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CEO Pay and the Lake Wobegon Effect

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ABSTRACT

In this paper, we propose a new explanation for the recent increase in CEO pay at US firms. Our explanation, which is based on asymmetric information in financial markets, is motivated by a recent observation made by former DuPont CEO Edward S. Woolard, Jr.: “The main reason (CEO) compensation increases every year is that most boards want their CEO to be in the top half of the CEO peer group, because they think it makes the company look strong. So when Tom, Dick, and Harry receive compensation increases in 2002, I get one too, even if I had a bad year.... (This leads to an) upward spiral” (Elson, 2003).

We present a game-theoretic model of this phenomenon, which is known in the business press as the “Lake Wobegon Effect.” Our model has three key features: (i) there is asymmetric information regarding the manager’s ability to create value at the firm; (ii) the pay package given to the manager must convey information about the manager’s ability to create value at the firm; and, (iii) the firm must have some preference for favorably affecting outsiders’ perceptions of firm value. We characterize the perfect Bayesian equilibrium of this model, identify conditions under which pay is distorted upward relative to a full-information benchmark, and then embed our model in a simple assortative matching framework. Our analysis offers a potential explanation across-country differences in CEO pay growth, and suggests that greater shareholder involvement in the pay process may be counterproductive.

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1 Introduction

CEO pay levels in the US have risen ten times as fast as average worker wages since the 1970s (The Economist, 2006). These ever-increasing paychecks continue to attract the attention of policymakers, the media, and the public. One much-discussed potential cause for the increase in CEO pay has come to be known as the Lake Wobegon Effect. In public radio host Garrison Keillor’s mythical hometown of Lake Wobegon, Minnesota, all the children are above average. And so it is claimed with CEOs — no firm wants to admit to having a CEO who is below average, and so each firm wants its CEO’s pay package to put him at or above the median pay level for comparable firms. Of course, not every CEO can be paid more than average, and so (it is claimed) we see ever-increasing levels of CEO pay. The reasoning behind this effect was perhaps best summarized by former DuPont CEO Edward S. Woolard, Jr., speaking at a 2002 Harvard Business School roundtable on CEO pay (Elson, 2003): “The main reason compensation increases every year is that most boards want their CEO to be in the top half of the CEO peer group, because they think it makes the company look strong. So when Tom, Dick, and Harry receive compensation increases in 2002, I get one too, even if I had a bad year.... (This leads to an) upward spiral.”

A remarkable range of commentators have referenced the Lake Wobegon Effect in discussing CEO pay, including consultant turned pay-critic Graef Crystal (The Washington Post, 2002), former Harvard Business School dean Kim Clark (2003, 2006), and the director of the SEC’s Division of Corporation Finance, Alan Beller (2004). The Effect has even been cited by disgruntled shareholders in picking proxy fights with management over pay levels. After *Business Week* ranked Alcoa worst nationally in the relation between CEO pay and stock price performance, The Catholic Funds introduced a shareholder resolution citing the Lake Wobegon Effect and instructing the board to review the firm’s pay practices. The resolution failed.

As it is discussed in the business press, the Lake Wobegon Effect appears to rely on three key assumptions. First, there must be asymmetric information regarding the manager’s ability to create value at the firm. Second, the pay package given to a manager must convey information about the manager’s ability to create value at the firm. Third, the firm must have some preference for favorably affecting outsiders’ perceptions of firm value. The business-press level discussion of the Lake Wobegon Effect appears to recognize each of these points, and then simply assert that firms will distort pay levels upward away from the level that would be selected in the absence of the information asymmetry.

In this paper, we develop several game-theoretic models of CEO contracting, each of which incorporates the three key assumptions of the Lake Wobegon Effect.¹ Specifically, we study a firm and a manager who privately observe a parameter that affects the productivity of their match. Stock market participants cannot observe this parameter, but attempt to infer it from observing the manager's wage. The firm maximizes a weighted sum of short-run and terminal firm value, and so may wish to distort the publicly observable wage contract in order to affect the market's beliefs regarding firm value.

We apply the standard tools of information economics to study this setting, and report three main results. First, we show that when firms have a sufficiently strong preference for high-short-run share prices, managerial pay can be distorted upward relative to a full-information benchmark. If the firm has a very strong preference for high short-run share prices, or if the manager captures a small share of the match surplus under full information, then the temptation to distort pay upward is stronger. Notably, however, the three key assumptions of the Lake Wobegon Effect are not sufficient to guarantee upward distortions in pay. Second, we find that the temptation to distort pay upward is stronger when the information asymmetry pertains to characteristics of the *firm* rather than characteristics of the manager. When the manager's ability is uncertain, increases in the manager's pay do boost the market's assessment of managerial ability; however, the manager — not the firm — captures rents associated with increases in managerial ability. Thus, the marginal increase in firm value associated with a dollar increase in managerial pay is low when the uncertainty pertains to a characteristic of the manager. Third, embedding our basic model in a simple model of assortative matching suggests that CEO pay at large firms can be affected by short-termism at small firms.

Our analysis yields implications both for empirical research on CEO pay and for policy. First, our findings may offer a path to explaining across-country patterns in CEO pay. As many observers have noted, growth in US CEO pay has far outstripped that of most other developed nations in recent years. Our analysis, which relies on asymmetric information in financial markets, suggests that one potential source of across-country differences in pay is across-country differences in financial markets. Specifically, suppose that small US firms are subject to greater short-termist market pressures than comparable firms in other countries. These firms may then distort CEO pay upward relative to a full-information benchmark, which,

¹Other work in economics studies a Lake Wobegon Effect in employee evaluations, where supervisors are unwilling to rate employees honestly and thus mark everyone as above average. See Moran and Morgan (2001) and MacLeod (2003).

as suggested by our assortative matching model, can lead to increases in CEO pay at larger firms.

Second, our analysis yields markedly different policy implications compared to other theories of recent CEO pay increases. Among other candidate theories for recent pay increases are failures in corporate governance, problems arising from the accounting treatment of stock options, and simple increases in demand for CEO talent. The governance-failure explanation, most recently articulated by Bebchuk and Fried (2003), holds that CEOs control the pay process, and are thus able to enrich themselves at shareholder expense. The option-accounting explanation, discussed by Hall and Murphy (2003), suggests that the favorable accounting treatment of stock options is at least partly responsible for recent CEO pay increases. Market-driven increases in pay may arise from economy-wide increases in the return to skill (Kaplan and Rauh, 2006), or from changes in the size distribution of firms that affect the returns to CEO skill (Gabaix and Landier, 2006).²

The Lake Wobegon Effect is similar to the governance and option-accounting explanations in that the level of CEO pay differs from that expected under a full-information or no-agency-problem ideal. However, the Lake Wobegon Effect suggests a very different *cause* of the rise in pay. Under the governance and accounting theories, the problem stems from an intra-organizational agency problem. Motivating boards to take closer account of shareholder interests may well lead to reductions in pay under the governance or accounting explanations, but are likely to exacerbate the problem identified in our model. Our model suggests that allowing shareholders to delegate pay decisions to board members whose preferences differ from those of shareholders (as in Fershtman and Judd, 1987, or Dybvig and Zender, 1991) may help restrain pay levels.

Discussions of the Lake Wobegon Effect often include mention of the effects of peer-group comparisons on CEO pay. (See Bizjak et al., 2003 for an empirical analysis of this practice.) The fact that pay for a given CEO would be positively related to pay at comparable firms is, of course, consistent with well functioning managerial labor markets. Further, as Crystal (1991) has noted, strategic choice of peer groups can artificially inflate pay (so long as directors are unable or unwilling to “undo” these strategies). We argue, however, that the quotations from Woolard and others suggest forces beyond well functioning labor market and strategic choice of peer groups are at work. Specifically, these observers allege that firms want to pay at the top

²See Lazear and Oyer (2007) for a richer summary of recent research on the level of CEO pay.

end of a peer group, even if that peer group is chosen non-strategically, and even if doing so is not necessitated by direct labor market competition. While the single-firm model we develop does not speak directly to the question of why firms would want to pay well *relative to peers*, it does offer a justification for the practice of paying well relative to *some market expectation* of pay, in an attempt, as Woolard puts it, to “look strong.”

2 Model Outline

We consider a single-period game with four dates, as depicted in Figure 1. At date 1, the firm is matched with a potential manager. The firm and potential manager costlessly learn manager- and firm-specific productivity parameters, and a match-specific productivity parameter. We denote the manager- and firm-specific productivity parameters as $q \in [q_L, q_H]$ and $a \in [a_L, a_H]$ for the firm and manager respectively. Let the match-specific productivity be given by $f(q, a; \gamma)$, where $\gamma \in [\gamma_L, \gamma_H]$ is a match-specific productivity parameter. Note the manager- and firm-specific productivity parameters may affect both the parties’ outside options and the value they split if they enter into an employment relationship and work together. We therefore interpret the manager’s productivity parameter a as a measure of general-purpose skill or ability. We can interpret the firm-specific productivity parameter as some measure of the firm’s technology or investment opportunities.

If employment is efficient, the firm and manager negotiate an employment contract at date 2. We ignore moral hazard on the part of the manager, and so the employment contract simply consists of a wage w . We assume the terms of this wage contract are publicly observable. If employment is inefficient, then the parties separate, receive their reservation values, and the game ends.

At date 3, a round of trading in the firm’s shares occurs. The value of the firm’s shares is conditioned on the date 2 contract between the firm and manager. However, this market value cannot be conditioned (directly) on the value of the firm, because this is observed only by the firm and the manager. Instead, stock market participants form beliefs about the value of the firm based on the observed date 2 contract. At date 4, production occurs. Wages are paid to the manager, and residual profits are paid to shareholders. The game ends.

We build in the three key assumptions of the Lake Wobegon Effect as follows. First, we assume that some aspect of productivity — one of the match-specific productivity, the manager-specific productivity, or the firm-specific productivity — are not observed by market partici-

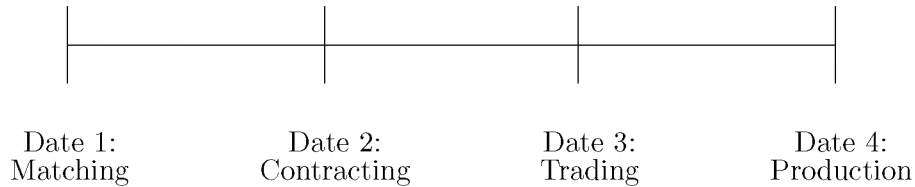


Figure 1: Timeline.

pants. Thus, there is asymmetric information about firm value.

Second, we assume that the manager has sufficient bargaining power to capture some part of the rent resulting from the match. This implies that contract terms will vary with the value of the firm, and thus that stock-market participants will condition their beliefs about firm value on the payment made to the manager.

Third, we assume that the firm has a some preference for a high share price at date 3. Many justifications for the assumption of corporate short-termism or myopia have been proposed in the literature. Miller and Rock (1985), for example, assume that shareholders have exogenously differing time horizons. In their model, shareholders are *ex ante* identical, and learn their specific time horizons after the firm's dividend policy is chosen; thus, all shareholders have some preference for high share prices in the short run. In Stein (1988), a corporate raider considers purchasing all of the firm's shares immediately after a corporate action is taken, but before the terminal payoff. The expected payoff to current shareholders is therefore the weighted sum of short-term share price and terminal value, with the weights determined by the probability of a takeover. In our analysis, we follow Stein (1989) by suppressing the precise reasons underlying corporate myopia. We assume that the firm places weight k on the date 3 firm value and $1 - k$ on the date 4 value. The variable k parameterizes the firm's myopia, with higher values implying a greater concern for short-term share prices.

The twin assumptions of asymmetric information and corporate short-termism have been widely used in the financial economics literature. For example, Myers and Majluf (1984) and Miller and Rock (1985) — who study capital structure and dividend policy, respectively — assume that shareholders care about short-run share prices, and that managerial compensation contracts induce managers (who actually make the capital structure and dividend policy decisions) to value high short-run share prices as well.

This approach has been criticized by Dybvig and Zender (1991), who argue that shareholders need not write contracts that motivate managers to care about short-run share prices. Indeed, given that equilibria in these models typically involve inefficient investment, shareholders are best off writing contracts that give managers a different objective function than shareholders themselves hold; essentially, Dybvig and Zender offer delegation-as-commitment as a solution to a strategic problem, as in Fershtman and Judd (1987). The delegation-as-commitment literature has been criticized by Katz (1991), Persons (1994), and others on the grounds that such contracts are not renegotiation-proof. If secret renegotiation of contracts is possible, then delegation may be strategically irrelevant. Dewatripont (1988) counters this claim by noting that informational problems may impede renegotiation, thus restoring a strategic role for contracts.

We remain agnostic on this debate, for two reasons. First, our analysis differs from the corporate finance literature in that it is the managerial wage contract itself — rather than a choice of capital structure or dividend policy which, in turn, is a function of the wage contract — that is affected by the information asymmetry and myopia. Thus, an appropriately constructed managerial incentive contract cannot help here. Second, the prescription of Dybvig and Zender (1991) — that myopic shareholders should credibly delegate decisions to an intermediary whose preferences are manipulated using contracts — sounds very much like status quo institutional arrangements, where pay decisions are delegated to a subcommittee of the board. If current institutional arrangements do succeed in insulating compensation committee members from shareholder myopia, then pay will not be distorted upward relative to a full-information benchmark. In this case, we argue that our analysis remains relevant to the policy debate, particularly because of recent calls for more direct shareholder involvement in the pay process. We develop this point in more detail in Section 5.

3 Idiosyncratic Matching

In this section, we develop several variants of this basic model. We consider idiosyncratic matching, where the parties' outside options are assumed to be equal to their individual-specific productivity parameters. We examine three cases, each corresponding to a different source of information asymmetry regarding firm value. First, we suppose that managerial ability a is unknown to stock market participants. Second, we assume that the informational asymmetry pertains to the match-specific productivity parameter γ . Third, we assume that stock market

participants are uninformed regarding the firm's individual productivity q .

3.1 Asymmetric Information Regarding Managerial Ability

We begin by considering the effects of asymmetric information regarding managerial ability. To focus on this effect, we make a number of assumptions. Let the firm's individual productivity parameter q be common knowledge among all players of the game. Let the parties' match payoff be $f(q, a)$, where the function f is common knowledge and the match-specific productivity parameter γ is suppressed. Finally, as noted above, we assume that the outside options of the firm and manager are given by q and a respectively.

Under these assumptions, the match surplus — that is, the difference between the parties' payoff when working together and when pursuing their outside options — is given by

$$f(q, a) - q - a.$$

If all players in the game can observe managerial ability a at date 1, then there is no reason for the firm to behave strategically to try to affect date 3 market values. We assume that in this case, the firm and manager split the match surplus according to Nash bargaining. Assuming the manager has bargaining power α , he will command a wage of

$$\tilde{w}(a) = a + \alpha(f(q, a) - q - a). \tag{1}$$

Let the wage schedule $\tilde{w}(a)$ be a full-information benchmark.

Suppose, however, that a is observed by the firm and manager at date 1, but that market participants cannot learn a directly until date 4 when the firm's terminal payoff is revealed. Given this, the firm may want to distort the manager's pay upward in an attempt to affect outsiders' short-run perceptions of firm value. In equilibrium, of course, such attempts to fool the market must fail, so a wage schedule that is part of a Perfect Bayesian Equilibrium (PBE) must satisfy a no-mimic constraint.

A firm whose manager has ability a must not prefer to mimic a firm whose manager has ability $\hat{a} \neq a$. Denoting the PBE wage schedule under asymmetric information as $\hat{w}(a)$, we see that a type- a firm's date 3 value when mimicking a type- \hat{a} firm is

$$f(q, \hat{a}) - \hat{w}(\hat{a}).$$

Note here that date 3 firm value can be *increasing* in the wage paid to the manager. Paying a higher wage can increase the market's perception of the available match surplus, and thus

increase value. Ordinarily, of course, higher factor prices reduce firm value, but this need not be the case given the information asymmetry here.

A type- a firm's date 4 value when mimicking a type- \hat{a} firm is

$$f(q, a) - \hat{w}(\hat{a}).$$

The firm places weight k on its date 3 market valuation, so its payoff when mimicking a type- \hat{a} firm is given by

$$k(f(q, \hat{a}) - \hat{w}(\hat{a})) + (1 - k)(f(q, a) - \hat{w}(\hat{a})).$$

If a type- a firm instead elects not to mimic a type- \hat{a} firm, then its date 3 and date 4 values are identical, and equal to

$$f(q, a) - \hat{w}(a).$$

Our no-mimic constraint is that \hat{w} must satisfy

$$f(q, a) - \hat{w}(a) > k(f(q, \hat{a}) - \hat{w}(\hat{a})) + (1 - k)(f(q, a) - \hat{w}(\hat{a})) \quad (2)$$

for all $\hat{a} \neq a$.

To build intuition, note that there are both costs and benefits to a type- a firm mimicking a type- \hat{a} firm, where $\hat{a} > a$. As long as $f_a > 0$ (where the subscript denotes a partial derivative), mimicking a higher type causes the firm's date 3 market value to increase. The firm places weight k on this benefit. However, the firm must also increase the employee's wage from $\hat{w}(a)$ to $\hat{w}(\hat{a})$ — this cost is felt both at date 3 and at date 4. Re-arranging, we see that the no-mimic constraint in (2) is equivalent to

$$\hat{w}(\hat{a}) - \hat{w}(a) \geq k(f(q, \hat{a}) - f(q, a)). \quad (3)$$

Assuming f is concave in a , we can replace (3) with a local no-mimic constraint, yielding

$$\hat{w}' > kf_a \quad (4)$$

for all $a \in [a_L, a_H]$.

Under what conditions can the full-information contract $\tilde{w}(a)$ be part of a PBE? The full-information wage must increase sufficiently quickly with a to make it unattractive for firms to try to increase managerial pay to boost date 3 market value. Differentiating (1), we have

$$\tilde{w}'(a) = (1 - \alpha) + \alpha f_a.$$

The full-information contract therefore satisfies (4) if

$$(1 - \alpha) + \alpha f_a \geq k f_a, \quad (5)$$

for all a . Because f is concave in a , we have that if

$$(1 - \alpha) + \alpha f_a(a_L) \geq k f_a(a_L),$$

then (5) holds for all a . Re-arranging, we have that if

$$k \leq \alpha + \frac{1 - \alpha}{f_a(a_L)} \quad (6)$$

then the full-information contract forms a PBE.

Inequality (6) leads to a number of observations. First, note that if $f_a(a_L)$ — the marginal effect of managerial ability on match value — is less than or equal to one, then the full-information wage schedule is always part of a PBE. Because match surplus is given by $f(q, a) - q - a$, boosting market perceptions of managerial ability has a positive effect on firm value only if $f_a > 1$. If $f_a \leq 1$, then a firm cannot increase market value by increasing the market's perception of managerial ability. Firm-specificity of human capital is therefore a necessary condition for upward distortions in pay.

Second, when $f_a(a_L)$ is sufficiently high, the full-information wage schedule cannot be part of a PBE. The marginal effect on firm value of an increase in the market's perception of managerial ability is high when f_a is high. This makes the firm's temptation to overpay relative to the full-information wage schedule strong.

Third, higher k increases the firm's temptation to increase pay to boost short run valuations, and thus the equilibrium moves away from the full-information benchmark as k increases. Fourth, higher α moves the equilibrium in the direction of the full-information wage schedule. Higher α means that a greater share of the match surplus is captured by the manager rather than the firm. This both increases the marginal cost and reduces the marginal benefit of attempts to boost the market's perception of managerial ability. The marginal benefit falls because an increase in perceived match surplus has a smaller effect on date 3 firm value. The marginal cost rises because a larger wage increase is required to move market perceptions of managerial ability.

Next, we characterize the PBE when the full-information wage schedule cannot be part of an equilibrium. We begin by considering the case where

$$k > \alpha + \frac{1 - \alpha}{f_a(a_H)}.$$

Here, the fact that f_a is decreasing means that the full information wage schedule does not satisfy (6) for any $a \in [a_L, a_H]$. We therefore derive the PBE contract using the differential equation in (4). (Here, we apply the standard refinement of minimal signaling.) For a boundary condition, we assert that every manager type must be paid as least as much under asymmetric information as under the full-information contract. Thus, our boundary condition is

$$\begin{aligned}\hat{w}(a_L) &= \tilde{w}(a_L) \\ &= a_L + \alpha(f(q, a_L) - q - a_L).\end{aligned}$$

We therefore have that for $k > \alpha + (1 - \alpha)/f_a(a_H)$, the PBE wage schedule is the solution to

$$\begin{aligned}w' &= kf_a \\ w(a_L) &= a_L + \alpha(f(q, a_L) - q - a_L).\end{aligned}$$

Next, we consider the case where

$$\alpha + \frac{1 - \alpha}{f_a(a_L)} < k < \alpha + \frac{1 - \alpha}{f_a(a_H)}.$$

Here, the full-information wage schedule satisfies (6) for some but not all values of a . The PBE wage schedule in this case is given by

$$\hat{w}(a) = \max[\bar{w}(a), \tilde{w}(a)],$$

where $\bar{w}(a)$ is the solution to the differential equation

$$w' = kf_a$$

with boundary condition

$$w(a_L) = a_L + \alpha(f(q, a_L) - q - a_L).$$

In this case, it is possible that pay is distorted upward relative to the full-information case for the low-ability managers, but not for high ability managers.

To illustrate the construction of our equilibria, we consider a simple numerical example. Assume $f(q, a) = 16\sqrt{qa}$, and let $q = 1$ be common knowledge. Let $a \in [1, 2]$. If $\alpha = 1/4$, then the full-information wage schedule is given by

$$\tilde{w}(a) = a + \frac{16\sqrt{a} - a - 1}{4}.$$

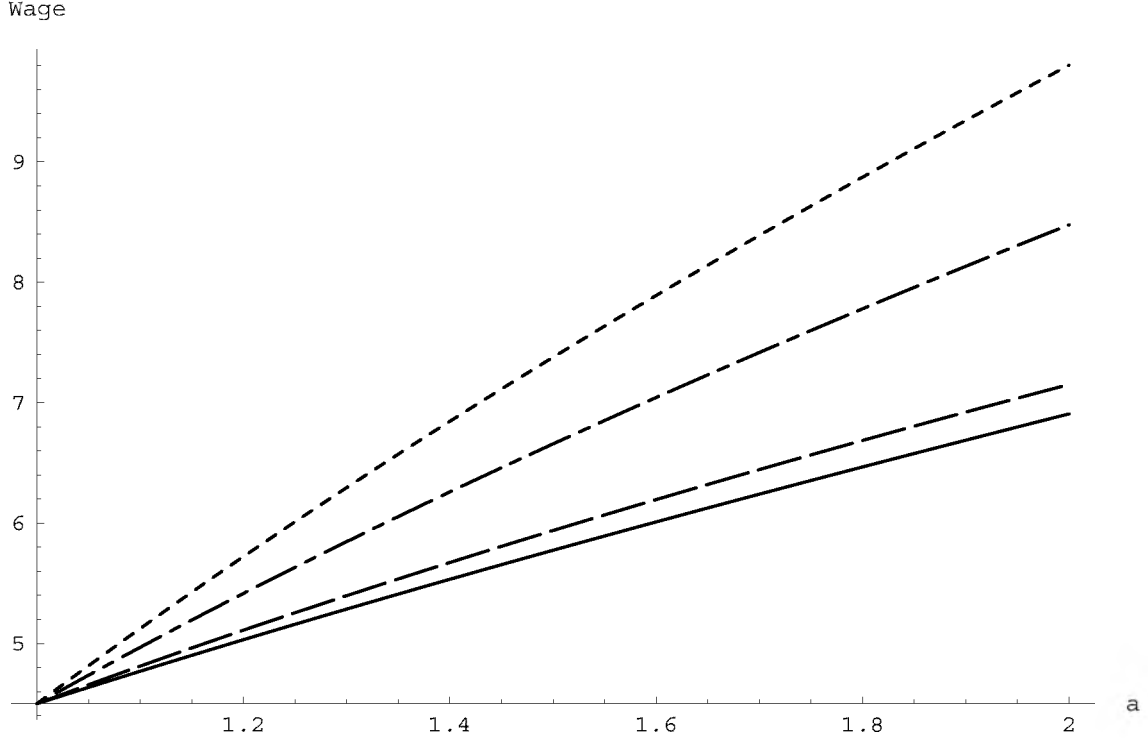


Figure 2: Solid line shows full-information wage schedule for $f(q, a) = 16\sqrt{qa}$, $q = 1$, $\alpha = 1/4$, and $a \in [1, 2]$. Dashed line is the PBE wage schedule for $k = 2/5$. Dot-dash line is the PBE wage schedule for $k = 3/5$. Dotted line is the PBE wage schedule for $k = 4/5$.

It is straightforward to verify that if $k > (8 + 3\sqrt{2})/32 \approx 0.38$, then the full-information contract cannot be part of a PBE. So, if for example $k = 2/5$, the PBE wage schedule is the function w that solves

$$\begin{aligned} w' &= \frac{16}{5\sqrt{a}} \\ w(1) &= \frac{9}{2}. \end{aligned}$$

This solves out to

$$\bar{w}(a) = \frac{64\sqrt{a} - 19}{10}.$$

We plot both the full-information wage schedule \tilde{w} and the asymmetric information contract \bar{w} (using various values for k) in Figure 2.

3.2 Asymmetric Information Regarding Match Quality

Next, we consider the case where the information asymmetry pertains to a match-specific productivity parameter γ .

To focus on this effect, we again make a number of assumptions to simplify notation and analysis. First, assume that both the manager's and the firm's individual-specific productivity parameters, a and q , are commonly known to all players as of date 1. Suppose, as above, that the outside options of the manager and firm are given by a and q , respectively. Next, suppose that the match value is given by $f(\gamma)$, where $\gamma \in [\gamma_L, \gamma_H]$. Here, we have suppressed the role of the individual-specific productivity parameters in f . Because these parameters are common knowledge, it is necessary for us to consider only the role of γ in determining the match value. Define, as above, the full-information wage schedule as

$$\tilde{w}(\gamma) = a + \alpha(f(\gamma) - q - q).$$

To study the asymmetric-information case, assume that market participants cannot observe γ directly, but instead condition their beliefs regarding firm value on the observed wage payment to the manager. This raises the possibility that a firm may wish to increase the manager's pay in an attempt to fool the market in to assigning it a high date 3 market value. Equilibrium requires that such attempts must fail, so a PBE wage schedule \hat{w} must satisfy the following no-mimic constraint:

$$f(\gamma) - \hat{w}(\gamma) > k(f(\hat{\gamma}) - \hat{w}(\hat{\gamma})) + (1 - k)(f(\gamma) - \hat{w}(\hat{\gamma})) \quad (7)$$

for all $\hat{\gamma} \neq \gamma$. The cost to a type- γ firm of mimicking a type- $\hat{\gamma}$ ($> \gamma$) firm is that it must pay a higher wage; the benefit is a higher date 3 market value.

Assuming f is concave in γ , we can replace (7) with a local no-mimic constraint, yielding the following constraint on equilibrium wage schedules:

$$\dot{w}' > kf_\gamma$$

for all $\gamma \in [\gamma_L, \gamma_H]$.

Again we inquire about the conditions under which the full-information wage schedule can be part of a PBE. Differentiating \tilde{w} with respect to γ , we have

$$\tilde{w}'(\gamma) = \alpha f_\gamma.$$

Thus, the condition under which \tilde{w} is an equilibrium wage schedule takes an especially simple form. Specifically, if

$$k \leq \alpha \tag{8}$$

then \tilde{w} is a PBE wage schedule, and otherwise not. If $k > \alpha$, then the PBE wage schedule is given by the solution to

$$\begin{aligned} w' &= kf_\gamma \\ w(\gamma_L) &= a + \alpha(f(\gamma) - q - a). \end{aligned}$$

Comparing (8) to (6) above, we see that the values of α and k where the full-information wage schedule is a PBE are not identical. In Figure 3, we place α and k on the x and y axes, respectively, and depict the values for which the full-information contract is a PBE. The solid line is the inequality from (8), while the dashed line is the inequality from (6). Points below the solid (dashed) line are the (α, k) pairs for which the full-information wage schedule forms a PBE when the information asymmetry pertains to γ (a). Clearly, the set of (α, k) values for which the manager's wage is distorted upward relative to the full-information case is larger when the information asymmetry pertains to the match-specific productivity parameter γ than when the information asymmetry pertains to the manager's ability a .

To see the reason for this difference, suppose the information asymmetry pertains to γ , and consider the effect on date 3 firm value when the firm pays the manager an additional dollar in wages. Paying one additional dollar in wages in the equilibrium action of a firm of type- $\hat{\gamma}$, where $\hat{\gamma}$ is defined by

$$\alpha(f(\hat{\gamma}) - f(\gamma)) = 1.$$

Thus, a firm paying an additional dollar in wages is behaving as though its match surplus is higher by $1/\alpha$. Because the firm captures fraction $1 - \alpha$ of the match surplus, paying an additional dollar in wages increases the firm's date 3 market value by $(1 - \alpha)/\alpha$.

Now suppose the information asymmetry pertains to managerial ability a , and again consider the effect on date 3 firm value when the firm pays the manager an additional dollar in wages. Paying one additional dollar in wages in the equilibrium action of a firm of type- \hat{a} , where \hat{a} is defined by

$$\begin{aligned} 1 &= \hat{a} - a + \alpha(f(q, \hat{a}) + \hat{a} - f(q, a) - a) \\ &= (1 - \alpha)(\hat{a} - a) + \alpha(f(q, \hat{a}) - f(q, a)). \end{aligned}$$

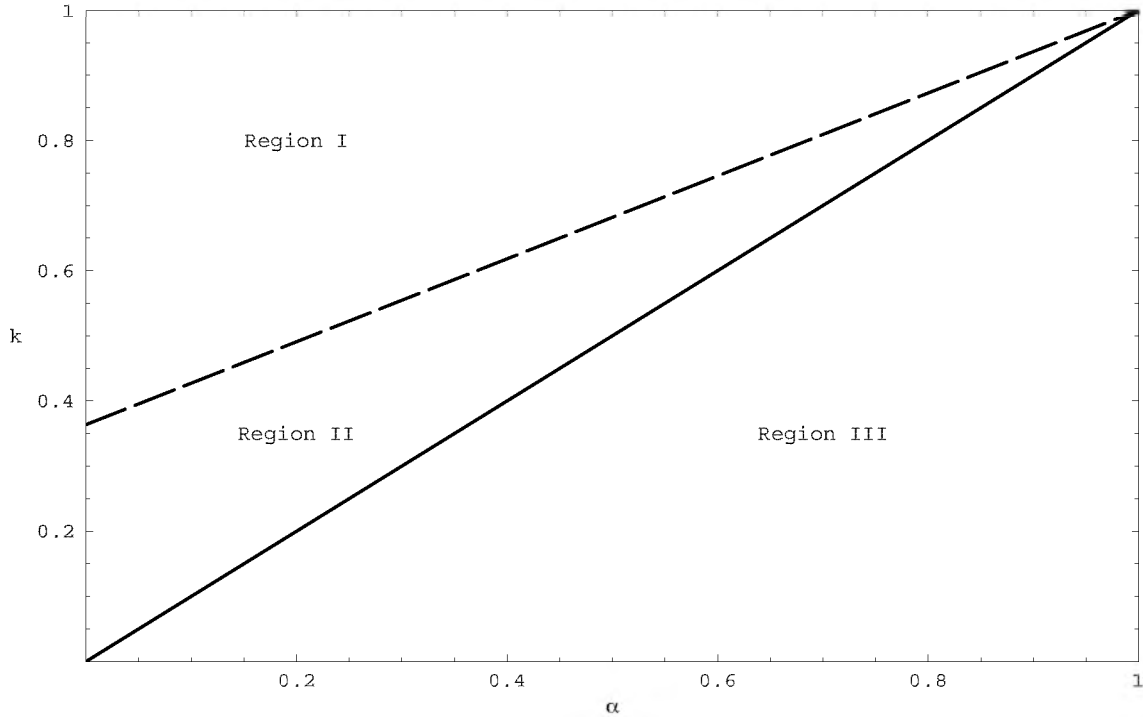


Figure 3: Let $f(q, a) = 16\sqrt{qa}$, $\alpha = 1/4$, and $q, a \in [1, 2]$. The solid line is the inequality from (8), while the dashed line is the inequality from (6) assuming $q = 1$. If the information asymmetry pertains to γ , then the full-information wage schedule is a PBE for all (α, k) pairs in Region III. If the information asymmetry pertains to a , then the full-information wage schedule is a PBE for all (α, k) pairs in Regions II and III.

Here, because the information asymmetry pertains to the manager's ability and hence to his outside option, only part of the additional dollar in wages is attributed to an increase in the match surplus. As a result, a firm paying an additional dollar in wages is behaving as though its match surplus is higher, but by an amount strictly less than $1/\alpha$. Because the firm captures fraction $1 - \alpha$ of the match surplus, paying an additional dollar in wages increases the firm's date 3 market value by an amount strictly less than $(1 - \alpha)/\alpha$.

Because the market attributes part of any increase in wages to an increase in the manager's outside option and therefore not to an increase in the match surplus, the marginal effect of a wage increase on date 3 firm value is smaller when the information asymmetry pertains to managerial ability a rather than a match-specific productivity parameter γ . Thus, the region

of (α, k) for which the manager's wage is distorted upward relative to the full-information case is larger when the information asymmetry pertains to γ .

3.3 Asymmetric Information Regarding Firm Characteristics

Finally, we consider the case where the information asymmetry pertains to the firm's individual-specific productivity parameter q . Let the manager's individual productivity parameter a be common knowledge among all players of the game. Let the parties' match payoff be $f(q, a)$, where the f is common knowledge and the match-specific productivity parameter γ is suppressed. Define the full-information wage schedule as

$$\tilde{w}(q) = a + \alpha(f(q, a) - q - q).$$

To study the asymmetric-information case, assume that market participants cannot observe q directly, but instead condition their beliefs regarding firm value on the observed wage payment to the manager. Given this, a PBE wage schedule must satisfy

$$f(q, a) - \hat{w}(q) > k(f(\hat{q}, a) - \hat{w}(\hat{q})) + (1 - k)(f(q) - \hat{w}(\hat{q}))$$

for all $\hat{q} \neq q$. Assuming f is concave in q , we can replace this with a local no-mimic constraint, yielding the following constraint on equilibrium wage schedules:

$$\hat{w}' > kf_q$$

for all $q \in [q_L, q_H]$.

Again we inquire about the conditions under which the full-information wage schedule can be part of a PBE. Differentiating \tilde{w} with respect to q , we have

$$\tilde{w}'(q) = \alpha(f_q - 1).$$

So, if

$$\begin{aligned} kf_q &\leq \alpha(f_q - 1) \\ k &\leq \alpha\left(1 - \frac{1}{f_q}\right) \end{aligned}$$

for all q , then \tilde{w} can be part of a PBE. Concavity of f means \tilde{w} can be part of a PBE if

$$k \leq \alpha \left(1 - \frac{1}{f_q(q_H)}\right). \tag{9}$$

The comparative statics of this case are similar, but not identical, to the case where the information asymmetry pertains to the manager's ability. Specifically, the equilibrium wage schedule is weakly increasing in k and weakly decreasing in α . Notably, however, the effects of f_q here are the reverse of those of f_a above. If, for example, $f_q \leq 1$, then the full-information contract can never be part of the PBE. Note that if $f_q \leq 1$, then the full-information wage schedule is *weakly decreasing* in q . This occurs because the manager's pay is a plus fraction α of the match surplus, and the match surplus is weakly decreasing in q . Further, for f_q sufficiently large, the full-information wage schedule is part of a PBE. Higher f_q means the manager's full-information wage is increasing more rapidly with q , and so may satisfy the no-mimic constraint.

Analyses of the cases where (9) does not hold is straightforward. If

$$k > \alpha \left(1 - \frac{1}{f_q(q_L)} \right),$$

then the PBE wage schedule is the solution to

$$\begin{aligned} w' &= kf_q \\ w(q_L) &= a + \alpha(f(q_L, a) - q_L - a). \end{aligned}$$

If

$$\alpha \left(1 - \frac{1}{f_q(q_H)} \right) < k < \alpha \left(1 - \frac{1}{f_q(q_L)} \right),$$

then define q^* implicitly as

$$k < \alpha \left(1 - \frac{1}{f_q(q^*)} \right).$$

The PBE wage schedule is \tilde{w} for $q \leq q^*$ and is the solution to

$$\begin{aligned} w' &= kf_q \\ w(q^*) &= \tilde{w}(q^*) \end{aligned}$$

if $q > q^*$.

In Figure 4, we update Figure 3 by denoting the set of (α, k) values for which the manager's wage is distorted upward when the information asymmetry pertains to the firm-specific productivity parameter q . Here, the region of upward-distorted pay is even larger.

To see why, consider the effect on date 3 firm value when the firm pays the manager an additional dollar in wages. Paying one additional dollar in wages in the equilibrium action of a firm of type- \hat{q} , where \hat{q} is defined by

$$\alpha(f(\hat{q}, a) - f(q, a) - (\hat{q} - q)) = 1.$$

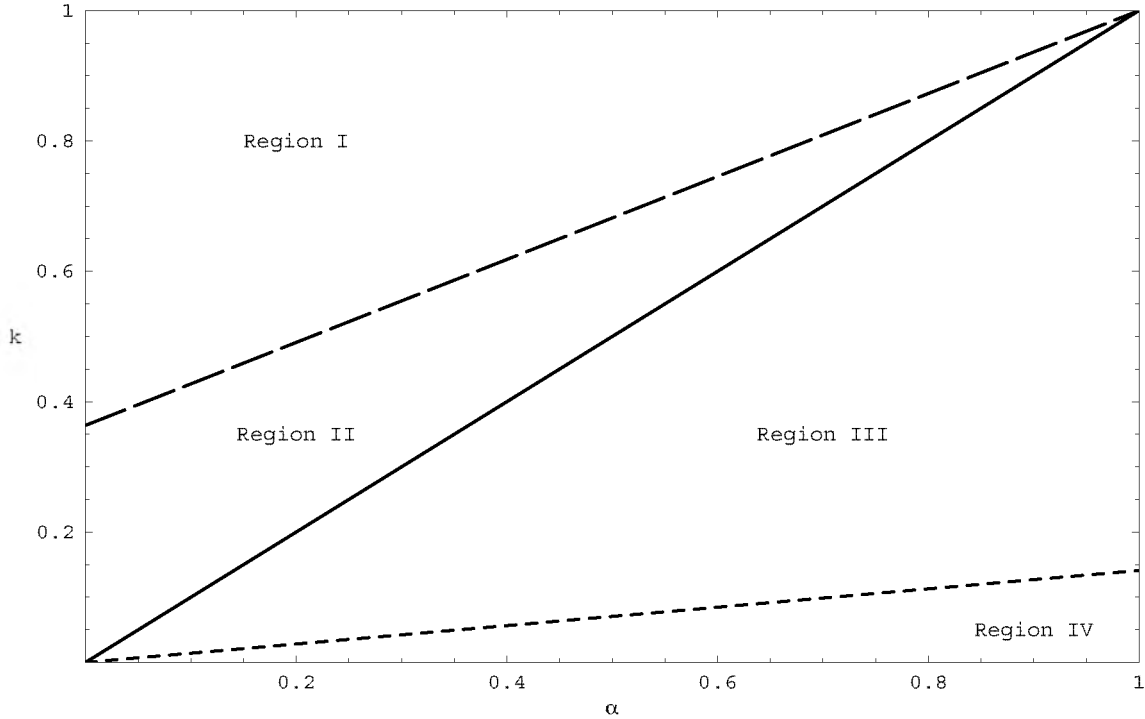


Figure 4: Let $f(q, a) = 16\sqrt{qa}$, $\alpha = 1/4$, and $q, a \in [1, 2]$. The solid line is Inequality (8), the dashed line is (6) assuming $q = 1$, and the dotted line is (9) assuming $a = 1$. If the information asymmetry pertains to q , then the full-information wage schedule is a PBE for all (α, k) pairs in Region IV.

A firm paying an additional dollar in wages is behaving as though its match surplus is higher by $\frac{1}{\alpha}$. Note, however, that the increase in date 3 firm value is strictly larger than $\frac{1-\alpha}{\alpha}$, because higher match surplus means a higher value of q . That is, by paying the manager more, the firm increases the market's assessment of the match surplus. Because the only unknown affecting match surplus is the firm-specific productivity parameter q , an increase in match surplus means the firm's outside option is higher as well. The marginal effect of a dollar of wages on date 3 firm value is highest when the information asymmetry pertains to q , second highest when γ is unknown, and lowest when a is unknown. This explains the pattern evident in Figure 4.

Before concluding this section, we briefly revisit the quotation from Edward S. Woolard, Jr. that we discussed in the introduction. Woolard indicates that increasing the manager's pay helps make "the company look strong." Notably, our analysis suggests that the temptation to

overpay a manager to influence market beliefs are strongest when there is significant uncertainty regarding firm-specific productivity and weakest when there is significant uncertainty regarding managerial ability. Overpaying a manager to increase the market’s assessment of managerial ability has a small effect on firm value, because the market expects the gains from increases in managerial ability to be captured largely by the manager. Overpaying the a manager to increase the market’s assessment of some firm-specific element of productivity has a large effect on firm value, because the market expects the gains from increases in firm productivity to be captured largely by the firm. Woolard’s assertion that Wobegon Effects are mostly likely intended to make the company look strong — rather than making the manager look good — therefore fits with our findings.

4 Assortative Matching

Next, we embed our analysis in a simple model of assortative matching. Such models typically assume a complementarity between some firm characteristic (say, size) and managerial ability. The complementarity implies that the equilibrium assignment of managers to firm will involve sorting: the highest ability manager will be matched with the largest firm, second highest with second largest, and so on. Assortative matching models have been studied extensively by labor economists; see Sattinger (1993).

The advantage of this approach over that taken above is that it allows us to endogenize the parties’ outside options. The bargaining between, say, the largest firm and the ablest manager is framed by the possibility that the largest firm could hire the second best manager or the best manager could seek employment at the second largest firm.

We focus on the case where the manager’s ability a is unknown (as in Section 3.1), and adjust our notation somewhat. Specifically, let $q_i \in [q_L, q_H]$ be a firm-specific characteristic that we interpret as firm i ’s “size” and let $a_j \in [a_L, a_H]$ (where $i, j \in \mathbb{N}$) be a manager-specific characteristic we interpret as manager j ’s ability. Let the gross surplus arising from their match be given by $f(q, a)$ where f is increasing, concave, and supermodular.

We start by deriving the full-information equilibrium wages. Consider a setting with two firms and two managers, where $a_1 > a_2$ and $q_1 > q_2$. Given supermodularity of f , it is straightforward to show that the equilibrium assignment of managers to firms places manager 1 with firm 1 and manager 2 with firm 2. We assume, as above, that each party has an option outside of this labor market equal in value to its individual-specific productivity parameter.

That is, if manager j (firm i) departs this market, he earns a payoff of a_j (q_i). Note that because firm 2's value would be strictly higher if it could attract manager 1 rather than manager 2, manager 1's reservation value in its wage bargaining with firm 1 is endogenously determined by firm 1's willingness to pay. Similarly, firm 1's reservation value is endogenously determined by its value when hiring manager 2 away from firm 2.

We derive these values by first considering firm 2 and manager 2. Here, the parties' reservation values are determined by their options outside of this labor market. Again assuming that the manager captures fraction α of the surplus, we have that manager 2's wage when working for firm 2 is

$$\tilde{w}_{22} = a_2 + \alpha(f(q_2, a_2) - q_2 - a_2). \quad (10)$$

As above, we denote full-information wages as \bar{w} . Firm 1's profit when employing manager 1 is

$$\tilde{\pi}_{22} = q_2 + (1 - \alpha)(f(q_2, a_2) - q_2 - a_2).$$

Things are more complex for the match between the first firm and the first manager. The reservation values here are determined endogenously — the first firm could bid for the second manager, and the first manager could work for the second firm. Specifically, note that firm 2 would be willing to bid manager 1's wage up to the point where firm 2 is indifferent between employing manager 2 and employing manager 1. Thus, the highest wage that firm 2 is willing to offer to manager 1 (call this \tilde{w}_{21}) is determined by

$$f(q_2, a_1) - \tilde{w}_{21} = f(q_2, a_2) - \tilde{w}_{22}.$$

Thus, the outside option for manager 1 in wage bargaining with firm 1 is

$$\tilde{w}_{21} = (f(q_2, a_1) - f(q_2, a_2)) + \tilde{w}_{22}.$$

Similarly, the reservation value for firm 1 in bargaining with manager 1 is

$$\tilde{\pi}_{12} = (f(q_1, a_2) - f(q_2, a_2)) + \tilde{\pi}_{22}.$$

Thus, surplus in the firm 1/manager 1 match is given by

$$f(q_1, a_1) - \tilde{w}_{21} - \tilde{\pi}_{12}$$

which reduces to

$$f(q_1, a_1) - f(q_2, a_1) - f(q_1, a_2) + f(q_2, a_2).$$

This quantity is positive, by the assumption of supermodularity of f . Again assuming the manager captures fraction α of the surplus, we have

$$\begin{aligned} w_{11} &= \alpha(f(q_1, a_1) - \tilde{w}_{21} - \tilde{\pi}_{12}) + \tilde{w}_{21} \\ &= \alpha(f(q_1, a_1) - f(q_2, a_1) - f(q_1, a_2) + f(q_2, a_2)) + f(q_2, a_1) - f(q_2, a_2) + \tilde{w}_{22}. \end{aligned} \quad (11)$$

The intuition here is that manager 1's wage is equal to manager 2's wage plus the full amount of value manager 1 would create at firm 2 over what manager 2 would create, plus fraction α of the match surplus at firm 1.

Next, we consider how equilibrium wages are affected when market participants cannot directly observe the value of the firm, and instead attempt to infer it from the manager's wage. We therefore merge our analysis of equilibrium wages under assortative matching with our model, from Section 3.1, of asymmetric information regarding managerial ability. (The analyses of settings where the asymmetry of information pertains to a match-specific or firm-specific parameter are similar.) Let k_i be the weight placed on date 3 share price by firm i . Suppose q_1 and q_2 and the function f are common knowledge. Manager abilities a_1 and a_2 are commonly observed by the two firms and the two managers, but are not observed by market participants. We focus on equilibria where only wages, not the equilibrium matches, are affected by the firms' myopia.

Within this framework, we establish three main results. First, we show that pay for manager 1 is weakly increasing in the myopia of firm 2. Second, we show that firm 1 and firm 2 are equally myopic, then pay for manager 1 increases faster (weakly) with that common degree of myopia than does pay for manager 2. Third, we show that any upward distortions in pay for manager 1 are greater when q_1 and q_2 are far apart.

To establish these results, note first that the analysis for firm 2 is identical to that in Section 3 above. We therefore have that the PBE wage schedule for manager 2 at firm 2 is

$$w_{22}(a_2) = a_2 + \alpha(f(q_2, a_2) - q_2 - a_2)$$

if

$$k_2 \leq \alpha + \frac{1 - \alpha}{f_a(q_2, a_L)}.$$

The PBE is the solution to

$$\begin{aligned} w'_{22} &= k_2 f_a(q_2, a_2) \\ w_{22}(a_L) &= a_L + \alpha(f(q_2, a_L) - q_2 - a_L). \end{aligned}$$

if

$$k_2 > \alpha + \frac{1 - \alpha}{f_a(q_2, a_H)}.$$

Finally, if

$$\alpha + \frac{1 - \alpha}{f_a(q_2, a_L)} < k_2 < \alpha + \frac{1 - \alpha}{f_a(q_2, a_H)},$$

then the PBE wage schedule is

$$\hat{w}_{22}(a_2) = \max [\bar{w}_{22}(a_2), \tilde{w}_{22}(a_2)],$$

where $\bar{w}(a_2)$ is the solution to the differential equation

$$w'_{22} = k_2 f_a(q_2, a_2)$$

with boundary condition

$$w_{22}(a_L) = a_L + \alpha(f(q_2, a_L) - q_2 - a_L).$$

Now suppose $k_1 = 0$, so there is no incentive for firm 1 to increase its manager's wage to affect market perceptions of value. In this case, manager 1's equilibrium wage schedule is given by

$$\hat{w}_{11}(a_1) = \alpha(f(q_1, a_1) - f(q_2, a_1) - f(q_1, a_2) + f(q_2, a_2)) + f(q_2, a_1) - f(q_2, a_2) + \hat{w}_{22}.$$

Thus, if k_2 is such that $\hat{w}_{22} > \tilde{w}_{22}$, then $\hat{w}_{11} > \tilde{w}_{11}$. The intuition for this result is straightforward. Firm 2's myopia causes it to overpay manager 2 in a futile attempt to increase its date 3 market value. This reduces firm 2's profit when employing manager 2, and hence increases firm 2's willingness to pay for manager 1.

This observation leads immediately to our first two conclusions. For $k_1 = 0$, we have that

$$\frac{d \hat{w}_{11}}{d k_2} = \frac{d \hat{w}_{22}}{d k_2},$$

that is, \hat{w}_{11} increases dollar-for-dollar with \hat{w}_{22} . For $k_1 > 0$, it is possible that firm 1 attempts to increase manager 1's pay to affect short-run market valuations. Thus, if $k = k_1 = k_2$, we have

$$\frac{d \hat{w}_{11}}{d k} \geq \frac{d \hat{w}_{22}}{d k}.$$

To get our third result, we derive the firm 1 no-mimic constraint.

$$\hat{w}'_{11} > k_1 f_a(q_1, a_1)$$

for all $a_1 \in [a_2, a_H]$. Recall that we assume the equilibrium matches are not upset by the asymmetry of information. Because the market's beliefs about the ability of the second manager (a_2) are correct in equilibrium, the no-mimic constraint must hold only for values of $a_1 > a_2$.

Under what conditions can the full-information contract $\tilde{w}_{11}(a_1)$ be part of a PBE? The full-information wage must increase sufficiently quickly with a_1 to make it unattractive for firms to try to increase managerial pay to boost date 3 market value. Differentiating (11), we have

$$\tilde{w}'_{11}(a_1) = (1 - \alpha)f_a(q_2, a_1) + \alpha f_a(q_1, a_1).$$

The full-information contract therefore satisfies (4) if

$$(1 - \alpha)f_a(q_2, a_1) + \alpha f_a(q_1, a_1) \geq k_1 f_a(q_1, a_1),$$

for all $a_1 \in [a_2, a_H]$. Re-arranging, we have that if

$$k_1 \leq \alpha + \frac{(1 - \alpha)f_a(q_2, a_1)}{f_a(q_1, a_1)} \tag{12}$$

for all $a_1 \in [a_2, a_H]$. then the full-information contract forms a PBE. Note that supermodularity implies that

$$\frac{f_a(q_2, a_1)}{f_a(q_1, a_1)} < 1,$$

so there are values for $k_1 \in [0, 1]$ for which the inequality in 12 is not satisfied. Note also that this inequality is not satisfied when q_1 is sufficiently large compared to q_2 . Why? If q_1 and q_2 are close together, the firm 1 and firm 2 are close substitutes as employers for manager 1. Thus, an increase in manager 1's ability doesn't increase the match surplus with firm 1 as much as it increases manager 1's outside option. An extra dollar paid to manager 1 therefore does increase the market's assessment of managerial ability, but the firm is not assumed to capture much value as a result. Thus, if the information asymmetry pertains to managerial ability, then pay is distorted upward when employers are not good substitutes for each other.

5 Discussion

5.1 Empirical Implications

These results offer a possible explanation for one of the most persistent puzzles in the executive compensation literature. Why have pay levels in the US risen so much more quickly than those in other developed nations? Two leading explanations for the recent increases in US pay levels — corporate governance failures and increases in demand for CEO talent — would seem

to predict no major across-country differences. Governance practices seemingly do not vary substantially across the developed world. Technological changes that increase the marginal return to ability would seem to affect firms equally across national boundaries.

Because pay increases in our model are triggered by information asymmetries in capital markets, our analysis suggests a link between characteristics of a nation's capital markets and pay levels in its managerial labor market. In particular, our main result from Section 4 — that an increase in myopia or short-termism at a small firm leads to an increase in pay at a large firm — suggests that the presence of small public firms with a significant interest in boosting short-run market valuations can affect equilibrium pay levels at larger firms. If small US firms are more eager to affect short-run market valuations than similar firms in other nations, then our model may help explain cross-country pay patterns.

It is, of course, difficult to make cross-national comparisons of corporate myopia, but one approach may be to focus on the liquidity of equity markets. Illiquid equity markets may mean high trading costs and, presumably, low share turnover. If a firm's shareholders face high costs associated with selling shares, then adjusting corporate policies to try to affect short-run share prices is likely to be less attractive. Butler et al. (2005) offer evidence that supports this line of reasoning; they show that investment banking fees associated with seasoned equity offerings are lower for firms with more liquid stock and attribute this to increased underwriting costs when shares are illiquid. If small US firms have significantly greater liquidity than small firms in, say, continental Europe, then the relative attractiveness of overpaying managers to influence short-run market perceptions may be greater in the US.

One empirical approach that we think is unlikely to produce a sensible test of our theory would be a firm-level, cross-sectional comparison of pay and some myopia measure within the US. Because, as we have shown, myopia at one firm can lead to higher pay at its labor-market competitors, it is not necessarily the case that pay will be higher at more myopic firms. Note in particular that our assortative matching model suggests that pay can be higher at the large firm even if the small firm is more myopic. Controlling for firm size addresses this problem only if size is the only firm characteristic that is relevant for matching.

5.2 Policy Implications

One important assumption of our model is that the firm's contract offer to the manager is affected by the firm's myopia. Following the reasoning of Dybvig and Zender (1991), this suggests that the firm's shareholders could benefit from delegating the job of contracting with

the manager to a third party, and manipulating that third party's preferences using incentive contracts. Specifically, a myopic firm finding itself in the position outlined in our model would benefit from hiring an agent, granting the agent equity that cannot be sold until our model's date 4, and then delegating the job of contracting with the manager to the agent. If the shareholders can credibly commit to this arrangement — and note that our discussion in Section 2 questions the credibility of such a commitment — then the manager's wage schedule should equal the full-information benchmark for all levels of shareholder myopia.

Notice that this suggested solution looks quite a bit like existing institutional arrangements surrounding CEO pay. Pay decisions are delegated to a subcommittee of the board of directors. If compensation committee members are less myopic than shareholders, then this arrangement may be an efficient response to Lake Wobegon Effect pressures. Adjusting our model to fit this setting is straightforward. Consider myopic shareholders who hire an agent to contract with a manager. Re-interpret the model's key myopia parameter, k , as the weight the agent places on firm's date 3 share price. This k will depend on the agent's own preferences, the contract given to the agent by the shareholders, and the extent to which the shareholders can credibly commit not to interfere in the pay process via renegotiation of the agent's contract. The degree to which directors value high short-run share prices is an open question, but at least some observers believe that boards do prefer to take actions that make the company look strong.

More broadly, we think this discussion points out that current institutional arrangements — which have been sharply criticized by some who assert that agency problems underlie recent CEO pay increases — may be an efficient response to informational problems in financial markets. If myopic shareholders currently succeed in delegating pay decisions to less-myopic directors, then forcing shareholders to take a more active role in determining pay could exacerbate the problems identified in our model. We therefore take our analysis as a cautionary tale: Unless economists can produce stronger evidence that intra-organizational agency problems rather than financial-market information asymmetries underlie recent CEO pay increases, then changes in SEC regulations or corporation law intended to give shareholders more direct power to determine CEO pay may do more harm than good.

6 Conclusion

In this paper, we have attempted to build an economic model of the Lake Wobegon Effect, whereby firms attempt to influence market perceptions of value by increasing managerial pay.

Our model builds in three key assumptions. First, there must be asymmetric information regarding the manager's ability to create value at the firm. Second, the pay package given to a manager must convey information about the manager's ability to create value at the firm. Third, the firm must have some preference for favorably affecting outsiders' perceptions of firm value.

Our main results are these: First, we show that when firms have a sufficiently strong preference for high-short-run share prices, managerial pay can be distorted upward relative to a full-information benchmark. If the firm has a very strong preference for high short-run share prices, or if the manager captures a small share of the match surplus under full information, then its pay is distorted upward relative to the full-information case. Second, we find that upward distortions in pay are more likely when the information asymmetry pertains to characteristics of the firm rather than characteristics of the manager. When the manager's ability is uncertain, increases in the manager's pay do boost the market's assessment of managerial ability; however, the manager — not the firm — captures rents associated with increases in managerial ability. Thus, the marginal increase in firm value associated with a dollar increase in managerial pay is low when the uncertainty pertains to a characteristic of the manager. Third, embedding our model in a simple model of assortative matching suggests that CEO pay at large firms can be affected by short-termism at small firms.

Our analysis suggests that the high relative growth rate of US CEO pay may be attributable in part to properties of US capital markets. If markets for equities of small US firms are more liquid than those of small firms in other developed countries, then the resulting temptation to overpay managers to affect short-run market values could affect pay at both small and large US firms. Our model also suggests that current institutional arrangements — where pay decisions are delegated to directors whose preferences may differ from those of shareholders — may arise as an efficient response to informational problems in financial markets.

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