

Corporate Governance and the Division of Rents among Shareholders, Managers and Employees

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Abstract

This paper investigates the relationship between corporate governance, managerial behavior and wages. To do so, it develops a model in which control is delegated to the manager by owners, who exercise their control rights only if their return falls below a threshold value determined by the firm's governance structure. The model shows that improving owners' ability to exercise their control rights will generally lead to lower managerial and nonmanagerial compensation. It may, however, also lead the manager to make inefficient choices. Increasing the manager's ownership stake will generally have opposite effects, leading to more efficient choices and greater wages. When the manager is the controlling owner, so that there is no separation between ownership and control, wages will be maximal.

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1 Introduction

In recent years, the subject of CEO pay has received much attention, both by economists and by the media at large. According to some commentators and researchers, especially in the U.S., CEO's may have been enjoying excessive levels of compensation at the expense of the shareholders whose interests they are supposed to serve. The absence of effective control by owners or boards of directors over managers' compensation has been singled out as the main culprit for this state of affairs. As Lindy L. Paull, chief of the Joint Committee on Taxation of the U.S. Congress, put it in reference to one of the largest corporate scandals in recent times: "Enron's very top executives essentially wrote their own compensation." (*New York Times*, February 14, 2003).

A parallel, yet less conspicuous, debate has focused on the effects of corporate governance on nonexecutive compensation. Following the active market for corporate control in the U.S. during the 1980s, several researchers have analyzed the consequences of takeovers on the employment and wages of target firms, trying to assess whether corporate control transfers lead to less generous employment policies. The idea behind these studies is that incumbent managers may not minimize wage costs, be it because they care about their workers or because they have to incur the full cost of bargaining for lower wages, while receiving only part of the resulting benefits. Takeovers—especially hostile ones—may thus lead to reductions in employment or wages if the new management optimally minimizes wage costs.

Underlying these debates is the idea that managers enjoy significant discretion in the determination of both their own compensation and that of nonmanagerial employees. In the current paper, we develop a model in which managers enjoy this sort of discretion to a degree determined by the firm's governance structure. We use this model to study how corporate governance changes will affect managerial incentives and managerial and nonmanagerial compensation.

Our modeling strategy departs from the more standard optimal contracting approach, which regards managerial compensation as determined by a contract designed by the firm's owners or its board of directors to provide the manager with adequate incentives. This approach has been recently questioned by several authors that, alluding to anecdotal and econometric evidence, have suggested that CEO compensation may be better described as the result of CEOs' efforts to extract rents than as the outcome of optimal compensation

contracts.¹ Without denying the usefulness of the optimal contracting approach, we consider that this evidence demands a better understanding of managerial behavior when managers have a significant degree of discretion to set their own pay.

Managerial discretion is, however, not only relevant for the compensation of executives, but also for the compensation of nonmanagerial employees. Although the evidence in this area is scarce, in a recent paper, Bertrand and Mullainathan (1999) show that wages tend to increase after the passage of anti-takeover laws, suggesting that a greater degree of managerial discretion is associated with higher wages. Their findings fit well with public perceptions and some previous econometric evidence suggesting that, when unchecked, managers seem to pay higher wages. The standard explanation for why this may be the case is that managers actually have a preference for paying higher wages. This preference may be caused by a simple care for workers with whom they interact often, or, in a less altruistic vein, by the cost of negotiating low wages in a bargaining context, or by the cost of monitoring workers in an efficiency-wage framework.² These costs are fully borne by the manager, while the benefits of cost-cutting are, at least, shared with shareholders. It is important to note that the latter type of explanation implies that, as the manager's ownership share increases, nonmanagerial wages should decrease as the manager gets to bear a higher part of the wage costs.

The purpose of the current paper is twofold. On the one hand, it aims at providing parsimonious model of managerial behavior when the manager enjoys substantial discretion in making both operational and compensation decisions. On the other hand, it intends to analyze how corporate governance changes affect managers' behavior and the compensation paid both to managers and nonmanagerial employees. Because corporate governance defines the constraints faced by managers in the exercise of their discretion, the two goals are closely intertwined.

In the model developed in this paper, actual control over the operation of the firm, including control over her own compensation,³ resides in the hands of the manager unless shareholders decide to exercise the control rights they legally possess.⁴ Shareholders, much as debtholders do, exercise those control rights only if the return they obtain is below a certain

¹A recent paper by Bebchuk, Fried, and Walker (2002), reviewed in the next section, gives a comprehensive account of the evidence supporting this view.

²See, for example Holmstrom (1988) and Williamson (1988). Pagano and Volpin (2002) develops the efficiency-wage explanation.

³Throughout the paper, we will use the pronoun *she* to refer to the manager.

⁴Using the terms proposed by Aghion and Tirole (1997), owners have formal authority while managers (may) enjoy real authority.

threshold. Unlike in the case of debtholders, however, this threshold is not determined by contract, but by the expected benefits and costs of effectively exercising control. The benefits of full control are the expected returns when owners either run the firm themselves or design and enforce an optimal contract for a manager. The costs include the costs of evaluating the returns offered by the manager; convincing other owners of the need to intervene; taking the actions required to take control from the hands of the incumbent management; designing and writing an optimal contract; enforcing the contract; and ensuring that the contract is not changed by the new management once it achieves a certain degree of discretion.

These control costs will depend on the firm's governance structure. For example, one may expect that the existence of a large shareholder would reduce control costs, while a very dispersed ownership would make them higher. Similarly, the manager's ownership share is likely to affect the other owners' ability to replace or discipline her. The composition and size of the board of directors, the presence of anti-takeover amendments in the firm's charter, or the degree of legal protection of minority shareholders protection are also likely to affect the costs to shareholders of exercising control.

Nonmanagerial wages in our model are negotiated by the manager and nonmanagerial employees, who bargain over quasi-rents associated with employees' firm-specific skills. Corporate governance influences the bargaining outcome by determining the return that the manager has to pay owners to avoid losing control, and, thus, the part of the surplus over which the manager and employees can bargain. Therefore, in our model, corporate governance is understood, in the spirit of Zingales (1998) and Rajan and Zingales (2000), as a constraint shaping the ex post bargaining over the quasi-rents generated by the firm.

The model shows that improving owners' ability to exercise their control rights (that is, reducing control costs) leads to lower managerial and nonmanagerial compensation. This result is not due to some sort of managerial preference for high nonmanagerial wages: the manager in our model only accepts to give up some quasi-rents to workers to ensure that they contribute their specific skills. Rather, the result is a consequence of the smaller part of surplus available for sharing when control costs are low, and, thus, when the return required by owners is high.

Increasing the manager's ownership share, however, leads to higher nonmanagerial wages. Two reasons lie behind this departure from usual predictions. The first is that, in our model, the manager is effectively the residual claimant and, therefore, always wants to minimize wage payments. The second is that increasing the manager's ownership shares increases the share

of the surplus that she can appropriate, and, consequently, increases the negotiated wage as well. In fact, nonmanagerial wages will be highest when the manager's control is not contestable.

The above results describe how corporate governance changes affect the outcome of the wage bargain between the manager and employees. Corporate governance changes, however, are likely to affect the manager's incentives to take different actions as well. Therefore, in the model, we analyze the relationship between owners' ability to exercise control and managerial incentives. Understanding this relationship is also important to evaluate the net effects of corporate governance changes on wages: if an increase in control costs allows workers to obtain a higher share of surplus, yet induces the manager to take an action that leads to a smaller surplus, the net effect on wages may not necessarily be positive.

In our model, the manager's compensation is not determined by a contract designed by owners, but, rather, implicitly determined as the residual income left after paying workers and shareholders. Therefore, corporate governance changes will affect incentives through their impact on those residual earnings. Somewhat surprisingly, we show that an improvement in owners' ability to exercise their control rights may reduce the manager's compensation more for efficient than for inefficient actions and, therefore, may lead to inefficient outcomes. The negative effect on wages of improvements in owners' ability to exercise control is shown to be quite robust, and may even be amplified by the effect that those improvements have over managerial incentives.

The paper is organized as follows. After reviewing some related work in section 2, the model is presented in section 3. Section 4 explains how corporate governance arrangements translate into constraints on the amount of surplus that can be appropriated by the manager, and section 5 analyzes the relationship between corporate governance and bargaining outcomes. The effect of corporate governance on managerial incentives is, in turn, studied in section 6. Finally, section 7 discusses some caveats and potential extensions of the model, and section 8 concludes.

2 Related Work

Bebchuk, Fried, and Walker (2002) give a comprehensive account of the evidence supporting the view, which the authors label the "managerial power" view, that managers enjoy a significant degree of discretion, even in the determination of their own compensation. Among the

evidence reviewed by these authors, it is worth highlighting several studies that relate different measures of executive power or discretion with executive compensation. For example, Borokhovich, Brunarski, and Parrino (1997) find that anti-takeover amendments are associated with higher CEO pay and a greater likelihood of enjoyment of “golden parachutes”; Core, Holthausen, and Larcker (1999) and others provide evidence showing that less independent or effective boards are associated with more generous compensation packages for CEOs; and, in a series of papers,⁵ M. Bertrand and S. Mullainathan show, among other things, that the passage of anti-takeover laws tends to increase CEO compensation, and that CEOs seem to be rewarded for mere luck, both effects being stronger in firms lacking large shareholders. In the light of their findings, the latter authors have also put forth what they term the “skimming view” of managerial compensation, according to which managers to a large extent set their own pay to skim what they can from shareholders. This view has been recently advocated by Hellwig (2000) as well, who provides examples of the ability of executives to immunize themselves against any interference from outsiders.

The empirical literature on the relationship between corporate governance, wages, and employment is more limited. Apart from the paper by Bertrand and Mullainathan (1999) cited above, some work on the effects of ownership changes (Brown and Medoff (1988), Lichtenberg and Siegel (1989), Rosett (1990), Gokhale, Groshen, and Neumark (1995), Becker (1995)) provides evidence that takeovers affect wage and employment outcomes, although this evidence is not conclusive. Using a different approach, Krueger (1991) studies the consequences of different governance structures by comparing franchises and company-owned stores in the fast-food industry and reports that company-owned stores (where the manager is not the residual claimant) pay more and have steeper wage-age profiles than franchises.

There is even less theoretical work on the relationship between corporate governance and labor market outcomes. In an influential paper, Schleifer and Summers (1988) argued that takeovers could allow shareholders to renege on implicit contracts and increase ex post profits by substituting new managers with no commitment to workers or other stakeholders for trustworthy incumbents. The debate sparked by this paper, however, has not led to much theoretical work, with the exception of a recent paper by Pagano and Volpin (2002). These authors argue that it may be in the interest of incumbent managers to use generous long-term contracts to protect themselves against hostile takeovers. These contracts are incentive

⁵Bertrand and Mullainathan (2000a), Bertrand and Mullainathan (2000b), and Bertrand and Mullainathan (2001).

compatible since incumbent managers, with a small ownership stake, will prefer to motivate workers by paying them high efficiency wages than by monitoring them directly, since most of the cost of higher wages is borne by shareholders, while the cost of monitoring workers is fully borne by managers themselves.⁶

3 The model

Consider a firm formed by a group of nonmanagerial employees who have firm-specific skills and no ownership stake in the firm and a manager who owns a proportion $\lambda \in [0, 1]$ of the firm's shares. An owner or set of owners possesses the remaining $(1 - \lambda)$ proportion of shares.

For simplicity, we will study the firm for only one period, but it is assumed that it can continue its operation after the period under study. At the beginning of the period, the manager chooses an action a , which can be interpreted as managerial effort, a non-verifiable choice of managerial perks, or a project choice. We will assume that there are only two possible actions, b and g . Action b generates a private payoff P for the manager. Therefore, it can be interpreted as implying a lower effort level, an excessive consumption of perks, an outright appropriation of company funds, or as the choice of a project that yields the manager some private benefit (for example a project that favors a supplier firm owned by a relative).

The action taken by the manager determines the probability of success for the firm. If the firm is successful (state H is realized), revenues are high, while if it is unsuccessful (state L is realized), revenues are low. If the manager chooses action g , the probability of state H is $\gamma > \frac{1}{2}$ and the probability of state L is $1 - \gamma < \frac{1}{2}$, where $\pi > \frac{1}{2}$.

$Pr(H g) = \gamma > \frac{1}{2}$	$Pr(L g) = 1 - \gamma < \frac{1}{2}$
$Pr(H b) = 1 - \pi < \frac{1}{2}$	$Pr(L b) = \pi > \frac{1}{2}$

Therefore, action b yields the manager a private payoff but reduces the probability of success for the firm.

The revenues generated by the firm depend on which state of nature is realized and also on whether current employees contribute their firm-specific skills. Let R_i be the revenues generated in state i if the firm retains its skilled employees and \bar{R}_i if it hires alternative workers with no firm-specific skills. Therefore, $Q_i \equiv R_i - \bar{R}_i$ represents the quasi-rents

⁶A similar argument is put forth by Krueger (1991).

associated with skilled employees in state i . In accordance with our description of state H as the successful state, it is assumed that $R_H > R_L$ and $\bar{R}_H > \bar{R}_L$.

After the state of nature is realized, employees and the manager bargain over the revenues generated. If they agree on a wage bill w , employees stay at the firm and revenues R are generated. If no agreement is reached, the manager hires alternative workers at a competitively determined rate \bar{w} and revenues are \bar{R} .

Finally, the manager decides how much to pay out to owners (r), and keeps the remaining revenue. If owners are satisfied with the return paid to them by the manager, they do not intervene. However, if they consider that the return is too low, they intervene in a way that is made more precise below.

The time-line of the model is thus:

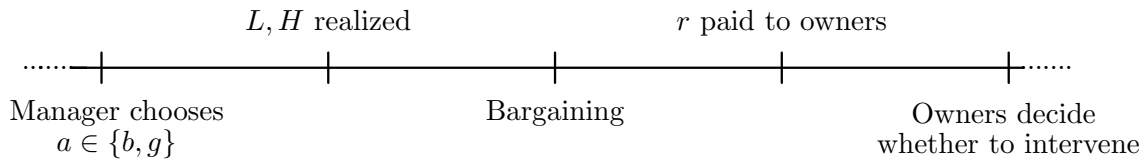


Figure 1: Time-line.

To solve the model, we proceed backwards. First, we analyze the determination of the return paid out to shareholders. We then analyze the bargaining process between manager and employees, and, finally, the manager's action choice.

4 Corporate Governance and Constraints on Managerial Action

Instead of assuming that owners (the principals) design the manager's contract and monitor that the terms of this contract are respected, in our model the manager exercises authority over all decisions, including setting her own compensation, unless challenged by shareholders. That is, although owners have the right to set the manager's contract (formal authority), they may or may not exercise that right. If they do not do so, real authority over the manager's contract resides in the hands of the manager herself.

This modeling strategy tries to account for the view that the checks imposed by owners or boards of directors on managers are not as stringent as commonly assumed, so that, to a large extent, managers set their own compensation. Those checks, however, do exist:

managers cannot get away with fully expropriating owners. If shareholders earn a return that they consider too low, they will intervene to discipline the manager. In our model, this intervention will take the form of a) selecting an optimal manager (who may be the current one) and the optimal compensation contract for that manager, b) writing that contract, and c) enforcing it. In other words, if owners do not get a minimum return, they act as the “full-fledged” principals of standard principal-agent models of managerial behavior.

Obviously, the return that owners would obtain if they acted as full-fledged principals cannot be lower than the return that the manager would be willing to grant them if unchecked. The reason why owners do not behave like principals to begin with is that it is costly to do so: owners first need to assess what the optimal contract would be and how much they would obtain if they implemented that contract, then they have to take the actions that would lead to the implementation of that contract (such as convincing other owners of the need to replace or discipline the manager – for example by appointing a compensation committee that would follow owners’ directions), and finally they have to ensure that the terms of the contract are met. These activities require: a) acquiring a large amount of information, b) being able to process it, and c) spending time and effort obtaining the agreement of other owners, writing the contract and enforcing it. Therefore, owners will only intervene if the return that the manager grants them lies below the one they would obtain as principals, *net of all these costs*, which we will label control costs.

The magnitude of the control costs will depend on the number of owners, their characteristics, and the distribution of ownership shares. For example, costs will be low when there is a single owner with a good knowledge of the business, and high when ownership is dispersed. Similarly, the degree of legal protection of shareholders is likely to affect the costs of control, as, say, a truly independent and knowledgeable board could carry out some of the principal’s tasks at a low cost.

Several recent papers have analyzed the relationship between ownership structure or the extent of legal protection of minority shareholders and owners’ monitoring ability, and the consequences of this relationship on the determination of the optimal ownership structure. In the current paper we will not model how control costs, and thus the minimum return required by owners, are determined.

Let \hat{r} be the expected net present value of the income that shareholders would obtain if they intervened and acted as principals, and let c be the costs of acting as such, that is,

the control costs.⁷ Although we are analyzing a single period, \hat{r} includes both the returns owners could obtain in the current period and the expected returns of future periods. As argued above, the model is to be understood as a one-period cut of a repeated interaction.

The cost of acting as principals may depend on the manager's ownership stake λ . For a fixed number of owners and distribution of shares among nonmanagerial owners, it is reasonable to think that, as λ increases, c should increase as well, as the stakes of nonmanagerial owners are reduced (reducing their incentive to act if doing so involves any fixed cost) and the stake of a shareholder opposed to disciplining the manager (the manager herself) increases. For our purposes, we will assume that the manager's control over her own compensation is not contestable if $\lambda \geq \frac{1}{2}$, so that, in such case, $c \geq \hat{r}$. If, however, $\lambda < \frac{1}{2}$, control is contestable and $c < \hat{r}$.

Therefore, if $\lambda \geq \frac{1}{2}$, the manager can fully expropriate other owners and will set $r(\lambda) = 0$. If $\lambda < \frac{1}{2}$, then the manager will pay out to shareholders (including herself) $r(\lambda) = \hat{r} - c(\lambda)$ if she wants to keep the right to set her own compensation. Following the discussion above, $r(\lambda)$ will be nonincreasing in λ . For simplicity, we will just assume that $r(\lambda) = r$ for $\lambda < \frac{1}{2}$. As will become apparent, making r strictly decreasing in λ would only reinforce the results.

The state of nature at the end of the period, $i \in \{L, H\}$, may affect the revenues that could be obtained if owners intervene. Similarly, whether an agreement with workers has been reached in the current period can also have permanent effects on revenues. Therefore, the amount that the manager has to pay owners to keep them from intervening may depend on the state of nature and on whether an agreement with workers has been reached. Let r_i be the required return if state i has been realized and an agreement has been reached with workers, and \bar{r}_i if no agreement has been reached. Not having reached an agreement will certainly not increase owners' return if they decide to intervene, so that $r_i \geq \bar{r}_i$. We will simply assume that $r_i = \bar{r}_i$, an assumption that can be relaxed without altering the results. We will also assume that the return required by owners is greater in the good state of nature, that is, $r_H \geq r_L$.

⁷Disciplining the manager is a public good, and, therefore, owners have incentives to free-ride on other owners' efforts. We will not analyze how this free-riding problem is solved, and, therefore, will treat \hat{r} and c as parameters.

5 Wage Bargaining

The presence of quasi-rents (which could also be derived from the existence of hiring or firing costs) implies that wages will be bargained between employees and the manager. To formalize this bargaining process, we resort to the usual generalized Nash-bargaining problem.

When bargaining, employees and the manager know the state of the world ($i \in \{L, H\}$), and they also foresee that the manager will have to pay r_i or \bar{r}_i to shareholders, depending on whether they reach an agreement. Since the state of the world will be given throughout this section, we will drop all subscripts referring to it.

If bargaining proceeds without agreement, workers strike (or are locked out) so that no production takes place. While on strike, workers can earn a competitively determined wage rate \bar{w} by temporarily working elsewhere or from strike funds.

If negotiations finally break down, workers work elsewhere and earn the competitive rate \bar{w} paid to workers with no firm-specific skills, and the manager operates the firm with alternative unskilled workers. Since the manager can decide to terminate negotiations and operate the firm with alternative workers, her negotiated payoff can never be less than what she could earn if she exercised this outside option. The generalized Nash-bargaining problem thus takes the following form, with $\beta \leq 1$ representing workers' bargaining power:⁸

$$\begin{aligned} & \max_w (w - \bar{w})^\beta (R - w - r + \lambda r)^{(1-\beta)} \\ & s.t. \\ & R - w - r + \lambda r \geq \bar{R} - \bar{w} - r + \lambda r, \end{aligned} \tag{MO}$$

with the manager's outside option as a constraint on the negotiated outcome.⁹

An interior solution of the above problem has the well-known form:

$$w = \beta(R - \bar{w} - r(1 - \lambda)) + \bar{w}, \tag{1}$$

and, if we let m stand for the manager's total compensation, including the earnings stemming

⁸This formulation implies that private benefits are consumed prior to the bargaining process or that, equivalently, its consumption does not depend on whether an agreement is reached. Therefore, the presence of these benefits does not affect the bargaining outcome.

⁹When *inside* (the payoffs if bargaining continued forever without agreement) and *outside* options do not coincide, noncooperative approaches to bargaining theory support using the *inside* options as the disagreement payoffs of the Nash-bargaining problem, with outside options acting as constraints on the negotiated outcome. The idea is that outside options are credible threats only if they exceed the payoff that could be obtained in their absence. See Muthoo (1999) for a review of the relationship between the Nash-bargaining solution and noncooperative bargaining outcomes.

from her ownership stake λ :

$$m = (1 - \beta)(R - \bar{w} - r(1 - \lambda)) \quad (2)$$

If the manager's outside option is binding at the unrestricted solution, then the manager earns her outside option and employees obtain the revenues that remain after paying out owners. The manager's outside option will be binding at the unrestricted interior solution only if:

$$(1 - \beta)(R - \bar{w} - r(1 - \lambda)) < \bar{R} - \bar{w} - r(1 - \lambda), \quad (3)$$

that is, if:

$$c > \hat{r} - \left(\frac{1}{1 - \lambda} \right) \left(R - \bar{w} - \frac{Q}{\beta} \right) \equiv c^* \quad (4)$$

Therefore, we can express the wage bill as a function of c and λ as follows:

$$w(c, \lambda) = \begin{cases} \bar{w} + \beta(R - \bar{w} - (1 - \lambda)\hat{r}) + \beta(1 - \lambda)c, & \text{for } c \leq c^* \\ \bar{w} + Q, & \text{for } c > c^*, \end{cases} \quad (5)$$

where the last expression follows from the fact that, for $c > c^*$, the manager earns her outside option $R - Q - \bar{w} - (\hat{r} - c)(1 - \lambda)$. Total managerial compensation is, in turn, given by:

$$m(c, \lambda) = \begin{cases} (1 - \beta)(R - \bar{w} - (1 - \lambda)\hat{r}) + (1 - \beta)(1 - \lambda)c, & \text{for } c \leq c^* \\ R - Q - \bar{w} - (1 - \lambda)\hat{r} + (1 - \lambda)c, & \text{for } c > c^* \end{cases} \quad (6)$$

Inspection of $w(c, \lambda)$ and $m(c, \lambda)$ thus shows that both m and w are nondecreasing in c . Put differently, wages and managerial compensation are nonincreasing in the ability of owners to exercise control. Note that if $\lambda > 0$, m includes earnings stemming from the manager's stock ownership. If we let w_m represent the manager's non-stock compensation, then:

$$w_m(c, \lambda) = \begin{cases} (1 - \beta)(R - \bar{w} - \hat{r}) + (1 - \beta)c - \lambda(\hat{r} - c), & \text{for } c \leq c^* \\ R - Q - \bar{w} - (\hat{r} - c), & \text{for } c > c^* \end{cases} \quad (7)$$

Therefore, the manager's non-stock compensation is also increasing in c . The following proposition summarizes these results, which are also depicted in figures 2 and 3 for $\lambda = 0$. Note that, as these figures show, the relationship between c , w , and m is nonlinear if the outside option can become binding. Nonmanagerial wages thus can be concave in c , and total managerial compensation can be convex in c .

Proposition 1 *For a given realization of uncertainty:*

1. w is nondecreasing in c
2. m, w_m are increasing in c
3. $w + w_m$ is increasing in c

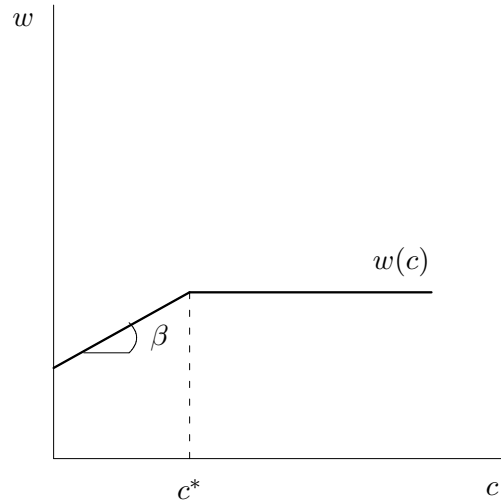


Figure 2: Negotiated wage.

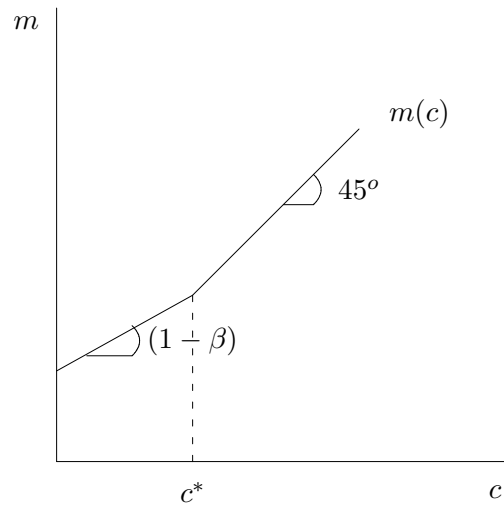


Figure 3: Managerial compensation.

Proposition 1 thus shows that the degree of managerial discretion may affect nonmanagerial wages not because managers have a preference for paying high wages to their employees

or because they do not bargain hard enough, but because owners' ability to exercise control over the manager determines the surplus to be divided between employees and the manager, and therefore the outcome of the bargaining process between them. For example, a reduction in c (an improvement in owners' ability to exercise control) increases the return that has to be paid to owners, and therefore leaves a smaller amount to be shared between the manager and employees. This reduction in surplus forces wages and managerial compensation down. Therefore, improvements in owners' ability to control the manager result not only in lower managerial compensation, as one would probably expect, but also in lower nonmanagerial compensation.

The result is consistent with recent evidence put forth by Bertrand and Mullainathan (1999). These authors use the passage of anti-takeover legislation in several U.S. states as a source of independent variation in the extent of managerial discretion and find that greater managerial discretion leads to higher wages.

What happens as the manager's ownership stake increases? The effect of an increase in λ for $\lambda < \frac{1}{2}$ is twofold. On the one hand, it increases the surplus to be divided between the manager and employees. On the other hand, it increases directly the manager's stock compensation. Therefore, both wages and total managerial compensation increase as λ increases. The manager's non-stock compensation, however, may fall as λ increases. To see why, consider what happens as λ goes up by $d\lambda$. The higher λ would increase the surplus to be divided between the manager and workers by $rd\lambda$. If w_m does not change, the manager's total compensation will go up exactly by $rd\lambda$, so that the manager appropriates the whole increase in surplus. If the manager shares part of the increase in surplus with workers, however, her total compensation will go up by less than the increase in surplus ($rd\lambda$), which can only happen if her non-stock compensation w_m falls. That is, increases in the manager's ownership stock, despite raising her total compensation, reduce her cash compensation. Total non-stock compensation, on the other hand, does not depend on the manager's ownership stake. Proposition 2 summarizes these results:

Proposition 2 *If the manager owns a noncontrolling stake $\lambda < \frac{1}{2}$, then, for a given realization of uncertainty:*

1. w is nondecreasing in λ
2. m is increasing in λ

3. w_m is nonincreasing in λ

4. $w + w_m$ is independent of λ

Proposition 2 runs counter intuitive arguments about the relationship between wages and managerial ownership. It is commonly argued that high wages may be the reflection of an agency problem: if the manager does not have a large enough stake in the firm, she may not trim wage costs as much as possible if doing so is costly. Increasing the manager's ownership stake, according to this view, would reduce wages, as the manager's return from decreasing wages increases. Proposition 2 looks at the problem from a different angle. If the manager holds real control over her own compensation, then she will have all the interest in keeping wages as low as possible independently of her ownership stake. This ownership stake, however, determines her ability to keep wages low. Increasing the manager's ownership increases the proportion of total revenues that can be shared between employees and the manager, and workers will benefit from this increase. For any given wage, the manager's total compensation would increase as λ increases, leading workers to demand higher wages as well.

This effect is greatest when the manager is the controlling owner. The agency view outlined in the previous paragraph would predict that, in this case, wages should be lowest, since the manager's incentives to reduce costs are maximal. If $\lambda > \frac{1}{2}$, however, $r = 0$. Now, other owners cannot reclaim any part of the revenues generated by the firm, so that all revenues are for grabs for manager and employees. This ownership structure yields the manager a maximum payoff, but it also allows employees to achieve the maximum wage possible.¹⁰

Corollary 1 *For a given realization of uncertainty, when the manager owns a controlling stake, wages and total managerial compensation are higher than when control is contestable.*

A caveat is in order here. Corollary 1 follows from the assumption that noncontrolling owners cannot require any payment from the controlling owner. This would make an ownership structure in which the manager is the controlling owner and there is significant ownership by noncontrolling owners highly unlikely, as no one would willingly contribute money expecting a zero return. If we observe this type of ownership structure, thus, we may

¹⁰The manager could choose to give shareholders a positive return if the value of an extra dollar diverted is less than a dollar, as in, for example, Pagano and Röell (1998).

expect that noncontrolling owners have some sort of implicit self-enforceable contract with the manager that gives the latter the incentives to pay a positive return. For example, owners could be suppliers (including employees) or costumers with whom the firm wants to maintain an ongoing relationship, or they could be banks or other firms or individuals from whom the manager expects to obtain future financing. Alternatively, these owners could be relatives of the manager or other individuals whose welfare matters for the manager. Several owners when one has uncontestable control can only be possible if either the controlling owner cares about them directly, or there exists a value to the owner of maintaining that relationship. Therefore, in those firms where we observe this ownership structure, it will be the case that $r > 0$, and, in principle we cannot tell the a priori whether this r will be smaller or greater than the r required by owners in firms where the manager is not the controlling owner.

It is interesting to note that the effect of changes in c is muted as λ increases, and *vice versa*:

Corollary 2 *The magnitude of the effect on w , m , or w_m caused by changes in c (λ) decreases as λ (c) increases.*

As λ increases, changes in c reduce the surplus to be divided between employees and the manager by a smaller amount, since a greater share of the extra money paid to shareholders ultimately reverts to the manager. Therefore the compensation effects of changes in c are weaker when λ is large. The same argument explains why the effects of changes in λ are weaker as c increases (reducing r).

6 Corporate Governance and Managerial Incentives

The previous section has the implication that if the degree of managerial discretion when setting their own compensation did not affect managers' choices, workers would be better off the greater that discretion, since the surplus over which they bargain increases as the control exercised by owners weakens. Standard agency arguments, however, suggest that a weaker control by owners may result in suboptimal managerial choices.

In this section, we thus analyze the manager's action choice, given that she anticipates the results derived in the previous two sections. As described in section 3, the manager can take two actions, b and g . Action b yields a private benefit P to the manager but leads to a lower probability (π) that the firm is successful (that is, that state H is realized). Action g has no private benefit for the manager, but leads to state H with greater probability (γ).

We will assume that action g is the first best optimal action, that is, that

$$\gamma R_H + (1 - \gamma)R_L > \pi R_L + (1 - \pi)R_H + P,$$

or

$$R_H > R_L + P \left(\frac{1}{\pi + \gamma - 1} \right) \quad (\text{A. 1})$$

Given that the manager earns private benefits P if she takes the inefficient action b , to induce the manager to take action g , her expected compensation if she takes the latter action needs to be sufficiently larger than if she takes the former. That is, the following incentive compatibility constraint must obtain:

$$\begin{aligned} \gamma m_H(c, \lambda) + (1 - \gamma)m_L(c, \lambda) &\geq \\ \pi m_L(c, \lambda) + (1 - \pi)m_H(c, \lambda) + P, & \end{aligned}$$

or

$$m_H(c, \lambda) - m_L(c, \lambda) \geq \frac{P}{\gamma + \pi - 1} \quad (\text{IC})$$

Therefore, whether the manager makes an efficient decision will depend on P , γ , and π as in any standard moral hazard problem, but also on c and λ , as the latter variables determine the manager's compensation, and thus may affect $(m_H - m_L)$. We will first look at the effect of changes in c on the manager's decision, and then turn to the effect of changes in λ . In order to do so, however, we need to add a bit more structure to the model. To do so, we make the following assumptions:

$$R_H - \hat{r}_H \geq R_L - \hat{r}_L \geq 0 \quad (\text{A. 2})$$

$$\bar{R}_H - \hat{r}_H \geq \bar{R}_L - \hat{r}_L \geq 0 \quad (\text{A. 3})$$

Assumptions (A. 2)-(A. 3) just state that, in case shareholders designed the contract, the amount they would leave for the manager and employees would be greater in the good state of nature. The assumption seems reasonable enough, especially if owners need to provide incentives to the manager in case they acted as principals.

The following proposition shows that, if these assumptions hold, improvements in shareholders' ability to control not only may not induce the manager to make efficient decisions, but, quite to the contrary, may lead to inefficient outcomes.

Proposition 3 *Let*

$$\bar{\beta} \equiv \frac{Q_H - Q_L}{(R_H - R_L) - (1 - \lambda)(r_H - r_L)} \quad (8)$$

Then:

- *If $\beta > \bar{\beta}$, reductions in c cannot make the manager switch from action b to g .*

- *If*

$$\frac{Q_H}{Q_L} \leq \frac{R_H - r_H(1 - \lambda) - \bar{w}}{R_L - r_L(1 - \lambda) - \bar{w}}, \quad (9)$$

reductions in c cannot make the manager switch from action b to g for any $\beta \in (0, 1)$.

- *If*

$$\frac{Q_H}{Q_L} \leq \frac{R_H - r_H(1 - \lambda) - \bar{w}}{R_L - r_L(1 - \lambda) - \bar{w}} \quad (10)$$

and $\beta > \bar{\beta}$, reductions in c can make the manager switch from action g to b .

Therefore, it follows that the common idea that improvements in owners' ability to exercise control will lead the manager to take more efficient actions holds only for some parameter values. If workers have a relatively large bargaining power ($\beta > \bar{\beta}$), or if the quasi-rents associated with their firm-specific skills do not change greatly with the state of nature, then improvements in owners' ability to exercise control over the manager will not induce better choices and can actually lead to inefficient ones.

The intuition for this result is easy to grasp by looking back at the function $w(c, \lambda)$ derived in the previous section, and reproduced below:

$$m_i(c, \lambda) = \begin{cases} (1 - \beta)(R_i - \bar{w} - (1 - \lambda)\hat{r}_i) + (1 - \beta)(1 - \lambda)c, & \text{for } c \leq c_i^* \\ R_i - Q_i - \bar{w} - (1 - \lambda)\hat{r}_i + (1 - \lambda)c, & \text{for } c > c_i^* \end{cases}$$

If the bargaining outcome is interior in both states of nature, or if in both states of nature, the manager is at her outside option, then the effect of an increase in c , dc , will be the same in both states ($(1 - \beta)(1 - \lambda)dc$ in the former case and $(1 - \lambda)dc$ in the latter). Therefore, the difference $(m_H - m_L)$ will remain unchanged. In this case, changes in c do not affect incentives: if it was optimal for the manager to choose a certain action before the change, that action remains optimal after the change. If the manager is earning her outside option in only one of the states, however, increasing c will increase her earnings more in that

state, as she gets to capture the whole increase in rents. Therefore, if there is an effect on managerial incentives, its sign will depend on whether the manager is pushed to her outside option first in one state or in the other. In turn, this is determined by the loss incurred by hiring workers with no firm-specific skills and by the share of surplus that goes to workers. The greater this share, the more attractive the outside option in state H becomes relative to that of state L , as surplus (and thus the total amount given up to workers) is larger in state H . On the other hand, the greater the quasi-rents associated with skilled workers, the less likely it is that the outside option is reached. The expression for the threshold value of c summarizes this argument:

$$c_i^* \equiv \hat{r}_i - \left(\frac{1}{1-\lambda} \right) \left(R_i - \bar{w} - \frac{Q_i}{\beta} \right)$$

If $Q_H = Q_L$, for example, the return associated with workers' specific skills does not depend on the state of nature, and, therefore the outside option in state H will become binding first (if either binds). In this case, increases in owners' ability to control the manager (reductions in c) can never lead the manager to switch from an inefficient to an efficient choice, yet can lead her to go the opposite way.

What happens as the manager's ownership stake λ increases? Our prior would be to expect that such an increase, by making the manager internalize a greater part of the effect of her choices on owners' returns, will lead to more efficient choices. Indeed, inspection of $m(c, \lambda)$ shows that if the outside option is not binding in either state, increases in λ will translate into increases in $(m_H - m_L)$, since $r_H \geq r_L$, and thus may lead to an efficient action choice. The same will happen if the outside option is binding in both states. If the outside option is binding in only one state, however, the increase in m brought about by the increase in λ will be greater in that state, since it is not shared with workers. As in the case of changes in c , the effect of a change in λ will depend on whether the outside option is more likely to become binding in one state or the other.

Proposition 4 *If*

$$\frac{Q_H}{Q_L} \leq \frac{R_H - r_H(1-\lambda) - \bar{w}}{R_L - r_L(1-\lambda) - \bar{w}}, \quad (11)$$

then $(m_H - m_L)$ is locally increasing in λ .

For

$$\frac{Q_H}{Q_L} \geq \frac{R_H - r_H(1-\lambda) - \bar{w}}{R_L - r_L(1-\lambda) - \bar{w}} \quad (12)$$

i. If:

$$\beta < \frac{Q_H - Q_L}{(R_H - R_L) - (r_H - r_L)}, \quad (13)$$

then there are parameter values for which $(m_H - m_L)$ is not monotonically increasing in λ .

ii. If:

$$\beta < \frac{Q_H - Q_L}{(R_H - R_L)}, \quad (14)$$

then there are parameter values for which $(m_H - m_L)$ is decreasing in λ .

Therefore, under the conditions that imply that increases in c (a weakening in owners' ability to exercise control) can induce efficiency, we obtain the more intuitive result that increasing the manager's ownership stake will increase her incentives to make efficient choices. The reason is that increases in c and in λ have similar effects: both increase the surplus over which workers and the manager bargain.

Perhaps not surprisingly given this argument, there might be scenarios in which, at least for some values of λ , increasing the manager's ownership stake may actually lead to inefficient choices. Interestingly, these scenarios are precisely those for which there is a negative relationship between managerial incentives and c . Therefore, there seems to be no easy way to reconcile the two standard arguments about the relationship between incentives and owners' control, on the one hand, and between incentives and managerial ownership, on the other: If increasing owners' control induces more efficient choices, then increasing the manager's ownership stake may lead to inefficient choices.

The effect of increased control can even lead, rather counter-intuitively, to lower returns for owners. To see this, let us assume that, at least for some c , action g is implementable. That is, $m_H - m_L > \frac{P}{\gamma + \pi - 1}$. For this c , owners' expected outcome is $\gamma r_H + (1 - \gamma)r_L$. Let \tilde{c} be such that $m_H(\tilde{c}) - m_L(\tilde{c}) = \frac{P}{\gamma + \pi - 1}$. If we are at this point, reducing c by $\epsilon > 0$ may lead the manager to choose action b , so that payoffs would go from $\gamma(\hat{r}_H - \tilde{c}) + (1 - \gamma)(\hat{r}_L - \tilde{c})$ to $\pi(\hat{r}_L - \tilde{c}) + (1 - \pi)(\hat{r}_H - \tilde{c}) + \epsilon$. Therefore, for ϵ small enough, profits are lower after the reduction in c .

Corollary 3 *Owners' expected returns are not always increasing in their control ability.*

One way to interpret these results is that in the model the manager effectively “rents” the firm (or the firm’s assets) in exchange for a “rental price” r that depends on the costs to owners of exercising control. If the manager did not have to bargain with any suppliers (as in the case in which the value of all inputs used is the same in the firm as elsewhere) and the rental price were independent of her actions ($r_H = r_L$), then she would appropriate all the surplus and, therefore, would make the efficient decisions. In such case, from the point of view of ex post efficiency, real control by the manager is efficient.

It is a standard result in the incomplete contracting literature, however, that if the manager has to bargain with suppliers (employees with firm-specific skills, suppliers with specialized inputs,...), manager’s control need not be efficient even if the rental price paid to owners were independent of the manager’s actions (that is, even if $r_H = r_L$). If part of the surplus generated by the manager’s actions goes to someone else, the marginal benefit for the manager of increases in effort (or, in general of giving up privately beneficial decisions) is less than the total marginal benefit, and thus inefficient decisions may be made.¹¹ What we show in the current paper is that increasing owners’ control does not necessarily increase the marginal benefit of the efficient decision for the manager, and, rather, may reduce it, making inefficient results more likely. The reason is that increasing owners’ ability to intervene (lowering their control costs) may worsen the manager’s bargaining position more in good states than in bad ones.

In the previous section, it was shown that increasing c or λ could lead to greater both managerial and nonmanagerial compensation. In this section, we have seen that, in some cases, increasing c or λ cannot make the manager switch from action g to action b . Therefore, in these cases, compensation is unambiguously increasing in c or λ .

Corollary 4 *If $\beta > \bar{\beta}$, or*

$$\frac{Q_H}{Q_L} \leq \frac{R_H - r_H(1 - \lambda) - \bar{w}}{R_L - r_L(1 - \lambda) - \bar{w}}, \quad (15)$$

then w and m are nondecreasing in both c and λ .

If $\beta < \bar{\beta}$ and $\frac{Q_H}{Q_L} \leq \frac{R_H - r_H(1 - \lambda) - \bar{w}}{R_L - r_L(1 - \lambda) - \bar{w}}$ then the relationship between compensation, c and λ may not be monotonic.

¹¹The fact that, in our model, the “rental price” can be higher if the efficient action is taken ($r_H \geq r_L$) provides additional incentives for an inefficient course of action.

7 Caveats and Extensions

We have analyzed the impact of owners' ability to exercise control over the manager on the compensation paid to nonmanagerial employees. The results of the model, however, straightforwardly extend to the compensation of any supplier that has made a firm-specific investment.

It is important to note that in our model, wages are lower when manager's control is contestable because the manager can commit not to bargain over the part of the surplus that needs to be paid to owners. If control is not contestable, however, $r = 0$, and the manager bargains with employees over the whole surplus. This result is in line with the idea, dating back to Schelling (1960), that a bargainer may obtain a better outcome by delegating bargaining to an agent and making the agent's compensation contingent on the bargaining outcome in an optimal way. If the agent is punished for giving up revenues to the other party, the contract with the agent effectively changes the bargaining problem in a way that is advantageous to the party hiring the agent. In our model, the owners do not offer the manager a contract to bargain on their behalf. The manager, however, is constrained by an implicit contract that requires her to pay at least r to owners.

A problem with this argument, already noted by Schelling himself is that it hinges on the ability of the bargainer and his agent to commit to the contract. For example, if the single owner of a firm signed a contract with a manager requiring a certain return, the contract would be effective in lowering wages only if workers believed that it cannot be renegotiated. If workers believed, for example, that if they pushed for higher wages, the owner would lower the required return in order to be able to retain the manager, or that they could bypass the manager altogether and bargain with the owner directly, the contract between the owner and the manager would be rendered less effective as a means to lowering negotiated wages.¹² Therefore, if changes that improve the ability or incentives of owners to exercise control over the manager, such as an increase in ownership concentration, at the same time make it significantly easier for workers to negotiate directly with owners, the results of the paper would have to be qualified.

A potential objection to the model is that an active market for corporate control or competition from potential managers could greatly limit the manager's discretion and thus reduce the significance of the model's results (though not their validity). Whether this is a

¹²See Green (1990) and Bester and József Sákovics (2001).

relevant objection is, however, an empirical issue. As discussed in the introduction, recent work provides support to the view that managers enjoy significant discretion when setting their own compensation. The relevance of the issue, however, merits further investigation.

The model in the current paper should be extended in several dimensions. First, some of the model's results depend on values of variables that we have taken as parameters. It would be desirable to derive the values of at least some of these variables, such as the returns that owners can command, from within the model to make more precise predictions. Second, the implicit intertemporal nature of the model should be analyzed more fully. Third, in the model we have not analyzed how different degrees of managerial discretion affect employment decisions. Fourth, more complex contract forms should be analyzed, both for nonmanagerial employees and for executives. In the latter case, we would like to know whether there are more efficient contracts that the executive can commit not to revise once in control. Finally, the model's results should be integrated with models that study the optimality of different ownership, and more generally, control structures.

8 Summary and Conclusion

This paper develops a model of the firm in which the manager enjoys real control over all decisions, including setting her own compensation, unless shareholders decide to exercise their control rights. The model allows us to study the consequences of managerial discretion on managerial incentives and the determination of nonmanagerial wages. It also allows us to analyze the effects of different corporate governance arrangements on incentives and compensation. The main results of the paper can be summarized as follows:

1. Corporate governance affects nonmanagerial wage costs even if managers do not have any preference for paying high wages and always attempt to minimize payroll costs.
2. Changes in corporate governance that reduce the level of managerial discretion will lead to lower managerial and nonmanagerial wages.
3. Yet those same changes do not necessarily lead to increased incentives for managers to make efficient choices, and, quite to the contrary, can lead managers to take inefficient actions.
4. Increases in the CEO's ownership share allow managers to enjoy greater total compensation but may lead to lower non-equity compensation.

5. Nonmanagerial wages will tend to be increasing in the CEO's ownership share.
6. A larger CEO ownership share is likely to increase the CEO's incentives to make efficient choices, yet the opposite result could also hold for certain parameter values.

These results are all potentially testable, and, as discussed in the introduction, there already exists some evidence that points out that increases in managerial discretion will be associated with higher compensation both for managers and nonmanagerial employees.

The contribution of the paper is thus twofold. On the one hand, it provides a model of managerial behavior that accommodates the view that managers enjoy a great deal of discretion and that is rich in empirical implications. On the other hand, the model studies an issue, the relationship between corporate governance and wage and employment outcomes, that has not received so far the attention it deserves. Much work, both theoretical and empirical, lies ahead on both fronts.

9 Appendix A: Proofs

Proof of Proposition 3. To prove the first two parts of the proposition, it is enough to show that the difference $(m_H - m_L)$ is nondecreasing in c for the cases described. To prove the last part, we also need to show that, at least for certain parameter values, $(m_H - m_L)$ can take values below and above $\frac{P}{\gamma+\pi-1}$ depending on the value of c .

For any value of c , the model's parameters determine four possible regimes:

A. $c \leq c_H^*$, and $c \leq c_L^*$. In this case:

$$m_H - m_L = (1 - \beta)(R_H - R_L - (1 - \lambda)(\hat{r}_H - \hat{r}_L)), \quad (16)$$

so that $(m_H - m_L)$ does not depend on c for values of c within this regime.

B. $c \leq c_H^*$, and $c > c_L^*$. In this case:

$$m_H - m_L = (1 - \beta)(R_H - \bar{w} - (1 - \lambda)\hat{r}_H) - (\bar{R}_L - \bar{w} - (1 - \lambda)\hat{r}_L) - \beta(1 - \lambda)c, \quad (17)$$

so that $(m_H - m_L)$ is decreasing in c for values of c within this regime. Condition (17) can hold only if $c_H^* > c_L^*$:

$$c_H^* = \hat{r}_H - \frac{1}{(1 - \lambda)} \left((R_H - \bar{w}) - \frac{Q_H}{\beta} \right) > \hat{r}_L - \frac{1}{(1 - \lambda)} \left((R_L - \bar{w}) - \frac{Q_L}{\beta} \right) = c_L^*, \quad (18)$$

that is if:

$$\beta < \bar{\beta} \equiv \frac{Q_H - Q_L}{(R_H - R_L) - (1 - \lambda)(r_H - r_L)} \quad (19)$$

Notice that assumption (A. 3) implies that $\bar{\beta} \leq 1$, since it requires that $(R_H - R_L) - (r_H - r_L) \geq Q_H - Q_L$.

C. $c > c_H^*$, and $c \leq c_L^*$. In this case:

$$m_H - m_L = (\bar{R}_H - \bar{w} - (1 - \lambda)\hat{r}_H) - (1 - \beta)(R_L - \bar{w} - (1 - \lambda)\hat{r}_L) + \beta(1 - \lambda)c, \quad (20)$$

so that $(m_H - m_L)$ is increasing in c for values of c within this regime. Condition (20) can hold only if $c_H^* < c_L^*$, which will be the case if $\beta > \bar{\beta}$.

D. $c > c_H^*$, and $c > c_L^*$. In this case:

$$m_H - m_L = (\bar{R}_H - \bar{w} - (1 - \lambda)\hat{r}_H) - (\bar{R}_L - \bar{w} - (1 - \lambda)\hat{r}_L), \quad (21)$$

so that $(m_H - m_L)$ does not depend on c for values of c within this regime.

Therefore, if $\beta < \bar{\beta}$, $(m_H - m_L)$ is nonincreasing in c , and if $\beta > \bar{\beta}$, $(m_H - m_L)$ is nondecreasing in c . In the former case, reducing c may make (IC) hold, while, in the latter case, increasing c may make (IC) hold.

It rests to check that there are feasible values of c for which a small change in c can induce the manager to change her decision. If $\beta < \bar{\beta}$, this can only happen if regime B is feasible. For this, it has to be the case that there exist $c < \hat{r}_L$, such that $c > c_L^*$:

$$c > \hat{r}_L - \frac{1}{(1-\lambda)} \left((R_L - \bar{w}) - \frac{Q_L}{\beta} \right), \quad (22)$$

that is, that

$$R_L - \bar{w} - (1-\lambda)r_L > \frac{Q_L}{\beta} \quad (23)$$

for some $r_L \geq 0$.

Now, $\beta < \bar{\beta}$ implies that

$$\frac{Q_L}{\beta} > \frac{Q_L}{\bar{\beta}} = Q_L \frac{(R_H - R_L) - (1-\lambda)(r_H - r_L)}{Q_H - Q_L} \quad (24)$$

Therefore, we need:

$$R_L - \bar{w} - (1-\lambda)r_L > Q_L \frac{(R_H - R_L) - (1-\lambda)(r_H - r_L)}{Q_H - Q_L} \quad (25)$$

Rearranging, we obtain:

$$\frac{R_H - (1-\lambda)r_H - \bar{w}}{R_L - (1-\lambda)r_L - \bar{w}} < \frac{Q_H}{Q_L}, \quad (26)$$

which is thus a necessary condition for $(m_H - m_L)$ to be strictly decreasing in c for at least some region. We also need $c_H^* > 0$:

$$\hat{r}_H - \frac{1}{(1-\lambda)} \left((R_H - \bar{w}) - \frac{Q_H}{\beta} \right) > 0, \quad (27)$$

i.e.,

$$\frac{Q_H}{\beta} > R_H - \bar{w} - \hat{r}_H(1-\lambda), \quad (28)$$

which will hold for β low enough.

If $\beta > \bar{\beta}$, $(m_H - m_L)$ will be strictly increasing in c for at least some region only if regime C is feasible. For this, it has to be the case that there exist $c < \hat{r}_L$, such that $c > c_H^*$:

$$c > \hat{r}_H - \frac{1}{(1-\lambda)} \left((R_H - \bar{w}) - \frac{Q_H}{\beta} \right) \quad (29)$$

$$R_H - \bar{w} - (1-\lambda)r_H > \frac{Q_H}{\beta}, \quad (30)$$

which is straightforwardly true for β high enough, since we have assumed (assumption (A.3)) that $R_H - Q_H - \bar{w} - r_H \geq 0$.

We also need $c_L^* > 0$:

$$\hat{r}_L - \frac{1}{(1-\lambda)} \left((R_L - \bar{w}) - \frac{Q_L}{\beta} \right) > 0, \quad (31)$$

i.e.,

$$\frac{Q_L}{\beta} > R_L - \bar{w} - \hat{r}_L(1-\lambda), \quad (32)$$

Now, $\beta > \bar{\beta}$ implies that

$$\frac{Q_L}{\beta} < \frac{Q_L}{\bar{\beta}} = Q_L \frac{(R_H - R_L) - (1-\lambda)(r_H - r_L)}{Q_H - Q_L} \quad (33)$$

Therefore, we need:

$$R_L - \bar{w} - (1-\lambda)r_L < Q_L \frac{(R_H - R_L) - (1-\lambda)(r_H - r_L)}{Q_H - Q_L} \quad (34)$$

Rearranging, we obtain:

$$\frac{R_H - (1-\lambda)r_H - \bar{w}}{R_L - (1-\lambda)r_L - \bar{w}} > \frac{Q_H}{Q_L} \quad (35)$$

Finally, it can be shown that there exist parameter values for which $(m_H - m_L) - \frac{P}{\gamma+\pi-1}$ can be negative for some values of c and positive for others, so that changes in c can induce changes in the decision made by the manager. \blacksquare

Proof of Proposition 4. Rewriting $(m_H - m_L)$ more clearly as a function of λ in the four possible regimes,

$$\text{A. } m_H - m_L = (1-\beta)(R_H - R_L - (r_H - r_L)) + (1-\beta)\lambda(r_H - r_L),$$

$$\text{B. } m_H - m_L = (1-\beta)(R_H - \bar{w} - r_H) - (\bar{R}_L - \bar{w} - r_L) + \lambda((1-\beta)r_H - r_L),$$

$$\text{C. } m_H - m_L = (\bar{R}_H - \bar{w} - r_H) - (1-\beta)(R_L - \bar{w} - r_L) + \lambda(r_H - (1-\beta)r_L),$$

$$\text{D. } m_H - m_L = (R_H - R_L - (r_H - r_L)) + \lambda(r_H - r_L),$$

it can be seen that in cases A, C or D, $(m_H - m_L)$ is unambiguously increasing in λ . Moreover, c_i^* is increasing in λ , and if $c_L^* - c_H^* > 0$ for some $\lambda = \bar{\lambda}$, it is positive for any $\lambda > \bar{\lambda}$. Therefore, if $c_L^* > c_H^*$, $(m_H - m_L)$ is increasing in λ .

Only in case B, which requires $c_L^* < c_H^*$, could $(m_H - m_L)$ be decreasing in λ if:

$$(1 - \beta)r_H - r_L < 0 \quad (36)$$

For β close to zero, this inequality cannot hold as long as $r_H > r_L$. It rests to check that it can hold for some larger $\beta < \bar{\beta}$. This will be easier for larger values of $\bar{\beta}$. For $\lambda = 0$, $\bar{\beta}$ is maximal:

$$\bar{\beta}(\lambda = 0) = \frac{Q_H - Q_L}{(R_H - R_L) - (r_H - r_L)} \quad (37)$$

Therefore, if conditions (36) and $\beta < \bar{\beta}$ can hold simultaneously for any λ , they will also do so for $\lambda = 0$. We thus need to guarantee that $\beta < \bar{\beta}(\lambda = 0)$ and condition (36) are consistent:

$$(1 - \bar{\beta}(\lambda = 0))r_H - r_L = \frac{(\bar{R}_H - \bar{R}_L) - (r_H - r_L)}{(R_H - R_L) - (r_H - r_L)}r_H - r_L < 0, \quad (38)$$

that is

$$\frac{(\bar{R}_H - \bar{R}_L) - (r_H - r_L)}{(R_H - R_L) - (r_H - r_L)} < \frac{r_L}{r_H} \quad (39)$$

which can obtain without contradicting any other condition or assumption. Therefore, if condition (39) and the conditions, derived in the previous proof, that make regime B possible hold, then $(m_H - m_L)$ can be decreasing in λ for at least some λ . If

$$\beta < \bar{\beta}(\lambda = 1) = \frac{Q_H - Q_L}{\bar{R}_H - \bar{R}_L}, \quad (40)$$

and

$$(1 - \bar{\beta}(\lambda = 1))r_H - r_L = \frac{\bar{R}_H - \bar{R}_L}{R_H - R_L}r_H - r_L, \quad (41)$$

i.e.

$$\frac{\bar{R}_H - \bar{R}_L}{R_H - R_L} < \frac{r_L}{r_H}, \quad (42)$$

then, if regime B is feasible, $(m_H - m_L)$ is decreasing in λ . ■

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