Incorporating Morale into a Classical Agency Model: Incentives, Effort, and Organization

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Abstract:

This paper incorporates morale into a standard principal-agent model. When morale is observable, the agent’s effort level, the optimal piece rate, and the firm’s expected profits are all increasing in the worker’s level of morale. However, when morale is unobservable, workers shirk relative to the full information solution. The paper also considers a model of morale interdependence. The results suggest optimal organization of workers depending on whether workers are paid primarily with incentives or base rates. Additionally, the results have implications for effectively organizing workers during mergers.

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1 Introduction

In recent decades, research in labor economics has included theoretical and empirical work on employment relationships. Much of the research concentrates on incentive pay, in which an individual’s pay is linked to his performance, and the prevalent model used in analyzing these incentive issues is the principal-agent model. The main result of the standard principal-agent model is that the agent’s utility-maximizing level of effort depends only on his wage. Wages no doubt are a highly significant factor in a worker’s chosen level of activity; however, research in other social science fields suggests that wages are not the only significant factor affecting effort choice. One such factor proposed is morale, and researchers suggest that morale matters and should be accounted for in firm-level contracting decisions. This paper addresses this premise in a theoretical framework. In particular, this paper provides a framework for the analysis of morale in the classical principal-agent model. Possible applications of the model are discussed in the conclusion.

What is morale? It has been defined as “a positive and energetic attitude toward a goal” (Bateson and Mead 1941), “the mental contribution to action” (Hocking 1941), and “the state of the spirits of a person or group as exhibited by confidence, cheerfulness, discipline, and willingness to perform assigned tasks” (Webster’s Dictionary, emphasis mine). The common idea is that morale influences how hard individuals are willing to work. This interpretation is echoed by Hughes (1960), who says that in an academic context, "Good morale does not mean that professors are contented cows, but that they are in a mood to keep
up a good pace of work themselves and to set up a good pace and standard of work among their students."

Early discussions of morale in the economics literature were largely motivated by World Wars I and II (Slichter (1920), Brown (1949), and Shister (1950)). Morale has also appeared, although infrequently, in the more recent economics literature. Bewley (1999) treats morale like intrinsic motivation (discussed below) and proposes that workers receive “unconscious” utility from morale, and that this factors into their “consciously experienced” utility from their earnings and from the effort itself. Straka (1993) refines an empirical study by Norsworthy and Zabala (1985) which analyzes whether low worker morale is costly to firms using U.S. auto industry data. Due to specification problems, no definite link can be determined, although it is suspected. Pemberton (1985) develops a model of wage and employment dynamics in which workers have endogenous preferences in terms of wage aspirations, and he finds that the long-run effect of morale on productivity is strong.

Unlike Bewley (1999), this paper treats morale in accordance with the early papers on morale, which is different than the concept of intrinsic motivation. Intrinsic motivation is utility received by workers from certain characteristics of their job that are not related to the wages they are paid. In contrast, the interpretation here is that morale affects the cost of exerting effort. In particular, higher levels of morale make any given level of effort less costly. One consequence of this difference is that, as shown in Proposition 2, higher morale individuals

\footnote{See Benabou and Tirole (2003) for a thorough analysis of intrinsic and extrinsic motivation.}
are more responsive to incentives.

Incorporating morale into the classical agency model is a useful exercise for many reasons. First, morale matters and should be included. Second, it challenges the current literature to consider more seriously the significance of behavioral aspects in the decision making process. Third, it is important to analyze the impact of morale on the firm’s optimal compensation scheme. Fourth, in situations such as the mergers, the interdependence of workers’ morale is important and has implications for how the firm organizes its workers.

The paper proceeds as follows. Section 2 reviews a standard principal-agent model. Section 3 incorporates morale into the principal-agent model. Additionally, it examines the worker’s optimal effort level and the firm’s optimal compensation scheme when morale is both observable and unobservable. Section 4 analyzes morale interdependence. Section 5 discusses implications of the results, and Section 6 concludes.

2 The Classical Principal-Agent Model

In the classical principal-agent model (for a summary, see Gibbons (1997)), the firm (the principal) observes output $y$ from a worker (the agent), where $y = e + \varepsilon$; $e$ is the (unobservable) level of effort exerted by the agent, and $\varepsilon$ is an independently distributed noise term drawn from normal distribution $\phi(\varepsilon)$ with zero mean and variance $\sigma^2$. This noise term suggests that the principal is unable to perfectly observe the agent’s effort level. The firm pays the agent a
wage \( w = s + by \), where \( s \) is the fixed, or salary, component of the wage, and \( b \) represents the variable component, called the piece rate. The salary component is based on inputs, such as hours worked, whereas the piece rate is based on observed output.\(^2\)

The agent chooses a level of effort to maximize his expected utility. The utility function is given by \( u(x) = -\exp^{-rx} \), where \( r > 0 \) is the coefficient of absolute risk aversion and \( x = w - c(e) \) is the agent’s net payoff; the function \( c(e) \) represents the agent’s cost of exerting effort with \( c_e > 0 \) and \( c_{ee} > 0 \). Assume further that the price of output is one, the firm is risk neutral, and its profit is given by \( \pi = y - w \).

A standard result is that the optimal level of effort \( e^* \) is the value of \( e \) which equates the marginal cost of effort to the piece rate, or \( c_e(e^*) = b \). The agent’s certainty equivalent (or certain equivalent wealth) is his expected wage minus the cost of both exerting \( e^* \) and bearing risk, and the firm’s certainty equivalent (or certain equivalent income) is expected revenue minus expected compensation. The firm chooses the piece rate to maximize the total surplus (or total certainty equivalent) in order to specify an efficient contract.\(^3\)

\(^2\)The salary and piece rate components highlight the tradeoff between insurance and incentives. Note that \( b = 0 \) corresponds to full insurance, whereas \( b = 1 \) corresponds to full incentives. Briefly, full insurance removes all risk from the worker, but it also removes all direct incentives for the worker to increase the firm’s profit by increasing effort. See Kerr (1975), Gibbons (1997), Prendergast (1999), and Prendergast (2000) for detailed studies.

\(^3\)Maximizing total surplus is equivalent to the firm maximizing its expected profit subject to the agent’s individual rationality constraint, which says that accepting employment earns him a certain equivalent income of zero.
\[ TS = e^* - c(e^*) - (1/2)rb^2\sigma^2 \]  

(1)

and the optimal piece rate is given by

\[ b^* = 1/(1 + rc_{ee}\sigma^2). \]  

(2)

Equation (2) shows that the optimal piece rate is decreasing in \( r \), the coefficient of absolute risk aversion; as an individual becomes more risk averse, he prefers more insurance. Equation (2) is also decreasing in \( \sigma^2 \), the variance of the noise term; as the firm’s observes effort with less precision, the worker also prefers more insurance. Finally, (2) is decreasing in \( c_{ee} \), which is the rate of increase in the marginal disutility of exerting effort. As \( c_{ee} \) increases, the agent prefers for his wage to be tied less to his performance. Since \( r, \sigma^2, \) and \( c_{ee} \) are all positive, \( b^* \) is between zero and one, or between full insurance and full incentives.

3 Morale

Section 2 summarizes well-know results about optimal linear wage contracts in a classical-principal agent model. This section provides new insight into how these contracts should be modified when morale is both observable (Section 3.1) and unobservable (Section 3.2). When including morale in the agency model, one

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4In a different framework, Lazear (1986) also shows that firms are less likely to use piece rates as noise increases.
can think of morale as affecting the cost of exerting effort. Those with higher morale are more willing to complete their tasks, or in other words, they find it easier (less costly) to work, while low morale individuals find it more costly to exert that effort.\(^5\) Having a higher level of morale can be viewed as a “cost savings” of providing increased effort.

This idea is formally modeled as follows. Suppose that an agent’s level of morale, \(m\), is determined by a random draw before any contracts are offered, and that morale affects their effort choice along with their expected wage.\(^6\) The cost of effort is now \(\gamma(e,m)\) with \(\gamma_e > 0\) and \(\gamma_m < 0\), signifying that cost of effort will be increasing in the effort level, as usual, and decreasing in the level of morale.\(^7\) Also, as usual, \(\gamma_{ee} > 0\). Assume the cost-of-effort function is defined as \(\gamma(e,m) = c_e(e)/m\).\(^8\) As morale increases, the disutility from exerting any given level of effort decreases. Using this functional form, \(\gamma_{mm} > 0\); this restriction is meaningful because it implies that cost-of-effort savings are diminishing. In addition, \(\gamma_{em} < 0\).

\(^5\)In this way, morale is different from intrinsic motivation. Morale affects the cost of exerting effort, while intrinsic motivation is received as a benefit. Consequently, the two have different implications on optimal compensation schemes.
\(^6\)While this assumption is unrealistic, it is reasonable to assume that some individuals are more apt to being low or high morale. Certainly an individual’s morale changes over time or even from day to day, but some individuals are naturally endowed with higher morale than others.
\(^7\)In a paper addressing incentives and motivation in the public sector (Delfgaauw and Dur (2004)), workers are also heterogeneous with respect to the cost of effort in the sense that workers can be lazy, regular, or motivated.
\(^8\)The main reason for this simplification is tractability; it yields useful comparisons between the morale model and the standard model.
3.1 The First-Best Benchmark

Assume that the agent receives a random draw of morale $m$ that is observable. Under full information, the agent’s problem is to choose an effort level which maximizes his expected utility:

$$\max_e \int \exp^{-r(s+b(e+\varepsilon)-\frac{c(e)}{2})} \phi(\varepsilon) d\varepsilon. \quad (3)$$

Necessary conditions require that the optimal effort level $e^*$ satisfies

$$c_e(e^*) = bm. \quad (4)$$

Since $c_{ee} > 0$, the optimal effort level is increasing in both $b$ and $m$. The result that higher incentives increase effort is standard, but expression (4) also says that an individual with higher morale exerts more effort. As morale increases, the cost of providing any given level of effort decreases.

The agent’s certainty equivalent is given by $s + be^* - c(e^*)/m - (1/2)rb^2\sigma^2$ where $(1/2)rb^2\sigma^2$ is the cost of bearing risk, and the firm’s expected profit is $(1-b)e^* - s$. As in Section 2, the firm selects the optimal piece rate to maximize the total surplus:

$$\max_b e^* - c(e^*)/m - (1/2)rb^2\sigma^2. \quad (5)$$

Substituting $c_e(e^*) = bm$ and $\partial e^*/\partial b = m/c_{ee}$ into the first order condition
from (5), the optimal piece rate is given by

\[ b^* = \frac{m}{m + r_{ee}\sigma^2}. \tag{6} \]

As in the standard case, the optimal piece rate is decreasing in \( r, \sigma^2, \) and \( c_{ee}. \) This leads to Proposition 1, which discusses the relationship between \( b^* \) and \( m. \)

**Proposition 1** The optimal piece rate is increasing in the level of morale.

**Proof.** Differentiating (6) with respect to \( m, \)

\[ \frac{\partial b^*}{\partial m} = \frac{r_{ee}\sigma^2}{(m + r_{ee}\sigma^2)^2} > 0 \tag{7} \]

since all terms of Equation (7) are positive. \( \blacksquare \)

Proposition 1 says that a higher (lower) morale individual receives a higher (lower) optimal piece rate because the marginal cost of supplying another unit of effort is less (more) costly for this individual, and consequently, his wage should be tied more (less) to his performance.

Using Equation (6), one can examine which morale types are more responsive to incentives. It turns out that an individual with a higher level of morale is more responsive to the intensity of incentives. To show this is true, suppose that there are two individuals, and without loss of generality, suppose agent 1 has a

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9 Observe in (6) that when \( m = 1, \) the optimal piece rate given in the morale model is identical to that in the classical model. Furthermore, when \( m > ( < ) 1, \) the optimal piece rate is greater (less) than that in the standard model.
higher level of morale than agent 2 so that \( m_1 > m_2 \). From (4), we know that an agent’s optimal effort level is determined by \( c_r(e^*_i) = bm_i \). Differentiating (4) with respect to \( b \) results in \( \partial e^*_i / \partial b = m_i / c_{ee} \). Since \( m_1 > m_2 \), \( \partial e^*_1 / \partial b > \partial e^*_2 / \partial b \), which says that the agent with higher morale is more responsive (or supplies more effort) to more intense incentives. This proves the next proposition.

**Proposition 2** Higher-morale individuals are more responsive to incentives.

Proposition 2 exhibits another difference between morale and intrinsic motivation. Research on intrinsic motivation suggests that incentives can sometimes undermine the effort of individuals; however, this proposition shows that higher morale individuals always work harder in response to higher incentives.\(^{10}\) Hence, when morale and not intrinsic motivation is the psychological factor at work, the models lead to divergent results.

The firm sets \( s \) so that the agent’s certainty equivalent is zero (assuming that the utility from his outside option is 0) so that he is just indifferent to signing on with the firm. In other words, \( s \) solves \( s + b^*e^* - c(e^*)/m - (1/2)r(b^*)^2\sigma^2 = 0 \), or

\[
s = c(e^*)/m - b^* e^* + (1/2)r(b^*)^2\sigma^2. \tag{8}
\]

Call the value of \( s \) which satisfies (8) \( s^* \).

\(^{10}\)In an experimental setting, Gneezy and Rustichini (2000) cite intrinsic motivation as an explanation for findings in which performance of subjects actually decreases when they are offered only small levels of compensation, indicating that this compensation is insulting and works against intrinsic motivation. Similar results are found in a field experiment by Frey and Oberholzer-Gee (1997); the authors suggest that price incentives can “crowd-out” (intrinsic) motivation to perform certain tasks.
The relationship between the salary component of the wage and the level of morale is indeterminate. Lower-morale workers might generally earn a higher salary component since their wage is optimally less tied to performance, but higher-morale individuals exert more effort and thus bear more risk since effort is unobservable, and they are compensated for bearing this extra risk through the salary component.

Corollary 3 compares the wages earned by different morale types and is surprising in the sense that higher-morale individuals who exert more effort do not always get compensated more than their lower-morale counterparts who exert less effort. The result stands in contrast to the standard agency models in which wages are always a non-decreasing function of $e$.

**Corollary 3** The total expected wage received by an agent is not always higher for high morale individuals.

**Proof.** The expected wage paid to a worker is $w^* = s^* + b^*e^*$, or substituting from Equation (6), $w^* = c(e^*)/m + (1/2)r(b^*)^2\sigma^2$. Differentiating with respect to $m$ yields

$$
\partial w^*/\partial m = -c(e^*)/m^2 + (c'(e^*)/m) \cdot (\partial e^*/\partial m) + rb^*\sigma^2 (\partial b^*/\partial m). \tag{9}
$$

The first term in (9) is negative and the second two terms are positive, so $\text{sgn}(\partial w^*/\partial m)$ is ambiguous. □

The rationale behind Corollary 3 is interesting. Assume for the moment that there is no noise so that $\sigma^2 = 0$. Expression (9) reduces to
\[ \frac{\partial w^*}{\partial m} = -c(e^*)/m^2 + (c'(e^*)/m) \cdot (\partial e^*/\partial m). \]

After a few manipulations, it can be seen that the optimal wage contract is increasing in morale when

\[ [(\partial c(e^*)/\partial e^*) \cdot (e^*/c(e^*))) \cdot [(\partial e^*/\partial m) \cdot (m/e^*)] > 1. \tag{10} \]

The first bracketed term on the lefthand side of (10) is the elasticity of the cost of effort with respect to \( e \), and the second bracketed term is the elasticity of effort with respect to \( m \). Consequently, the entire lefthand side represents the elasticity of the cost of effort with respect to morale. Expression (10) says that overall wage compensation is increasing in morale if the percentage increase in the cost of effort due to an increase in morale is greater than 1.

When considering the noise term in Equation (9), one can no longer manipulate the expression in terms of elasticities. However, given the result from Corollary 3, in order to accommodate the possibility of lower morale types earning more than higher morale types, the cost of effort must be sufficiently small to overcome the premium high types earn for bearing more risk when output is observed with noise.

Corollary 3 says that optimal wages are not necessarily increasing in \( m \).\(^{11}\) However, regardless of which morale type receives a higher wage, the firm always earns greater expected profits from higher morale individuals.

\(^{11}\) A model in which morale is endogenously determined should preclude this result. Practically speaking, paying low wages to those who work hard would undermine high morale!
Corollary 4 The firm’s expected profits are increasing in morale.

Proof. To show that $\partial E[\pi]/\partial m$ is positive, note that $E[\pi] = e^* - c(e^*)/m - (1/2)r(b^*)^2\sigma^2$. Then

$$\partial E[\pi]/\partial m = \partial e^*/\partial m + c(e^*)/m^2 - (c_e(e^*)/m) \cdot (\partial e^*/\partial m) - rb^*\sigma^2 \cdot (\partial b^*/\partial m).$$

Noting that $c_e(e^*)/m = b^*$, this can be rewritten as

$$\partial E[\pi]/\partial m = (1 - b^*) (\partial e^*/\partial m) + c(e^*)/m^2 - rb^*\sigma^2 \cdot (\partial b^*/\partial m).$$

Substitute $\partial e^*/\partial m = (1/c_{ee}) \cdot [b^* + m \cdot (\partial b^*/\partial m)]$ and get

$$\partial E[\pi]/\partial m = [(1 - b^*) (m/c_{ee}) - rb^*\sigma^2] \cdot (\partial b^*/\partial m) + b^*(1 - b^*)/c_{ee} + c(e^*)/m^2.$$

(11)

The first term is zero from the first order condition from (5). The second term is positive since $0 < b^* < 1$, and the third term is also positive. Therefore, $\partial E[\pi]/\partial m > 0$. □

Corollary 4 simply says that the firm earns higher expected profits from individuals with higher levels of morale. This result is not completely transparent in that while the firm clearly earns more revenue from higher morale types, it sometimes (but not always) pays these workers higher wages.
3.2 Asymmetric Information

Section 3.1 highlights the role of morale in optimal contracts when morale is observable. However, morale may be difficult to observe. This section analyzes the ramifications of unobservable morale.

In determining the optimal compensation scheme within the firm under conditions of asymmetric information, one alternative is that the firm can offer a menu of wages and outputs \((w^*_i, y^*_i)\) which correspond to the first-best levels for each morale type as solved for in Section 3, where \(w^*_i = s^*_i + b^*_i y^*_i\). The question is whether it is optimal for individuals to reveal their true morale types by pursuing the contract they would have received under full information.

Since the firm offers a menu of first-best contracts, both the salary and the piece rate are dependent upon output, or \(w(y) = s(y) + b(y)y\). The first-best contract incorporates the result that individuals with higher morale work harder, so the firm’s first-order condition comes from assuming that the agent chooses \(e\) to maximize

\[
\begin{align*}
 u(e, m) &= u\left(s^*(e) + b^*(e)e - c(e)/m\right). \\
 u_e(z)\left(s^*_e + b^*_e e + b^* - c_e/m + (c/m^2) \left(\partial m/\partial e\right)\right) &= 0.
\end{align*}
\]

Let \(z = s^*(e) + b^*(e)e - c(e)/m\). Then the first order condition for (12) is

\[
 u_e(z)\left(s^*_e + b^*_e e + b^* - c_e/m + (c/m^2) \left(\partial m/\partial e\right)\right) = 0.
\]

The final term of Equation (13) comes from the firm’s assumption (implicit in that it offers the first-best contract) that as morale increases, effort increases.
However, the agent does not consider this effect; his level of morale is determined at the beginning of the game and is independent of the contract offered. In other words, the agent can shirk or overwork with no effect on $m$. Consequently, the agent’s first-order condition from (12) is

$$u_c(z) \left( s^*_e + b^*_e e + b^* - c_e/m \right) = 0. \quad (14)$$

By comparing the optimal effort levels given by (13) and (14), the worker’s revelation of type can be determined.

**Proposition 5** The agent’s optimal effort level under asymmetric information is less than that under full information.

**Proof.** Let $e^*$ solve (13) and $e^{**}$ solve (14). From (4),

$$\frac{\partial e^*}{\partial m} = \frac{1}{c_{ee}} (m \cdot (\frac{\partial b^*}{\partial m}) + b^*)$$

, which is positive, and since $\partial m/\partial e^* = 1 / (\partial e^*/\partial m)$, $\partial m/\partial e^* > 0$. Also, note that the second order necessary conditions hold since $\partial^2 u/\partial e^2 < 0$. Then (13) evaluated at $e^{**}$ is positive, which implies that $e^{**} < e^*$. ■

Proposition 5 says that under asymmetric information, workers do not reveal their true morale type when workers are offered the first-best contract; in other words, the worker has an incentive to not truthfully reveal his type. His utility from shirking is higher than his utility from truthfully revealing his type or from mimicking a higher-morale individual and overworking.
Under asymmetric information, production falls since agents exert less effort relative to the first-best, which means that the firm’s expected profits fall. Workers shirk because the marginal cost savings from mimicking a lower type in terms of effort outweighs the loss in marginal benefit from a lower piece rate. As a result, the firm faces a mechanism design problem in designing a contract which will induce truthful revelation of morale type. Although not the focus of this paper, the firm should be able to design a contract in which it can ensure that the higher morale agents to reveal their true type (by exerting higher effort levels). For example, in a simple setting where workers have either high or low morale, the firm could pay the high types an information rent that should be roughly proportional to the difference in cost of low effort relative to the two morale types.

4 Morale Interdependence

The previous section assumes that morale is given and unaffected by internal or external factors. While personal characteristics may naturally endow some individuals with lower or higher morale, external factors over which the individual has no control may also influence morale. One important factor in the workplace is the effect of one worker’s morale on that of others. For example, the success of a potential merger is dependent on the nature and extent of both morale levels and morale externalities. The interaction of workers from two formerly distinct groups may pose significant obstacles to managerial effectiveness. In
order to formally analyze this phenomena, this section looks at the case where an individual’s level of morale is dependent on interactions.

Suppose that the prevailing level of morale is determined by a convex combination of the lowest and highest morale levels, $m_L$ and $m_H$:

$$\hat{m} = \theta m_L + (1 - \theta)m_H,$$

where $0 \leq \theta \leq 1$. The representation in (15) describes polar as well as intermediate cases. For example, one polar case where $\theta = 1$ corresponds to the a situation in which low morale undermines the morale of the entire group (a "Bad Apple" model). In the other polar case, when $\theta = 0$, there are synergies present, and the highest morale agent improves the morale of the entire group (a "Rising Tide" model). A third interesting case occurs when $\theta = 1/2$, so that the prevailing level of morale is the average of the low and high types (an "Averaging" model). The results from this third model suggest optimal ways for managers to organize their workers.

If morale is observable and contractible by the firm, then from Section 3.1, the optimal wage for any morale type $\hat{m}$ is

$$w^*(\hat{m}) = c(e^*_m)/\hat{m} + (1/2)r(b^*_m)^2 \sigma^2.$$  (16)

Furthermore, the firm’s per capita expected profit is

$$E[\pi_i] = e^* - c(e^*_m)/\hat{m} - (1/2)r(b^*_m)^2 \sigma^2.$$  (17)
These equations will be used in the following analyses.

4.1 The “Bad Apple” Model

Suppose that in (15), $\theta = 1$. This as the “Bad Apple” model, where the lowest morale agent (the bad apple) corrodes the morale of his coworkers. In this model, even one low morale type among a firm employing all high morale types will ruin the morale of the entire group; consequently, workers exert less effort and ultimately, the firm’s profit falls. Then, using this model, the loss incurred due to hiring a bad apple can be determined.

If the firm employs $n$ workers and at least one of them is a low type, then $m = m_L$ and the firm’s expected profit is $nE[\pi_L]$. Suppose, however, that the firm employs $n$ high types, so $m = m_H$. The firm’s expected profit is $nE[\pi_H]$ where $E[\pi_H]$ is given in (17). If the firm hires even one low type, then according to this model, the morale of the $n$ high types decreases so that $m = m_L$ for all $n$ workers. Consequently, the firm’s expected profit from employing $n + 1$ low types is $(n + 1)E[\pi_L]$. The change in total profit can be expressed as

$$E[\pi_L] + n(E[\pi_L] - E[\pi_H]).$$  \hspace{1cm} (18)

In (18), the first term is the additional profit the firm earns from hiring the low type. The second term represents the cost of hiring the bad apple. This is the profit the firm loses when the first $n$ workers earn $E[\pi_L]$ rather than $E[\pi_H]$.

When the firm initially consists of all high types, hiring just one low type reduces the firm’s expected profit. Proposition 6 provides factors which exacer-
bate the cost of hiring this bad apple.

**Proposition 6** The firm’s loss from hiring of a bad apple is increasing in the number of workers \( n \) and the level of high morale \( m_H \) but is decreasing in the level of low morale \( m_L \).

The explanation of Proposition 6 is straightforward. First, as the number of workers increases, the firm’s loss in profits increases because more workers are earning \( E[\pi_L] \) for the firm rather than \( E[\pi_H] \). Second, as \( m_H \) gets larger, the expected profit from one high type \( E[\pi_H] \) increases, and the firm forgoes more profits by hiring the low type. Similarly, as \( m_L \) decreases, the profit earned by one low type \( E[\pi_L] \) falls, and as a result the cost of the bad apple increases.

### 4.2 The “Rising Tide” Model

Now, suppose that in (15), \( \theta = 0 \). This is the “Rising Tide” model of morale, which occurs when synergies are present. In this model, the high morale individual drives the morale of everyone else up to his own level, just as the rising tidewaters raise the level of all boats on the water. Using this model, one can evaluate the value of hiring a high type.

The interesting case occurs when the firm initially employs \( n \) low types, so that \( m = m_L \) for all \( n \). The firm earns expected profit \( nE[\pi_L] \). When the firm hires one high type, the morale of each individual rises to \( m = m_H \). As a result, the firm earns an expected profit of \( (n + 1) E[\pi_H] \). The addition of just one high type increases the firm’s expected profit by \( (n + 1) E[\pi_H] - nE[\pi_L] \). This can be rewritten as
\[ E[\pi_H] + n(E[\pi_H] - E[\pi_L]). \] (19)

In Equation (19), the value of a high type’s output is the first term, \( E[\pi_H] \), and the second term represents the value of the high type beyond his own output as he increases the total expected profit produced by his coworkers by \( n(E[\pi_H] - E[\pi_L]) \).

Similar to Proposition 6, the next proposition states factors which magnify the increased profits the firm enjoys by hiring its first high morale type when the Rising Tide model prevails. Intuition for the results are the same as in Proposition 6.

**Proposition 7** The value to the firm of a high type is increasing in the number of workers \( n \) and the level of high morale \( m_H \) but is decreasing in the level of low morale \( m_L \).

### 4.3 The “Averaging” Model

Finally, suppose that in (15), \( \theta = 1/2 \). This is the “Averaging” model, and it says that when individuals of both morale types work together, the level of morale is a compromise between the high types and the low types.

If the firm cannot fire or replace its workers, how best can the firm organize its workers? Since expected profit is increasing in morale, in the Bad Apple model, it is clear that the firm should keep high and low morale types separate, while in the Rising Tide model, the firm should integrate its work-
ers. The key issue when the work environment resembles the Averaging model is whether it is more profitable for the firm to integrate or segregate low and high types. In short, the solution depends on the relationship between the expected profit function and morale. Convexity of the expected profit function with respect to morale means that the firm would prefer to segregate its workers because $E[\pi_m] \leq (1/2)E[\pi_L] + (1/2)E[\pi_H]$, and conversely, concavity of the profit function suggests that the firm would rather integrate its workers since $E[\pi_m] \geq (1/2)E[\pi_L] + (1/2)E[\pi_H]$.

From Equation (11), the first derivative of the expected profit function with respect to morale can be reduced to

$$\frac{\partial E[\pi]}{\partial m} = b^*(1 - b^*) / c_{ee} + c(e^*) / m^2.$$ 

Upon making the usual assumption that the cost function is quadratic, the second derivative with respect to $m$ is

$$\frac{\partial^2 E[\pi]}{\partial m^2} = \left[ (1/c_{ee}) \cdot (\partial b^*/\partial m) \cdot (1 - 2b^*) \right] + \left\{ (1/m^2) \cdot [c_e(e^*) \cdot (\partial e^*/\partial m) - c(e^*) / m] \right\}.$$ \hspace{1cm} (20)

The sign of (20) is indeterminate, but the profit function will be convex in morale when (20) is positive, suggesting that the firm should segregate its workers according to morale type. This can happen when incentives are weak ($b^*$ is small, and specifically less than 1/2). Segregating the workers is reasonable
because wages are not closely linked to effort, and combining two types give high types little motivation to continue working hard when their increased efforts are only minimally rewarded. In addition to weak incentives, Equation (20) can be positive when the optimal wage contract is increasing in morale; the second term in brackets is the first derivative of $w^*$ with respect to $m$. Low types, even though they optimally exert less effort and earn smaller wages, may find it demotivating to work alongside individuals who work harder and thus (deservedly) earn more.

Consider two examples to illustrate the optimal organization of workers based on this result. In the academic profession, piece rates are small (or non-existent). This model suggests that high morale types (the productive and motivated researchers) and low morale types (their counterparts) should have their offices on different sides of the building. Since wages are not significantly linked to effort, combining the two types could result in overall reduced effort and research – after all, in the short run, where is the motivation in working hard if those who do not are being rewarded at the same rate? At the other extreme, consider a profession in which workers are paid mostly on commission, such as in car sales. Results from this section suggest that dealerships pool all of its salesmen because low morale types (those who exert less effort) either must increase their effort to compete with the high morale types or soon find a new profession.

\footnote{Of course, for assistant professors, this does not account for the fact that the tenure carrot looms in the long run.}
5 Discussion

Results from Section 3.1 suggest that an individual’s level of morale affects how hard he chooses to work, and consequently, this dependence has implications for the firm’s optimal wages. Furthermore, even when morale is not observable, the results have implications for organization of the firm. If, as seems reasonable, the morale of individuals interacts as in the Averaging model, this paper suggests that it is profit-maximizing for firms to pool their workers in professions where wages are driven by incentives. On the other hand, when wages are not driven by incentives, the profit-maximizing strategy is to separate workers by morale type; management should attempt to uncover morale types and segregate them accordingly.

The results in Section 3 assume that morale is exogenous. Since the firm earns higher profits from high morale individuals, firms can undertake morale-building activities to increase morale and ultimately effort choices. An interesting project would be to look at the optimal level of investment in morale-building activities, such as company retreats and employee appreciation days. These events do not necessarily increase the enjoyment an individual receives from performing daily tasks, but they do serve to boost the worker’s morale and consequently his willingness to work.

Finally, the results from this paper also provides implications on how managers can most profitably organize its workers during mergers. For example, mergers which provoke ill-will on a subset of workers may cause the work environment to resemble the Bad Apple model, and hence at least in the short run,
the paper suggests that managers should keep workers separate until morale improves.

6 Conclusion

This paper develops a theoretical framework for introducing morale into the standard principal-agent model and analyzes optimal compensation by the firm when morale is observable. In addition, it shows that under asymmetric information, the agent has an incentive to shirk when offered a menu of first-best contracts. This result is problematic because morale is difficult to measure, and the firm’s compensation scheme and profits are both suboptimal when it does not account for morale. Finally, the paper analyzes morale interdependence and suggests organization policies for firms based on their wage structures.

Areas for future research include developing a model where morale is endogenously determined. One could examine which factors affect an individual’s morale and, moreover, how morale evolves over time. Briefly, it seems that two of the most important external factors which can affect morale are relative considerations and expectations. Relative considerations include salary comparisons between coworkers. According to Akerlof and Yellen (1990), individuals care about their wages and the average wage of their coworkers. Kandel and Lazear (1992) qualify this assumption by also addressing the quality of effort; an individual cares about the relationship between his wage and effort level rel-

\[13\] For an informal discussion, see Bewley (1999a).
ative to the wage and effort of his coworkers, assuming that effort is observable. Expectations also play a large role in morale. For instance, workers form expectations about wages, including bonuses and raises. When a bonus is expected but not received, the morale of the worker may fall, and conversely, if a worker receives an unexpected raise or a bonus, the worker’s morale should increase.

Finally, as noted in Section 5, one can look at optimal investment in morale-building activities. This also requires the ability to measure morale, a challenging task, perhaps through the use of surveys or other metrics to "take the temperature" of individuals or an organization.
References


