 0$ the owner could induce the manager to invest in the optimal level of quality even when $s = \underline{\sigma}$ and the first best would be attainable under monitored empowerment. Since u is non-communicable, the absence of a revenue bonus when $s = \underline{\sigma}$ leads to a fixed investment decision that is not responsive to different realizations of u .

The above derivations indicate that similar to the forcing regime, monitored empowerment facilitates eliminating the manager's informational rents but does not permit the owner to obtain first best levels of quality and profitability unless $f=0$ and monitoring is costless. In contrast to the forcing regime, however, investment decisions are partially responsive to the realization of the signal u which predicts the consumers' relative valuation of the quality attributes (when $s = \bar{\sigma}$ but not when $s = \underline{\sigma}$.) Since the manager is empowered to make the investment decision herself, she can utilize her private signal to better match consumers' preferences. If $C_{NE} \geq C_E$, monitored empowerment is then unambiguously a superior organizational form to forcing. Both regimes require investment in monitoring, which eliminates the manager's informational rents. However, only the monitored empowerment regime facilitates some adjustment of the quality investment decisions to information about consumers' relative valuation of quality attributes. Moreover, note that in compensating the empowered manager the monitored investment levels are utilized only when the bad state of the signal s is reported. Hence, if the owner could pre-commit to a monitoring policy that is contingent upon the report about s that is delivered by the manager, he would choose to monitor when $\hat{s} = \underline{\sigma}$ but not when $\hat{s} = \bar{\sigma}$. As a result, expected monitoring cost would be $K/2$ instead of K . Such savings are never feasible with forcing since the owner must always verify that the manager executes his instructions. We summarize the comparison between the forcing and monitored empowerment regimes in Proposition 1. (Proofs of all propositions are available upon request).

Proposition 1. (i) When $c_{NE} \geq c_E$, the monitored empowerment regime is superior to the forcing regime, in terms of both expected quality and the profitability of the owner.

⁹ Note that informational rents would be eliminated even if the support of the random variable s included more than two points.

(ii) When $c_{NE} < c_E$, the forcing regime may dominate the monitored empowerment regime if the spread $(c_E - c_{NE})$ is sufficiently large or the products $f(\bar{\beta} - \underline{\beta})$ and $a(\bar{\sigma} - \underline{\sigma})$ are sufficiently small.

According to part (ii) of Proposition 1, if the manager incurs greater disutility when decision powers are delegated to her, the owner will disempower the manager as long as the extent of prior uncertainty about the random variables σ and β (as measured by the spreads $(\bar{\sigma} - \underline{\sigma})$ and $(\bar{\beta} - \underline{\beta})$) and the precision of the signals s and u (as measured by a and f) are not too high.

It is important to note that in contrast to standard principal-agent models that are characterized by a single source of uncertainty, monitoring of investment decisions in a two-dimensional uncertainty model where information pertaining to at least one dimension is non-communicable cannot eliminate agency costs completely. Given that there are uncertainties concerning both the willingness to pay for quality and the relative evaluation of quality attributes, even after the owner observes both total revenues ($TR = \sigma(\alpha q_1 + \beta q_2)$) and individual investment levels in quality (q_1 and q_2) he is still uncertain about the exact realization of the stochastic state of nature since both σ and β are unknown.¹⁰

Even though our analysis assumes that the precision parameters a and f are exogenously determined, we can use our computations to predict the incentives of the owner to improve informativeness by establishing, for instance, better communication channels with consumers. Using the expressions of expected profits we can compute the marginal benefit of improved precision in order to assess the strength of such incentives. In Proposition 2 we compare the marginal benefit of improved informativeness under the regimes considered so far.

Proposition 2. (i) *The marginal benefit of increased precision of the signal u is higher under the first best than under monitored empowerment. Increased informativeness of u is useless under forcing.*

(ii) *The marginal benefit to the owner of improved precision of the signal s is higher under monitored empowerment than under the first best which, in turn, is higher than under forcing.*

Improving the precision of the noncommunicable signal is more beneficial under the first best because investment decisions are always chosen contingent upon u . Under a monitored empowerment regime, on the other hand, investment is only partially responsive to the value of u (when $s = \bar{\sigma}$.) Improved informativeness of this signal is useless under forcing since investment in this case is never adjusted to reflect different values of the non-communicable signal. The marginal benefit to the owner of improving the precision of the communicable signal is higher under monitored empowerment than

¹⁰ In a uni-dimensional uncertainty model (concerning, for instance, only willingness to pay or only relative valuation of quality attributes), monitoring of investment levels would eliminate agency costs completely and lead to optimal investment levels in quality, whether or not the single source of uncertainty is communicable.

under the first best scenario because the owner operating under the former system places higher weight on this signal in his decision making process (when $s = \underline{\sigma}$) than the decision maker in the latter regime. The marginal benefit of improved precision of the communicable signal is lowest under forcing since the information embedded in this signal cannot be utilized to same extent as when it is combined with the complementary signal u .

6. The complete empowerment regime

We now turn to the regime in which the manager is empowered to determine the level of investment in quality and the owner does not allocate any resources to monitor the manager's choice. Given the compensation scheme $(B(\hat{s}), J(\hat{s}))$ that is selected by the owner, the manager chooses q_1, q_2 and her report about the consumers' willingness to pay, $\hat{s}$, in order to maximize her expected payoff:

$$\max_{q_1, q_2, \hat{s}} V = E_{s,u} E_{\sigma, \beta} \{ B(\hat{s}) \sigma [\alpha q_1 + \beta q_2] + J(\hat{s}) - c_E (q_1^2 + q_2^2) \mid s, u \}. \quad (21)$$

Optimizing with respect to quality investment yields

$$q_1(\hat{s}, s) = \frac{\alpha B(\hat{s}) E(\sigma \mid s)}{2c_E}, \quad q_2(\hat{s}, u, s) = \frac{E(\beta \mid u) B(\hat{s}) E(\sigma \mid s)}{2c_E}. \quad (22)$$

The manager's payoff can be expressed conditionally upon the private information, s , u , and $\hat{s}$, by substituting Eq. (22) into the objective function Eq. (21) to obtain

$$W(\hat{s}; s, u) = \frac{\alpha^2 B^2(\hat{s}) E^2(\sigma \mid s)}{4c_E} + \frac{E^2(\beta \mid u) B^2(\hat{s}) E^2(\sigma \mid s)}{4c_E} + J(\hat{s}). \quad (23)$$

Designating by $w(s)$ the interim net payoff of the manager yields from Eq. (23) the following individual rationality and incentive compatibility constraints.

$$w(\underline{\sigma}) = \frac{E^2(\sigma \mid \underline{\sigma}) B^2(\underline{\sigma}) f(\bar{\beta}^2 - \underline{\beta}^2)}{4c_E}, \quad (IR) \quad (24)$$

$$w(\bar{\sigma}) = w(\underline{\sigma}) + \frac{B^2(\underline{\sigma}) \Delta a(\bar{\sigma}^2 - \underline{\sigma}^2)}{2c_E}. \quad (IC) \quad (25)$$

From Eqs. (24) and (25) it follows that eliminating informational rents requires once again that $B(\underline{\sigma}) = 0$. However, from Eq. (22) such a choice would yield zero investment in quality when the bad state of consumers' willingness to pay is observed by the manager. In contrast to monitored empowerment, where positive investment could be guaranteed even when $B(\underline{\sigma}) = 0$, with complete empowerment such an outcome is not feasible since the owner cannot condition the manager's compensation on observed quality levels.

The payoff of the owner can be derived by subtracting from total revenues the compensation of the manager which amounts to the sum of her disutility from investment in quality and her informational rents. Substituting the investment levels of Eq. (22) into

the owner's payoff yields the following program solved under the complete empowerment regime.

$$\max_{B(\underline{\sigma}), B(\bar{\sigma})} \Pi = \frac{1}{2} \left[\frac{\Delta E^2(\sigma | \underline{\sigma}) B(\underline{\sigma}) (2 - B(\sigma))}{4c_E} - w(\underline{\sigma}) \right] + \frac{1}{2} \left[\frac{\Delta E^2(\sigma | \bar{\sigma}) B(\bar{\sigma})}{4c_E} - w(\bar{\sigma}) \right]. \quad (26)$$

subject to the condition: $w(\bar{\sigma})$ and $w(\underline{\sigma})$ which are defined by Eqs. (24) and (25). The solution to this program is given by

$$B(\bar{\sigma}) = 1, \quad B(\underline{\sigma}) = \frac{\Delta E^2(\sigma | \underline{\sigma})}{\Delta E^2(\sigma | \bar{\sigma}) + 2f(\bar{\beta}^2 - \underline{\beta}^2)E^2(\sigma | \underline{\sigma})} \quad (27)$$

$$q_1(s) = \frac{\alpha E(\sigma | s) B(s)}{2c_E}, \quad q_2(s, u) = \frac{E(\beta | u) B(s) E(\sigma | s)}{2c_E} \text{ with } s \in \{\underline{\sigma}, \bar{\sigma}\} \text{ and } u \in \{\underline{\beta}, \bar{\beta}\},$$

yielding the expected quality

$$E(q^*) = \frac{\Delta}{4c_E} [(\bar{\sigma} + \underline{\sigma}) - (1 - B(\underline{\sigma}))E(\sigma | \underline{\sigma})] \quad (28)$$

and expected profitability to the owner

$$E(\Pi^*) = \frac{\Delta}{4c_E} \left[\frac{(\bar{\sigma} + \underline{\sigma})^2}{4} + a^2(\bar{\sigma} - \underline{\sigma})^2 - \frac{E^2(\sigma | \underline{\sigma})(1 - B(\underline{\sigma}))}{2} \right]. \quad (29)$$

The manager can extract informational rents equal to

$$E(w^*) = \frac{B^2(\underline{\sigma})}{4c_E} \left[E^2(\sigma | \underline{\sigma}) f(\bar{\beta}^2 - \underline{\beta}^2) + \Delta a(\bar{\sigma}^2 - \underline{\sigma}^2) \right]. \quad (30)$$

The above derivations indicate that the manager can extract informational rents under complete empowerment, unlike under the monitored empowerment regime. To guarantee positive investment levels in quality, the bonus, $B(\underline{\sigma})$, is chosen to be positive, even though such a choice implies from Eqs. (24) and (25) that the owner has to share surplus with the manager. However, since the manager's incentives to misrepresent her private information are positively related to the size of this bonus, the owner allots only a partial claim to the firm's revenues when $s = \underline{\sigma}$. This reduces expected quality in this state relative to the level chosen under monitored empowerment. In the good state, $s = \bar{\sigma}$, both regimes yield identical investment levels in quality since $B(\bar{\sigma}) = 1$ under both empowerment regimes. Note also that in contrast to monitored empowerment, where quality levels are adjusted only partially in response to different realizations of the non-communicable signal u (only when $s = \underline{\sigma}$) under complete empowerment the investment decision always depends on the value of this signal (both when $s = \underline{\sigma}$ and $s = \bar{\sigma}$). Hence, while complete empowerment has the disadvantage of transferring rents to the manager and thus distorting her investment in quality when $s = \underline{\sigma}$, it does facilitate investment decisions that are responsive to information about consumers' preferences. A comparison of the expected quality attained under the two empowerment regimes (from Eqs. (28) and (19)) indicates that the disadvantageous effect of complete empowerment more than

outweighs the favorable effect, leading to a reduction in average quality compared to monitored empowerment. In Proposition 3 we state this result and show a comparison of profits across the two empowerment regimes.

Proposition 3. (i) $E(q_{FB}^*) > E(q_{ME}^*) > E(q_E^*)$

(ii) Let $Y \equiv \frac{E^2(\sigma|\underline{\sigma})}{8c_E} [\Delta(1 - B(\underline{\sigma})) - f^2(\bar{\beta} - \underline{\beta}^2)]$ where $B(\underline{\sigma})$ is given by Eq. (27). Then $Y > 0$ and if $K > Y$, $E(\Pi_{FB}^*) > E(\Pi_E^*) > E(\Pi_{ME}^*)$, otherwise if $K \leq Y$, $E(\Pi_{FB}^*) > E(\Pi_{ME}^*) > E(\Pi_E^*)$.

Note that the comparison in part (i) of Proposition 3 depends upon the assumption that the manager's disutility function is unaffected by monitoring (i.e., $c_{ME} = c_E$). If we allow the manager's disutility to be higher if the owner monitors her choice, namely, $c_{ME} > c_E$, expected quality may actually decline under the monitored empowerment regime even though agency costs are moderated with monitoring. As a result, the owner is less likely to prefer monitored empowerment over complete empowerment. Only if monitoring costs are sufficiently low relative to Y can the monitored empowerment form dominate in this case. For $c_{ME} > c_E$, this holds if $K < \hat{Y} < Y$, where $\hat{Y}$ designates the critical level of monitoring costs for which the monitored and complete empowerment regimes are equivalent.

Because the two-dimensional uncertainty in the model precludes obtaining the first best, even with monitoring, Proposition 3 compares two different 'second best' regimes. The superiority of one regime over the other depends upon the cost of monitoring as well as the extent of prior uncertainty (in comparison to the precision of the posterior signals) concerning the two dimensions that determine consumers' preferences. The value of the variable Y , which measures the extra benefit (gross of monitoring cost) that accrues to the owner from monitoring his empowered manager, depends upon the spreads of the prior uncertainties $(\bar{\sigma} - \underline{\sigma})$ and $(\bar{\beta} - \underline{\beta})$ as well as on the precision of the private signals as reflected by the values of a and f . While Y is unambiguously increasing in the values of a and $(\bar{\sigma} - \underline{\sigma})$, its relationship to f and $(\bar{\beta} - \underline{\beta})$ is non-monotonic. When the prior uncertainty about the communicable signal (as measured by $(\bar{\sigma} - \underline{\sigma})$) or the precision of this signal (as measured by a) are high, the owner reduces the revenue bonus of the empowered manager in the bad state $\underline{\sigma}$ if her behavior remains unmonitored. The investment decision then becomes more distorted than under monitored empowerment and Y increases. In contrast, when either $(\bar{\beta} - \underline{\beta})$ or its precision f is high, there are two counteracting effects on the benefit from monitoring. On the one hand, since monitored empowerment yields only partial adjustment to this signal when $s = \bar{\sigma}$, as the non-communicable signal becomes more precise the benefit from monitoring declines. Given that complete empowerment investment decisions are chosen contingent upon u , even when $s = \underline{\sigma}$ monitoring reduces the extent of responsiveness to a reliable signal about consumers' preferences. On the other hand, since the two private signals s and u are complementary, as the precision of the signal u increases, the precision of the signal s indirectly increases as well. As a result, the manager's investment decision in the state $\underline{\sigma}$ becomes more distorted when her behavior remains unmonitored. In Proposition 4 we summarize the findings just discussed.

Proposition 4. The benefit from monitoring an empowered manager (gross of monitoring cost) is an increasing function of α , $(\bar{\sigma} - \underline{\sigma})$ and a . It is a non-monotonic function of $(\bar{\beta} - \underline{\beta})$ and f . When $a(\bar{\sigma} - \underline{\sigma})$ and α are sufficiently small and $f(\bar{\beta} - \underline{\beta})$ is sufficiently large, Y is a decreasing function of f or $(\bar{\beta} - \underline{\beta})$. Otherwise, for large values of $a(\bar{\sigma} - \underline{\sigma})$ and α and small values of $f(\bar{\beta} - \underline{\beta})$, Y is an increasing function of those parameters.

Proposition 4 implies that the owner's willingness to monitor his empowered manager depends on the relative precision of the communicable and the non-communicable signals. If the communicable signal is relatively more precise than the non-communicable signal, it will be optimal for the owner to monitor the manager, even if monitoring costs are relatively high. In contrast, when the non-communicable signal is highly precise and the parameter α (which measures the marginal contribution of the attribute q_1 to overall quality) is relatively small, it is optimal for the owner to monitor the empowered manager only if monitoring costs are sufficiently low.

Proposition 4 permits us to compare the empowerment regimes in terms of the incentives to the owner of improving the precision of the private signals. Since the gross benefit from monitoring is an increasing function of a , it follows from Proposition 4 that the owner has greater incentives to improve the precision of the communicable signal under a monitored regime than under the complete empowerment regime. A comparison of the owner's incentives to improve the precision of the non-communicable signal, however, is ambiguous since Y is a non-monotonic function of f . Since the manager earns no informational rents under monitored empowerment she has no incentives to improve either a or f under this regime. Eq. (30) reveals that under complete empowerment, the informational rents of the manager may rise or fall when the precision of the private signals is improved. This ambiguity arises because improved precision implies greater informational asymmetry between the manager and owner and greater opportunities for the manager to extract rents. However, greater precision may also yield more significant distortions in investment which reduces the total producer surplus to be shared between the manager and the owner.

Finally, we combine Propositions 1 and 3 to identify the optimal management system from the various regimes we have investigated.

Corollary 1. When $c_E \leq c_{NE}$, either monitored empowerment or complete empowerment can arise as the optimal regime. When the communicable signal is relatively precise and the deterministic marginal contribution to overall quality is high, monitored empowerment is preferred to complete empowerment even for relatively high costs of monitoring. In contrast, when the non-communicable signal is more precise than the communicable signal and the deterministic marginal contribution parameter α is small, monitored empowerment dominates complete empowerment only if the costs of monitoring are sufficiently small. (ii) When $c_E > c_{NE}$, forcing may arise as the optimal choice if $(c_E - c_{NE})$ is sufficiently large and $f(\bar{\beta} - \underline{\beta})$ is sufficiently small. Otherwise, either monitored or complete empowerment are selected according to the criteria discussed in part (i) of the corollary.

7. Concluding remarks

We considered an environment where the investment decision in quality involves two types of uncertainty. The first is uncertainty about consumers' willingness to pay more for higher-quality products; the second concerns the marginal contribution of different attributes of quality on consumers' perception of the overall quality of the product. The manager of the firm privately observes signals about these types of uncertainty. While the manager can communicate to the owner information about consumers' willingness to pay for quality, her assessment of consumers' relative evaluation of quality attributes is too qualitative to facilitate meaningful communication. We distinguished three management systems that differ in the extent of decision powers delegated to the manager, and the extent of monitoring of the manager's behavior. We compared the complete empowerment regime with the monitored and forcing (disempowerment) regimes along three dimensions: the extent of disutility of effort that is experienced by the manager; the magnitude of monitoring costs that are incurred by the owner; and the extent of agency costs that arise due to the asymmetry of information between the owner and the manager about consumers preferences.

We have identified two disadvantages of a forcing (disempowerment) regime. First, disempowerment implies that the owner must expend resources on monitoring the manager's choice to guarantee that mandated investment levels are executed. Second, the owner cannot adjust quality investment decisions in response to information about consumers' relative evaluation of different quality attributes since this information cannot be communicated effectively. This leads to a reduction in the perceived quality of the product since consumers' preferences are not likely to be fully considered. Nonetheless, forcing may arise as the desired management system in settings in which managers are more effective in executing decisions than in making them.

When empowerment reduces the disutility experienced by the manager, either monitored or complete empowerment arise as the preferred management system. While both empowerment regimes fail to attain first best levels of investment in quality, monitored empowerment tends to reduce agency costs to a greater extent than complete empowerment. The improvement offered by monitoring depends, however, on the precision of the communicable and non-communicable signals observed privately by the manager. A relatively more precise communicable signal yields greater benefits from monitoring. Hence, when the non-communicable signal is more precise, monitored empowerment is the preferred choice if the cost of monitoring is relatively small.

Although this paper has not addressed the implications of the selected management system on the behavior of participants in the labor market, some observations in this regard can be made. Since complete empowerment is the only organizational form that allows the manager to extract positive informational rents, a manager would prefer being employed by a firm utilizing such a management system. In equilibrium, managers will compete amongst each other for such positions by investing in additional training and education that the owners of such firms value. Such investment will equalize this manager's net payoff to that earned by her counterpart in firms utilizing monitored empowerment or forcing. Similarly, we have assumed that the parameters of the disutility functions c_E or c_{NE} are exogenously determined. It may be more reasonable to assume

that the owner who adopts a given organizational form will try to attract managers who have a natural preference for that management system (i.e., individuals characterized by a low c_E parameter will be attracted to more highly decentralized firms and those characterized by a low c_{NE} parameter will choose the more centralized structure instead).

Several important managerial implications emerge from this study. In selecting the management system, owners should look beyond coordination and control issues. The effect of delegating decision making on the manager's self efficacy has been shown here to matter in the determination of the desired management system. In some settings, managers are more productive when they have more authority. In other settings the reverse is true. If American managers derive inherent satisfaction from assuming added responsibility and being empowered to make managerial decisions, our study predicts that the benefit of delegating decision powers to managers is directly related to the difficulty of communicating information that pertains to the decisions at hand. Intensified empowerment is predicted when decisions must be based upon highly qualitative information. Our study also predicts that the extent of monitoring of an empowered manager is directly related to the variability in the environmental uncertainty that is communicable between the manager and owner and inversely related to the cost of monitoring.

Acknowledgements

We are grateful to the Social Sciences and Humanities Research Council of Canada (Grant No. 412-93-0005 to Amit) and the National Science Foundation (Grant No. SBR-9453839 to Gal-Or) for their generous research support. We are indebted to seminar participants at UBC, two anonymous referees and to the Editor for their helpful suggestions, and to Jennifer Wohl and Richard Arend for assistance.

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