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Altruism, social norms, and incentive contract design

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Abstract

We study theoretically and empirically the relation between altruism and incentive contract design. Theoretically, we extend Fischer and Huddart (2008) to investigate how social norms reinforce managers' altruistic preferences, thus affecting the optimal contract design related to incentive strength and performance measurement. Empirically, we draw on the notion of an organization's work climate to capture managers' altruistic preferences. Using data collected from a sample of 557 managers, we find that in a work climate where managers are mostly out for themselves, firms have lower pay-for-performance sensitivity and place a greater weight on aggregate performance measures. In addition, respondents report that they engage more in undesirable actions that are unproductive and costly to firm owners. In contrast, in a work climate where managers care about others (including peers in their organizational unit), firms place lower weights on aggregate performance measures. At the same time, respondents report that they supply more effort and engage less in undesirable actions.

Keywords Incentive contract · Performance measures · Social norms · Unproductive actions · Work climate

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1 Introduction

Individuals vary in the extent to which they care about the well-being of others (Becker 1974; Fehr and Gächter 2002). More altruistic people experience greater psychic benefits from taking actions that help others. These benefits are larger when these others also show that they care more about their peers (Levine 1998). In contrast, less altruistic people experience lower psychic costs from taking actions that potentially harm others. And if others also take harmful actions, the psychic costs for the less altruistic are further reduced. These simple descriptions about the interplay between altruistic *preferences* and the *actions* taken by other individuals have powerful, albeit mostly unexplored, consequences for the design of incentive compensation and performance measurement.

The idea that "the way things are done around here"—that is, the *social norm*—can influence how individuals behave is not controversial.[1] Indeed, much has been written in the press about how dysfunctional social norms can lead organizations awry, such as in the case of the Wells Fargo fake account scandal.[2] Social norms, whether harmful or beneficial, develop endogenously within organizations (Fischer and Huddart 2008), reflecting the actions commonly taken by employees. What is less well appreciated is that the working of these norms depends on the given altruistic preferences of the employees in these organizations.

When designing incentive compensation and performance measurement within organizations, superiors can take advantage of employees' altruistic preferences and their interplay with the social norm. The idea is that a superior takes the reinforcing effects of the social norm on employees' altruistic preferences into account when choosing between using more or less pay-for-performance and/or performance measure weightings. We, therefore, examine theoretically and empirically how employees' altruistic preferences are associated with the design of incentive compensation and performance measurement as well as with the employees' actions.

We model the setting of a firm with a principal and N identical agents. Each agent provides unobservable effort in the form of desirable and undesirable actions, where each action involves externalities for the other agents. Desirable actions increase the output of the agent's work unit and have a positive impact on the other agents' output. Undesirable actions (e.g., accounting manipulation) also increase work-unit output but have a negative impact on the other agents' output. Consider channel stuffing and deferred maintenance as examples. Channel stuffing by a division is the division's attempt to inflate its sales and earnings by pushing products out to distributors. The practice can detrimentally affect the demand for substitute products of other divisions. Similarly, if a division defers needed maintenance, this can have consequences for a centralized maintenance division

[1] Social psychologists make a distinction between descriptive norms and injunctive norms, defined as "what is *commonly done*" as opposed to "what is commonly *approved and disapproved*" (Kallgren et al. 2000). Consistent with Tayler and Bloomfield (2011), we view social norms as descriptions of what most people in the organization are doing.

[2] See "The Price of Wells Fargo's Fake Account Scandal Grows by $3 Billion," *New York Times*, February 21, 2020 (reported by Emily Flitter).

by increasing workloads and disrupting maintenance schedules. In each case, the undesirable action increases the output of the agent's work unit and decreases the output of other agents' work units and, if negative externalities are sufficiently strong, the firm's output.

Caring about the well-being of other agents affects the psychic benefits and costs the agent experiences when exerting effort on actions with externalities. In this context, building on Fischer and Huddart (2008), the agent internalizes social norms that reflect the activities of other agents employed by the firm. Specifically, due to the desirable action's positive externalities, the altruistic agent experiences feelings of satisfaction (psychic benefit) that, crucially, are *larger* when other agents also contribute positive externalities. Similarly, due to the undesirable action's negative externalities, the agent suffers feelings of guilt (psychic cost). However, these feelings of guilt are *smaller* when other agents are doing the same thing and imposing negative externalities is more common. In this sense, social norms, by which we mean what is commonly done by everyone else in the firm, reinforce the agent's altruistic preferences.

The model highlights the principal's optimal design of incentive compensation and performance measurement to shape the effects of the agent's altruistic preferences on the agent's actions. Specifically, we use the model to analyze the effects of altruistic preferences on (1) the incentive rate for total performance (i.e., pay-for-performance sensitivity) and (2) the relative weightings of individual and aggregate performance measures in the incentive contract. When the agent's altruistic preferences are such that he cares (more) about other agents and, thus, more about the positive externalities of his desirable action, the principal's *first* option is to take advantage of this altruistic preference and motivate more effort on the desirable action by increasing the incentive rate. Similarly, if the agent is more concerned about himself and, by implication, cares less about other agents, this implies that he experiences less discomfort from the negative externalities of his undesirable action. In such cases, the principal responds to the (lower) altruistic preference by choosing a smaller incentive rate.

The principal's *second* option is to adjust the measurement of the agent's performance. When the principal cannot rely on the agent taking actions that are consistent with the principal's objective, the accounting literature suggests using performance measures that capture these objectives and linking the agent's wealth to these measures (Feltham and Xie 1994; Baker 2000). Following Bushman et al. (1995) and Dur and Sol (2010), the use of aggregate performance measures (e.g., firm-wide profit that includes the agent's and other agents' performance) encourages the agent to internalize the externalities associated with his actions. Thus, the benefit, to the agent, of engaging in undesirable actions reduces as more aggregate performance is used to measure the agent's contribution.

When the agent cares more about the positive externalities of his desirable action, the principal will reduce the relative weight on the aggregate performance measure. Intuitively, when the agent inherently cares about his positive externalities, there is less need for the principal to use the aggregate performance measure to let the agent internalize the externalities of his actions. The principal will, however, increase the relative weight on the aggregate performance measure when the agent cares less about

the negative externalities of his undesirable action. This choice will let the agent strongly internalize the cost of his undesirable action.

The predictions of our theoretical model guide our subsequent empirical work, in which we estimate the association between senior management's choices regarding the design of incentive compensation and performance measurement and a lower-level manager's altruistic preferences, as well as the association between the lower-level manager's altruistic preferences and his action choices given senior management's choice of incentive compensation and performance measurement. We use data collected from a third-party survey that includes questions about the incentive rate (i.e., the pay-for-performance sensitivity) and the percentage weight placed on aggregate performance measures in compensation contracts. These empirical proxies map tightly into our theoretical constructs. The tight mapping matters to us, as these proxies not only represent the contracting choices available to the principal but also are of substantive interest to accounting researchers.

We measure productive effort (i.e., desirable action) as the percentage of hours worked by respondents compared to their contract. The survey also asks managers about their work unit's involvement in what we describe as undesirable actions, and we adapt an existing set of survey questions that capture managers' actions to manipulate accounting performance measures—behaviors such as accelerating sales, deferring needed expenditures, and shifting funds between accounts to avoid budget overruns—to proxy for the level of undesirable actions.

Measuring a manager's altruistic preferences poses significant challenges, which we attempt to address by relying on work in the management literature on the different types of ethical work climates that exist within firms.[3] These ethical work climates, which are distinct from ethical *behavior*, can be thought of as the strength of the *average altruistic preferences* among employees. Following Arnaud and Schminke (2012), employees in a *self-focused* work climate are mostly out for themselves. Their primary concern is to benefit themselves, even if it is to the detriment of others. The other prevailing work climate is one where employees are concerned with "others," including their peers in the organizational unit, other organizational units, the firm, and even society at large. In these *focus-on-others* work climates, there is a common altruistic preference to take actions that benefit others, including the firm. Our survey uses a manager's assessment of his unit's work climate to capture the altruistic preferences of the firm's employees. In line with above, a self-focused work climate corresponds to the manager being out for himself, whereas a focus-on-others work climate corresponds to the manager having preferences that make him care about his peers' interests.[4] Prior empirical research demonstrates that focus-on-others and self-focused work climates are not two sides of

[3] Victor and Cullen (1988) empirically document five dimensions to an organization's ethical work climate and that organizations have combinations of work climates. Others have adapted their set of survey questions and reduced the number of dimensions.

[4] Both Fischer and Huddart's (2008) model of social norms and Victor and Cullen's (1988) concept of a work climate rest on Kohlberg's (1984) framework of moral development.

the same coin but rather capture employees' preferences, which reflect combinations of altruism and egoism.

Our empirical results support our predictions on the design of incentive compensation and performance measurement. In particular, we find that the incentive rate in compensation contracts increases in focus-on-others work climates, albeit not significantly so, and decreases in self-focused work climates. In addition, the percentage weight on aggregate performance measures decreases for managers employed in organizational units with focus-on-others work climates and increases for managers employed in organizational units with self-focused work climates.[5] Together, these findings support the idea that incentive contract design is significantly associated with altruistic preferences.

We also examine the action choices of managers and find that, as predicted, managers with focus-on-others preferences supply more effort *and* (unpredicted by our model) engage less in accounting manipulations. At the same time, managers with focus-on-self preferences undertake more accounting manipulations. We do not, however, find a significant association with the amount of effort supplied by managers with these preferences.

Our study contributes to the literature in three ways. First, we extend Fischer and Huddart (2008) by showing how altruism affects a firm's performance measurement design. Our setting is distinguished from theirs by the positive and negative externalities of the agent's actions on other agents' outputs and by our allowing the agents' outputs to be correlated. Thus, demand for contracting on an aggregate performance measure arises endogenously in our setting. We introduce the idea that altruistic preferences can be captured by established empirical proxies for the work climate within an organization. By doing so, we are able to link two heretofore disparate literatures—the economics-based work on social norms and a vast collection of studies in management on work climates. We believe that the management literature on work climates can benefit from the rigorous analysis offered by economic models. Similarly, the social norm literature can benefit from the rich set of empirical findings on work climates in management.[6]

Second, important earlier work in accounting has studied the determinants of the use of performance measures (for a summary, see Ittner and Larcker (2001)). These studies have highlighted structural factors related to the organizational design and the firm's environment as key explanatory variables. Our study emphasizes that performance measures also have an important role in dealing with "softer" managerial problems, such as in settings where widely shared norms and values create a climate where it is

[5] Our reasoning is similar to Heinle et al. (2012), who show that firms are more likely to employ less precise but more congruent performance measures, such as aggregate measures, when contracting with managers who identify little with the organization. In contrast, firms use more precise but less congruent measures, such as work-unit earnings, when contracting with managers who identify strongly with the firm.

[6] The economics literature also emphasizes the role of norms in games with multiple equilibria, where a norm can have economic value if it creates a solution to a coordination problem (e.g., Bicchieri 2006). Consistent with this literature, in our setting descriptive social norms are enforced because norm violations trigger the possibility of social punishment as well as feelings of shame or guilt (e.g., Young 2008).

considered acceptable for managers to engage in undesirable behavior. We thus highlight an important potentially omitted correlated variable in studies on the determinants of performance measurement design: employees' altruistic preferences. Similarly, the management literature has investigated the association between work climates and managerial behavior but has ignored the role of contracting choices in steering managers away from undesirable actions that are associated with certain work climates and towards actions that benefit the firm. Thus, this literature too suffers from a potentially incomplete consideration of important determinants of managerial action choices.

Third, prior studies have suggested that personal values play a role in how individuals respond to social norms (Hobson et al. 2011). Indeed, Stevens and Thevaranjan (2010) argue that when agents' *moral sensitivity* is taken into account, traditional incentive solutions to contracting problems might be less prominent (see, also, Stevens (2018)). We deviate from this literature by considering the role of agents' altruistic preferences and find a more nuanced relation between altruism, incentive rates, and performance measurement. This is important, as both the economics and accounting literatures have suggested that social norms need to be *activated* to have an effect on individual behavior (Davidson et al. 2013; Bicchieri 2006). An emerging literature (e.g., Gibbons and Kaplan 2015) examines how "formal institutions" such as performance measurement and incentive compensation interact with what Graham et al. (2018) refer to as "informal institutions," namely social norms, to potentially achieve such activation.

2 Basic model of endogenous social norms

In this section, we present theoretical insights on the relation between altruistic preferences, social norms, and incentive contract design. First, in line with Fischer and Huddart (2008), we characterize the setting of a firm where altruistic agents—agents who care about the well-being of other agents—internalize social norms which reflect the activities of other agents employed by the firm. Second, we show how an agent's concern for other agents affects the principal's optimal design of incentive compensation and performance measurement, and how the agents' activities respond to these choices.

2.1 Agents' actions, performance measures, and compensation

We consider a firm where, at date 0, the principal, acting on behalf of the firm's risk-neutral owners, employs $N \geq 2$ identical risk-averse and altruistic agents to provide personally costly effort at date 1 in return for compensation at date 2. Each agent privately chooses a "desirable" action and an "undesirable" action, where each action involves externalities for the other agents. The desirable action is such that the agent's productive effort has a positive impact on his own output and a positive impact on the other agents' output. The undesirable action, such as the agent's engaging in accounting manipulation (e.g., channel stuffing or deferring needed expenditures), has a positive impact on his own output and a negative impact on

the other agents' output. The desirable action is overall beneficial to the principal, whereas the undesirable action imposes a cost on the principal (as detailed below). Specifically, the output of the agent's work unit, y_i, is characterized by

$$y_i = a_i + u_i + \sum_{j=1;j\neq i}^{N} \left(ma_j - \mu u_j\right) + \varepsilon_i, i = 1, \ldots, N, \tag{1}$$

where $a_i \geq 0$ and $u_i \geq 0$ represent the effort in the form of desirable and undesirable actions, respectively; $m > 0$ represents the marginal productivity of a unit of the agent's desirable action in other work units; $\mu > 0$ represents the (negative) marginal productivity of a unit of the agent's undesirable action in other work units; and the ε_is are normally distributed error terms with mean zero, variance σ_y^2, and covariance $\mathrm{Cov}\left[\varepsilon_i, \varepsilon_j\right] = \rho\sigma_y^2$, where ρ is the correlation coefficient for work-unit outputs and $\rho \in [-1/(N-1), 1]$ ensures that the variance-covariance matrix for the N error terms is positive semi-definite.

In line with Bushman et al. (1995), we interpret the output of the agent's work unit as accounting profit (e.g., divisional profit), and define the firm's aggregate output (e.g., firm profit), Y, as $Y = \sum_{i=1}^{N} y_i$. Specifically,

$$Y = \sum_{i=1}^{N} \left(ba_i - zu_i\right) + \varepsilon_Y, \tag{2}$$

where $b = (N-1)m + 1$ represents the total marginal productivity of a unit of the agent's desirable action, $z = (N-1)\mu - 1$ represents the total marginal productivity of a unit of the agent's undesirable action, and ε_Y is a normally distributed error term with variance $\sigma_Y^2 = N((N-1)\rho + 1)\sigma_y^2$ and covariance $\sigma_{yY} = \mathrm{Cov}[\varepsilon_i, \varepsilon_Y] = ((N-1)\rho + 1)\sigma_y^2$. To let the undesirable action u_i impose a cost on the principal, $z > 0$, we assume that $\mu > 1/(N-1)$. Similar to Ewert and Wagenhofer (2005) and Goldman and Slezak (2006), accounting manipulations have a real effect by decreasing firm profit. Hence, when an agent prefers a larger to a smaller work-unit output (e.g., because his compensation increases in y_i), his undesirable action is beneficial to the agent (because $d\mathrm{E}[y_i]/du_i > 0$) but costly to the principal (because $d\mathrm{E}[Y]/du_i < 0$). We also assume that $m < 1/(N-1)$; limiting the magnitude of positive externalities reflects the notion that large positive externalities to other work units would raise questions about the economic viability of having separate work units (cf. Milgrom and Roberts 1992).

To motivate effort, the principal uses compensation schemes based on work-unit output, y_i, and firm-wide output, Y. The compensation function is linear, $c_i = f_i + \beta_i y_i + \delta_i Y$, where f_i is the fixed compensation and $\beta_i \geq 0$ and $\delta_i \geq 0$ are the incentive rates for y_i and Y, respectively. When $N > 2$, limiting the agent's contract to (y_i, Y) is restrictive. Arya et al. (1997) and Che and Yoo (2001) show that using a common performance measure for a group of agents (such as firm-wide output) creates implicit incentives by encouraging mutual monitoring among the agents. Guay et al. (2019) find consistent evidence that top-management teams' bonus plans refer to a similar set of performance measures. Consistent with this line

of argument, none of the firms in our empirical sample includes the performance of other work units separately in its manager's performance evaluation.

The altruistic agent's choice of actions involves the conventional physical and opportunity costs of working, as well as the emotional benefits and costs associated with his actions' externalities that are moderated by the agent's norms of behavior. The altruistic agent enjoys feelings of satisfaction—a psychic benefit—because his desirable action involves positive externalities to other agents. Consistent with Gneezy (2005), he also suffers feelings of dissatisfaction or guilt—a psychic cost—because his undesirable action imposes negative externalities on other agents. Specifically, agent i incurs a personal cost of effort,

$$\kappa_i\left(a_i, \widehat{a}_i, u_i, \widehat{u}_i\right) = \frac{1}{2}\left(a_i - n_{a_i}\right)^2 + \frac{1}{2}\left(u_i - n_{u_i}\right)^2, \quad i = 1, \ldots, N, \tag{3}$$

where the n's represent the agent's norms for the desirable and undesirable actions, respectively. Expression (3) reflects the conventional feature that the agent's effort cost increases in the desirable and undesirable action (i.e., in equilibrium, $d\kappa_i/da_i > 0$ and $d\kappa_i/du_i > 0$) and that a higher value for a norm reduces the marginal cost of effort (i.e., $d^2\kappa_i/da_i dn_{a_i} < 0$ and $d^2\kappa_i/du_i dn_{u_i} < 0$).

In line with Fischer and Huddart (2008), the norm for each action is a function of the agent's personal norm and an endogenous social norm, where the social norm is descriptive and reflects the average level of the conjectured actions taken by all other agents in the firm. Specifically,

$$n_{a_i} = (1 - s_a)p_a + s_a\widehat{a}_i \text{ and } n_{u_i} = (1 - s_u)p_u + s_u\widehat{u}_i, \tag{4}$$

where p_a and p_u represent the agent's personal norms for desirable and undesirable actions, respectively; $\widehat{a}_i$ and $\widehat{u}_i$ represent the social norms of agent i for desirable and undesirable actions, respectively (with $\widehat{a}_i = \frac{1}{N-1}\sum_{j=1;j\neq i}^{N} a_j$ and $\widehat{u}_i = \frac{1}{N-1}\sum_{j=1;j\neq i}^{N} u_j$); and the s's represent the extent to which the agent is influenced by the behavior of others in the organization through the social norm (with $s_a \in [0, 1)$ and $s_u \in [0, 1)$).[7]

The agent's personal norms and sensitivities to social norms are the distinct elements of his utility function that allow for nuanced notions of altruism and egoism.[8] While the personal norm captures caring for others that is independent of the behavior of other agents, the sensitivity to the social norm captures the extent to which caring for others varies with the behavior of other agents. For example, a higher personal norm p_a for desirable actions implies a smaller marginal cost of effort for the desirable action *independent* of other agents' behavior (i.e., $d^2\kappa_i/da_i dp_a = -(1 - s_a) < 0$). Intuitively, for given financial incentives, a lower

[7] Expressions (3) and (4) apply the ideas presented in Fischer and Huddart (2008) to a LEN-framework with linear contracts, negative exponential utility, and normally distributed noise. We thank Steven Huddart for sharing his teaching notes on social norms in a LEN-framework.

[8] For example, Andreoni (1989) differentiates between pure altruism and "impure" altruism, where the latter describes individuals' experience of a "warm glow" when giving.

marginal cost of effort implies more effort. Thus, a higher personal norm p_a for desirable actions and a lower personal norm p_u for undesirable actions imply that the agent is inclined to do more of the desirable and less of the undesirable action—behavior that arguably characterizes a more altruistic agent.

In line with Levine (1998), the altruistic agent feels more altruistic toward other agents who are taking more of the positive externality action, and his guilt is smaller when other agents also impose negative externalities. For example, the psychic cost associated with his undesirable action decreases when other agents similarly engage in undesirable actions. A larger sensitivity s_u to the social norm for undesirable actions implies a smaller marginal cost of effort for the undesirable action (i.e., in equilibrium, $d^2\kappa_i/du_i ds_u < 0$). The marginal cost becomes even smaller as other agents engage more in undesirable actions (i.e., $d^3\kappa_i/du_i ds_u d\widehat{u}_i < 0$). Following the logic from above, a larger sensitivity s_a to the social norm for desirable actions and a smaller sensitivity s_u to the social norm for undesirable actions characterize a more altruistic agent.

An alternative way to capture notions of altruism is to let the agent benefit directly from the well-being of other agents (e.g., their payoffs). In such a model, an agent who has a greater concern for others would be more inclined to do more of the desirable and less of the undesirable action because the agent receives a greater benefit from doing so. In contrast, in our approach, an agent who has a greater concern for others has a higher norm for desirable actions and a lower norm for undesirable actions, implying a lower marginal cost for the desirable action and a higher marginal cost for the undesirable action. For given financial incentives, a lower marginal cost of effort implies more effort, i.e., a greater concern for others means that the agent does more of the desirable and less of the undesirable action. Our preferred, but arguably indirect, approach emphasizes norms of behavior as the mechanism that links altruistic preferences, incentive compensation and performance measurement, and the agent's behavior.

The agent's preferences for pay and effort cost are represented by negative exponential utility, with $U_i = -\exp[-r(c_i - \kappa_i)]$ and r being the coefficient of the agent's absolute risk aversion. As demonstrated by Holmstrom and Milgrom (1987), linear compensation functions, negative exponential utility, and normally distributed noise terms yield a simple representation of the agent's certainty equivalent, CE_i.

We solve for the optimal linear contracts offered by the principal using backward induction. The contracts induce an equilibrium in the agents' action-choice subgame when the social norms (i.e., the average conjectured efforts) equal average activities. The agent's incentive compatibility constraints, $(a_i, u_i) = \text{argmax } \mathrm{CE}_i$, reflect that the agent chooses actions that maximize his certainty equivalent. Even though the other agents do not observe his actions, the agent's altruistic preferences affect his actions via his feelings of satisfaction or guilt. Anticipating the equilibrium in the agents' action-choice subgame, the principal chooses contract parameters (f_i, β_i, δ_i) for all $i = 1, \ldots, N$ that maximize the firm's output net of the agents' compensation, $\mathrm{E}\left[Y - \sum_{i=1}^{N} c_i\right]$, subject to the agents' individual rationality constraints, $\mathrm{CE}_i \geq 0$. Individual rationality constraints ensure acceptance of the contracts by the agents. Without loss of generality, we scale each agent's reservation certainty equivalent to zero.

2.2 Optimal incentive parameters and altruistic preferences

Each agent chooses actions such that his marginal cost of effort equals the marginal benefit, i.e., $a_i{-}n_{a_i} = \beta_i + \delta_i b$ for the desirable action and $u_i{-}n_{u_i} = \beta_i{-}\delta_i z$ for the undesirable action. Reiterating from above, the norms, n_{a_i} and n_{u_i}, influence the agent's behavior because they reduce the agent's marginal cost of effort. For each action, the agent's marginal benefit increases in the incentive rate for own output, β_i, and varies with the incentive rate for firm-wide output, δ_i. By contracting on firm-wide output, the agent internalizes the positive externalities associated with his desirable action and the negative externalities associated with his undesirable action.

Following (4), the norms reflect the agent's personal and social norms, where the social norms are the average levels of the conjectured actions taken by the other agents. In line with Fischer and Huddart (2008), the agent correctly anticipates the social norms. In equilibrium, the agent's optimal actions (indicated by an asterisk) are given by

$$a_i^* = p_a + \left(1 + \frac{s_a}{N{-}1}\right)^{-1}\left(\beta_i + \delta_i b + \frac{s_a}{(N{-}1)(1{-}s_a)}\left[\sum_{j=1}^{N}\beta_j + \delta_j b\right]\right) \text{ and } \quad (5)$$

$$u_i^* = p_u + \left(1 + \frac{s_u}{N{-}1}\right)^{-1}\left(\beta_i{-}\delta_i z + \frac{s_u}{(N{-}1)(1{-}s_u)}\left[\sum_{j=1}^{N}\beta_j{-}\delta_j z\right]\right) \text{for } i = 1, \ldots, N. \quad (6)$$

Following (5) and (6), the agent's actions vary with the personal norms, the sensitivities to social norms, the agent's own incentive parameters, and the incentive parameters of all other agents. Specifically, a_i^* increases with the sensitivity to the social norm for desirable actions, s_a, the effect of which is reinforced when the principal also motivates other agents to engage in desirable actions (i.e., the term in brackets in (5)). Similarly, u_i^* increases with the sensitivity to the social norm for undesirable actions, s_u, the effect of which is reinforced when the principal motivates other agents to engage in undesirable actions (i.e., the term in brackets in (6)).

Noting that identical agents imply symmetry of the incentive parameters, $\beta_1 = \ldots = \beta_N = \beta$ and $\delta_1 = \ldots = \delta_N = \delta$, the optimal actions in (5) and (6) simplify to

$$a_i^* = p_a + \frac{(\beta + \delta b)}{(1{-}s_a)} \text{ and } u_i^* = p_u + \frac{(\beta{-}\delta z)}{(1{-}s_u)}. \quad (7)$$

Following (7), the agent's desirable and undesirable actions increase in his personal norms for the desirable and undesirable action, respectively, reflecting the reduced marginal cost of effort associated with a higher personal norm. For given financial incentives, a_i^* increases in the sensitivity to the social norm for desirable actions, s_a, and u_i^* increases in the sensitivity to the social norm for undesirable actions, s_u. These relations reflect that a larger s_a increases the contribution of a_i^* to the principal's profit directly by increasing firm-wide output and indirectly by increasing other agents' social norms for the desirable action (thereby motivating these agents to increase their desirable actions). Similarly, a

larger s_u increases the negative contribution of u_i^* to the principal's profit directly by reducing firm-wide output and indirectly by increasing other agents' social norms for the undesirable action (thereby motivating these agents to increase their undesirable actions).

The principal anticipates the equilibrium (7) in the agents' action-choice subgame and chooses contract parameters (f, β, δ) that maximize the firm's output net of the agents' compensation, subject to the agents' individual rationality constraints. We have:

Lemma 1: *The principal's choice of the agent's incentive parameters, β^* and δ^*, is given by*

$$\beta^* = \frac{bz(b+z)\left(\frac{1}{1-s_a}-\frac{1}{1-s_u}\right)+r\left(\frac{b\left(\sigma_Y^2-b\sigma_{yY}\right)}{(1-s_a)}-\frac{z\left(\sigma_Y^2+z\sigma_{yY}\right)}{(1-s_u)}\right)}{\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2}, \tag{8}$$

$$\delta^* = \frac{(b+z)\left(\frac{b}{1-s_a}+\frac{z}{1-s_u}\right)+r\left(\frac{b\left(-\sigma_{yY}+b\sigma_y^2\right)}{(1-s_a)}+\frac{z\left(\sigma_{yY}+z\sigma_y^2\right)}{(1-s_u)}\right)}{\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2}, \tag{9}$$

and f^* is set to ensure that each agent earns his reservation certainty equivalent.

Proof: See Appendix 1

The agent's personal norms, p_a and p_u, affect his action choice according to (7), but with the assumptions of the LEN-framework, the personal norms do not affect the principal's choice of incentive parameters. To understand the incentives offered by the principal, it is helpful to first consider the benchmark setting where the agents' behavior is not sensitive to other agents' behavior, i.e., $s_a = s_u = 0$. Using (8) and (9), we can express the ratio of the incentive rates on firm-wide output, δ^*, and work-unit output, β^*, as:

$$\left.\frac{\delta^*}{\beta^*}\right|_{s_a=s_u=0} = \frac{\left[b^2+z^2-(b-z)\frac{\sigma_{yY}}{\sigma_y^2}+\frac{(b+z)^2}{r\sigma_y^2}\right]/\sigma_Y^2}{\left[b-z-\left(b^2+z^2\right)\frac{\sigma_{yY}}{\sigma_Y^2}\right]/\sigma_y^2}. \tag{10}$$

In line with Banker and Datar (1989), the numerator and denominator reflect the signal-to-noise ratio for firm-wide and work-unit output, respectively, adjusted for the information included in the other performance measure. For instance, ceteris paribus, the principal reduces the relative weight on firm-wide output when the noise in firm-wide output, σ_Y^2, is large. As work-unit output is non-congruent with firm-wide output, in line with Feltham and Xie (1994), the principal chooses a relatively large weight on firm-wide output. This is the term $(b+z)^2/\left(r\sigma_y^2\right)$ in the numerator. The effect of the non-congruency on relative incentive rates is small, however, when the weight on

work-unit output is small (e.g., work-unit output is noisy, i.e., σ_y^2 is large).

When the agent's behavior is influenced by other agents' desirable actions, $s_a \neq 0$, the principal takes advantage of the direct and indirect effects of a larger s_a and motivates more effort a_i^* by increasing the incentive rate on work-unit output, $d\beta^*/ds_a > 0$. The principal also increases the incentive rate on firm-wide output as long as firm-wide output is not too noisy, $d\delta^*/ds_a > 0$ if $\rho < (b-1)/(N-1)$, where $(b-1)/(N-1) > 0$. Similarly, when the agent's behavior is influenced by other agents' undesirable actions, $s_u \neq 0$, the principal responds to the direct and indirect effects of a larger s_u and chooses a smaller incentive rate on work-unit output and a larger incentive rate on firm-wide output, $d\beta^*/ds_u < 0$ and $d\delta^*/ds_u > 0$.

To study the effects of the agent's altruistic preference on his incentives in our empirical setting, we restate the compensation function as $c_i = f + (\beta+\delta)\left[\frac{\beta}{\beta+\delta}y_i + \left(1-\frac{\beta}{\beta+\delta}\right)Y\right]$, where $(\beta+\delta)$ is the incentive rate for total performance, $\frac{\beta}{\beta+\delta}y_i + \left(1-\frac{\beta}{\beta+\delta}\right)Y$; $\frac{\beta}{\beta+\delta} \in [0,1]$ is the percentage weight on work-unit output, y_i; and $\left(1-\frac{\beta}{\beta+\delta}\right)$ is the percentage weight on firm-wide output, Y. The restated compensation function is consistent with our survey measures that capture the incentive rate for total performance and the percentage weights placed on diverse performance measures.

Proposition 1 summarizes the comparative statics regarding the agent's altruistic preferences. Because the agent's personal norms do not affect the principal's choice of incentive parameters, Proposition 1 only considers variations of the agent's sensitivity to social norms. We provide intuition below.

Proposition 1: *Let* $\rho \in \left[\underline{\rho}, 1\right]$;

(i) a larger sensitivity to the social norm for desirable actions implies

$$\frac{d\left(\beta^*+\delta^*\right)}{ds_a} > 0, \frac{d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)}{ds_a} < 0, \frac{da_i^*}{ds_a} > 0, \text{ and } \frac{du_i^*}{ds_a} > 0;$$

(ii) a larger sensitivity to the social norm for undesirable actions implies

$$\frac{d\left(\beta^*+\delta^*\right)}{ds_u} < 0, \frac{d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)}{ds_u} > 0, \frac{da_i^*}{ds_u} < 0, \text{ and } \frac{du_i^*}{ds_u} > 0 \text{ if } z < \bar{z},$$

where $\underline{\rho} < 0$ *and* $\bar{z}$ *are constants defined in Appendix 1.*

Proof: See Appendix 1

Following Proposition 1, when the agent is more sensitive to the social norm for desirable actions, the principal increases the incentive rate for total performance and reduces the percentage weight on firm-wide output, $d(\beta^*+\delta^*)/ds_a > 0$ and $d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)/ds_a < 0$. First, the positive association between s_a and a_i^* implies a positive association between s_a and $\beta^*+\delta^*$ because a_i^* is more sensitive to variations of δ^* as compared to β^* (see (7), noting $b > 1$). Second, with a relatively large weight on firm-wide output (due to the non-congruency of work-unit output), the rate on work-

unit output β^* is more elastic regarding s_a than the rate on firm-wide output δ^* (i.e., $\frac{d\beta^*/ds_a}{\beta^*/s_a} > \frac{d\delta^*/ds_a}{\delta^*/s_a}$), implying that $\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)$ decreases in s_a. Intuitively, when the agent inherently cares about his desirable action and the associated positive externalities (captured by a large s_a), then there is less need for the principal to use the aggregate performance measure to let the agent internalize the externalities of his actions. Consequently, a larger sensitivity to the social norm for desirable actions implies more desirable action and, as a "collateral damage," more undesirable action. Intuitively, the benefit to the principal from motivating more desirable action dominates the cost from motivating more undesirable action.

When the agent is more sensitive to the social norm for undesirable actions, the principal reduces the incentive rate for total performance and increases the percentage weight on firm-wide output, $d(\beta^* + \delta^*)/ds_u < 0$ and $d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)/ds_u > 0$. Intuitively, the principal mutes the undesirable action by choosing a small incentive rate and by letting the agent strongly internalize the cost of his undesirable action via a large percentage weight on firm-wide output. Despite these measures, a larger s_u implies a larger u_i^* when the effects of s_u on $\beta^* + \delta^*$ and $\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)$ are small, which is the case when the undesirable action is not too costly (i.e., $du_i^*/ds_u > 0$ if $z < \overline{z}$). Intuitively, muted effects of s_u on $\beta^* + \delta^*$ and $\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)$ limit the collateral damage due to less desirable action, $da_i^*/ds_u < 0$.

Proposition 1 suggests that the principal views her choice of incentive rates and the weighting of the aggregate performance measure as substitute mechanisms. For instance, a large sensitivity to the social norm for desirable actions implies a large incentive rate and a small percentage weight on firm-wide output. Proposition 1 also suggests that the two forms of the agent's altruistic preferences that vary with the behavior of other agents (i.e., the sensitivities to the social norm for desirable and undesirable actions) have largely opposite effects. That is, a large sensitivity to the social norm for desirable actions or a small sensitivity to the social norm for undesirable actions implies a large incentive rate and a small percentage weight on firm-wide output. These opposite effects of the two forms of the agent's altruistic preferences suggest that our empirical design might have discriminatory power since we measure both forms separately and test the associated relations, to which we turn next.

3 Sample selection, survey design, and variable measurement

3.1 Sample selection

To test our theory, we used a third-party database obtained from a salary survey conducted by Robert Walters, a professional recruiting consultancy, for the Dutch Controllers Institute (CI). The survey was sent to the members of the Vereniging voor Registercontrollers (VRC, *Association of Registered Controllers*). While the survey

was conducted under the responsibility of the CI, one of the co-authors of this study advised on questionnaire design and, in return, was able to include some additional questions unrelated to compensation.

VRC membership is open to those who pass advanced (post-graduate) examinations in controlling or auditing, and it entitles members to the legally protected title of "registered controller." All (approximately 7,900) members received an email invitation to participate in an online survey. The initial sample consists of 701 respondents, a response rate of 9 percent. We exclude 82 respondents working as managers on a temporary basis, as these managers are unlikely to have detailed information about company practices. We exclude another 62 respondents who have jobs without managerial responsibility. Thus, our main sample consists of 557 observations from managers of "work units." Respondents' job titles include chief executive officer, manager, chief financial officer, group controller, and finance manager.

We assess whether there is non-response bias in our survey data. What matters is not just the (non-)response rate, but also the difference between respondents and non-respondents on the characteristics of interest. Following Biemer (2010), we examine non-response bias by comparing the characteristics of early respondents (i.e., responses obtained in the first two weeks) and late respondents (i.e., responses received six weeks later) in the online survey. In untabulated tests, we find that early respondents tend to be slightly more experienced and older than late respondents. We do not find any differences in firm size between the same two groups. More importantly, no significant differences exist between the two groups in the variables of interest, that is, the prevailing work climate as a proxy for the respondents' altruistic preferences, the weight placed on aggregate performance measures, the incentive rate, and the degree to which units engage in desirable or undesirable actions. Non-response bias is unlikely to play a major role in our tests.

The source of our data is a survey, and we treat each respondent as if they represent a unique firm. There is a potential concern about common-method and single-informant bias when survey data uses questions that capture respondents' perceptions or attitudes rather than hard objective facts. Common-method and single-informant bias can occur when responses are caused by the survey instrument itself rather than the actual perceptions or attitudes of the respondent. We carefully design the questionnaire to avoid such bias, taking steps to protect respondent anonymity, separate the measurement of the variables of interest, and improve item clarity. We also ask, when possible, for "hard" information rather than inquiring about perceptions—in particular, in cases where we gather data on the features of the incentive contract of the respondent. Importantly, the survey is presented to respondents as the Controller's Institute Annual Salary Survey, so respondents are unlikely to guess that the data from it will also be used to investigate the relation between altruistic preferences, social norms, incentive contract design, and action choices. Thus, the influence of implicit theories or the respondents' assumptions about the co-occurrence of items should be relatively minor. We also conduct two statistical tests to estimate the extent to which common-method bias affects our findings. Our statistical remedies include a correlational marker technique (Lindell and Whitney 2001) and Harman's (1967) single-factor test. Together, these procedures suggest that neither common-method

nor single-informant bias unduly affects our inferences. (Details are available in the Appendix 3.)

Table 1, Panel A presents summary statistics on the respondents. On average, respondents are male and 40 years of age. Although only 11 percent of respondents in the sample are female, this proportion reflects the gender composition of the VRC membership, which is predominantly male (83 percent). As is true for the population, about 70 percent of the respondents are between 31 and 45 years of age; 49 percent of the sample have a CPA degree and thus are also members of the Royal NIVRA (the Dutch professional society of auditors). Consistent with their mean age, respondents have, on average, more than 16 years of work experience, including 5.4 years at their current firm and 2.8 years in their current job. They have reported to their current superior for about 2.4 years and have close to six people reporting directly to them.

The industry profile of the sample is reported in Table 1, Panel B. The (financial) services sector represents approximately 20 percent of the sample; manufacturing represents 22 percent; and the remainder of the sample represents a cross-section of industries (e.g., transportation, utilities, and construction). Compared to the population, we have fewer respondents from the service-related industries (sample = 45.25 percent; population = 60 percent); this difference is mostly due to the professional services and real estate sectors.

3.2 Survey design

The primary purpose of the survey is to gather information about the compensation packages of the VRC membership. In addition to details about salary, bonus, and benefits, respondents are asked to provide background information about their jobs, the firms in which they are currently employed, and the department with which they are most closely associated. Respondents are guaranteed anonymity to improve response rates on several sensitive questions, including those about the ethical climate in their organizational units, the degree to which their units are involved in undesirable actions, and salary-specific information. The anonymity of the respondents (and their places of employment) prevents us from linking our survey data to data from annual reports, stock prices, or other publicly available data. However, the survey uses adaptations of well-established sets of questions ("instruments") that have been extensively used and validated in prior work. We also believe that the use of an online survey improves the veracity of responses, as respondents may feel embarrassed to admit to undesirable actions or to reveal incentive contract details when facing an interviewer or even when completing a mailed questionnaire.

Our empirical model includes latent variables, constructed from the answers to multiple individual questions (so-called "indicators"). The use of such multi-item measures allows us to test the reliability and validity of each latent construct. In some cases, we have alternative measures for the same construct to test for convergent validity (i.e., whether two independent empirical measures of a single underlying latent construct are correlated).

Table 1 *Summary statistics on respondents' characteristics and sample firms*

Panel A: Summary statistics on repondents (N=557)

Variable	Mean	Std.Dev.	Min.	Median	Max.
Age	40.21	6.75	26.00	39.00	62.00
Total work experience (in years)	16.82	7.36	3.00	15.00	43.00
Tenure in current firm (in years)	5.44	5.38	0.00	4.00	38.00
Length of reporting relation with superior (in years)	2.43	2.52	0.00	2.00	18.00
Tenure in current position (in years)	2.77	2.68	0.00	2.00	19.00
Number of people reporting directly to respondent	6.13	11.77	0.00	4.00	172.00
= 1 if Gender = female	0.11	0.32	0.00	0.00	1.00
= 1 if auditor (CPA) qualification	0.49	0.50	0.00	0.00	1.00
= 1 if embedded in controlling department	0.07	0.26	0.00	0.00	1.00
Job insecurity	1.71	1.00	1.00	1.00	7.00
= 1 if respondent has long horizon in firm	0.76	0.42	0.00	1.00	1.00
= 1 if respondent's job is at headquarter level	0.49	0.50	0.00	0.00	1.00

Panel B: Industry profile of sample

Industry description	#	%
Agriculture, hunting, and fishing	17	3.05
Mining	7	1.26
Traditional manufacturing	84	15.08
High-tech manufacturing	39	7.00
Production, distribution and sales of gas, electricity, or water	24	4.31
Construction and building	42	7.54
Repair of consumer products and retail	35	6.28
Transportation, logistics, warehousing, and communication	57	10.23
Financial institutions	110	19.75
Real estate and professional services	43	7.72
Public government and social security	23	4.13
Health	43	7.72
Environment, culture, recreation, and other services	33	5.92
Total	557	100.00

This table presents summary statistics on respondents' characteristics and sample firms. *Gender* is an indicator variable that equals 1 if the respondent is female. *Auditor (CPA) qualification* is an indicator variable that equals 1 if the respondent is a CPA. *Embedded in controlling department* is an indicator variable that equals 1 if the respondent's job is in the firm's controlling department. *Job insecurity* is based on the amount of fixed salary the respondent is willing to give up to guarantee job security. *Long horizon in firm* is an indicator variable that takes the value of 1 if the respondent reports that the likelihood that they will be working at their current firm 10 years from today is higher than 50 percent. *Respondent's job is at headquarter level* is an indicator variable that equals 1 if the respondent is working at the firm's headquarters.

3.3 Variable measurement

Appendix 2 includes all survey items and descriptions of the scales used for each variable in this study. Panels A and B of the appendix provide summary statistics based on the original scale (e.g., a scale of 1–7) of all survey items used to measure each of the latent variables. Items are standardized (mean = 0; std. dev. = 1) when entered into the factor analysis, consistent with the recommendation in Nunnally and Bernstein (1994). Because items are standardized at the earliest possible moment, the final sample means of the latent constructs do not have to equal zero.

These tables also provide details on the tests of reliability and validity usually undertaken on survey multi-item measures. We find that our latent variables have good reliability (as measured by Cronbach's alpha) and construct validity (following from the "clean" factor pattern in the cross loadings) (Harman 1967). Correlations with measures used to test for convergent validity are also supportive. Based on these tests, we convert the responses to the individual items associated with a latent variable to a single variable by using their factor scores. Panel C provides the instrument used to capture the percentage weight placed on aggregate performance measures, and Panel D presents the survey items used to measure the control variables as well as the variables we use in construct validity tests.

3.3.1 Variables of interest

Incentive rate for total performance (i.e., $\beta^* + \delta^*$ in the model) is measured as the maximum percentage that respondent-managers can earn as performance-dependent pay, compared to their fixed salaries. On average, the *incentive rate* is about 22 percent of fixed salary, but performance-dependent pay ranges between 0 and 300 percent (see Table 2).

We measure the *(percentage) Weight on aggregate performance* (or $\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)$ in the model) using a set of questions from prior research (Abernethy et al. 2004). This instrument provides respondents with a list of performance measures and asks them to indicate the weight, in percentages, that their superiors place on each measure when evaluating their performance. We construct this variable by summing the aggregate performance measures that the respondents indicate their superiors use—that is, performance measures that are not specific to their own units.

We operationalize the respondents' actions by measuring supply of effort and the degree to which the respondent's organizational unit engages in actions that could change the reported accounting numbers. *Supply of effort* (i.e., the productive effort a_i^* provided for the desirable action in the model) is measured directly by comparing the actual number of hours worked to the number of contracted hours. To account for heterogeneity in the contractual hours of full-time employees, we scale this variable by the number of hours contracted. We use two questions from the survey to construct this measure. The first question simply asks the respondent to state the contracted number of hours to be worked each week. We compare this with another question taken from the survey, which asks how many hours a week the respondent works on average. *Supply of effort* is the scaled

Table 2 Summary statistics on variables of interest and control variables

Variable	Mean	Std. Dev.	Min.	Median	Max.
Variables of interest					
Focus-on-others	0.00	0.93	-3.77	-0.06	3.01
Focus-on-self	0.00	0.88	-3.66	-0.03	3.74
Incentive rate for total performance (% of fixed salary)	21.88	29.96	0.00	15.00	300.00
%Weight on aggregate performance	24.98	30.23	0.00	10.00	100.00
Degree of desirable action (Supply of effort, % hours worked vs. contracted)	21.62	16.84	-85.00	21.19	75.00
Degree of undesirable action (Accounting manipulation)	0.00	0.78	-1.46	0.00	2.54
Control variables					
Structure	-0.02	0.90	-1.95	-0.01	1.75
Within-firm interdependencies	0.00	0.79	-1.89	0.10	1.59
Information asymmetry	0.01	0.98	-2.38	-0.09	1.79
Competition	0.00	0.90	-2.51	0.07	2.23
Firm size (log of employees)	7.81	2.48	1.79	7.70	13.08
Capital market pressure	1.76	2.15	0.00	0.00	4.62

This table presents summary statistics of the variables of interest and the control variables used in the study. *Focus-on-others* is the measure of altruistic preferences (s_a) related to the social norm for desirable actions using the Arnaud (2010) instrument. *Focus-on-self* is the measure of altruistic preferences (s_u) related to the social norm for undesirable actions using the Arnaud (2010) instrument. *Incentive rate for total performance* is the maximum percentage respondents can earn as performance dependent pay, compared to their fixed salaries. *%Weight on aggregate performance* is the percentage weight placed by the superior on aggregate performance measures (e.g., firm-wide profits) when periodically evaluating performance. *Degree of desirable action* is the *Supply of effort*, the actual number of hours' work compared with the number of contracted hours scaled by the number of contracted hours. The *Degree of undesirable action* is based on the Merchant (1990) instrument of *accounting manipulation*. *Structure* is a measure of decentralization based on the Vancil (1978) instrument. *Within-firm interdependencies* is a measure of spillovers between different work units based on Bouwens and van Lent (2007). *Information asymmetry* is a measure of the knowledge differences between the superior and the respondent based on Dunk (1993). *Competition* is based on Khandwalla (1972) and measures the rate of change in the work environment of the respondent. *Firm size* is the natural log of the number of employees working for the firm. *Capital market pressure* is the natural log of 1 plus the percentage of equity owned by "anonymous shareholders."

difference between these two answers, with positive values denoting respondents working more hours than are contractually stipulated and negative values denoting respondents working fewer hours. We note that there are many determinants, in addition to productive effort, that affect hours worked; however, providing more effort often goes hand in hand with more hours worked. We test for convergent validity by using (untabulated) data collected elsewhere in the survey about the number of contractual holidays of the respondent compared with the actual number of days the respondent is on leave. Our idea is that respondents who provide more productive effort are less likely to use their full holiday allowance. We find a strong positive correlation between *Supply of effort* and the percentage of unused holiday allowance of respondents (corr. = 0.19, $p < 0.01$).

We capture the degree of work unit undesirable action (i.e., the effort u_i^* provided for the undesirable action in the model) using an instrument that was designed initially by Merchant (1990) to capture *Degree of accounting manipulation* (see also the description in Chow et al. 1995). We focus on accounting manipulation as an *example* of an undesirable action for two reasons. First, it is likely to resonate with our sample of respondents, who are educated as controllers and financial professionals. Second, we face the challenge of defining an undesirable action for respondents who work in a wide range of firm environments. Accounting manipulation occurs across industries, in professional services as well as in manufacturing, and in young as well as mature firms.[9] As such, using this example of an undesirable action in our empirical work reduces potential measurement error issues.

Respondents indicate how frequently in the past year they or someone in their organizational unit has engaged in the following behaviors: deferring a needed expenditure, accelerating a sale, shifting funds between accounts to avoid budget overruns, and, finally, buying equipment from the outside so that the expenditure is capitalized rather than expensed. In contrast to the four-point original instrument, the survey uses a seven-point Likert scale (1=never occurs, 4=occurs sometimes, 7=occurs frequently).

Altruistic preferences are captured using a set of questions developed by Arnaud (2010), based on Victor and Cullen's (1988) earlier research on organizations' work climates. The instrument is particularly useful for testing our model, since the questions ask managers not to report on *their own values* (where answers could be biased) but rather on their perception of how much people in their organizational unit care about themselves or care about others. Relying on the notion that managers self-select into organizations where their values are consistent with the prevailing work climate (Bandiera et al. 2015), we infer the managers' concerns for others from their responses. We use the shortened version of the instrument, which includes two constructs. The first includes three items that reflect the manager's assessment that, on average, individuals in their unit are mostly out for themselves and that their primary interest is to benefit themselves—what we refer to as a *Focus-on-self* (e.g., "In my department, people's primary concern is their own personal benefit"). The other construct is a five-item measure that captures a *Focus-on-others*, where managers perceive that individuals in their unit primarily care about others, including the firm (e.g., "People in my department are actively concerned about their peers' interests").

The instrument is able to subtly capture the respondent's altruistic preferences. Following Victor and Cullen (1988), an organizational unit's work climate reflects the shared *values* (i.e., preferences) of the unit's employees and guides them by reinforcing the normative system that governs decision making. For instance, in a unit where employees pay attention to others'

[9] We recognize that not all accounting manipulation is harmful for the principal. For example, Carter et al. (2007) show that firms might benefit from responding to investor pressures by smoothing reported income. Our survey questionnaire, however, attempts to ask (without triggering social desirability bias) about harmful-to-the-principal manipulation. We then control for potential capital market pressures to manipulate accounting numbers to tease out any such action that is intended to help the firm.

interests (high *Focus-on-others*), the employees enjoy feelings of satisfaction when they choose desirable actions that contribute positive externalities, suggesting a low cost for the desirable action. Likewise, a unit's employees that share a high score on *Focus-on-self*—even if this focus is to the detriment of others—experience minimal guilt due to their negative externalities, suggesting a low cost for the undesirable action. Strong altruistic preferences, therefore, manifest in high scores on *Focus-on-others* and weak scores on *Focus-on-self*.

The idea that an organizational unit's work climate reflects *shared* values of the unit's employees means that a strong work climate enhances employees' feelings of satisfaction due to the positive externalities and weakens employees' feelings of guilt due to the negative externalities, because employees throughout the unit will behave in a consistent way. This strengthening of employees' feelings is similar to the reinforcement associated with social norms (see the discussion of expressions (5) and (6)), suggesting that *Focus-on-others* and *Focus-on-self* relate to the agents' sensitivities to the social norms s_a and s_u, respectively. Arnaud and Schminke (2012) note that *Focus-on-self* and *Focus-on-others* "are not simply two sides of the same coin" but rather are independently important. Indeed, people's preferences can reflect combinations of altruism and egoism (Andreoni 1989). In addition, the distinctiveness of *Focus-on-self* and *Focus-on-others* is demonstrated in their capacity to exert a differential effect on behavior, that is, on action choices. To isolate each construct's unique contribution to actions, we use an orthogonal rotation to form the two factors.

3.3.2 Control variables

The control variables capture salient aspects of the organizational unit's operating environment, as well as heterogeneity among respondents. Tables 1 and 2 present summary statistics for all control variables. *Structure* is a measure of decentralization based on Vancil (1978). *Within-firm interdependencies* is a measure of spillovers between different units in the respondent's firm and is based on Bouwens and van Lent (2007). *Information asymmetry* is based on six survey items that ask respondents to indicate whether their superiors or the respondents themselves are more knowledgeable about some key aspects of their businesses. These questions were first published by Dunk (1993) and have received support from those working in agency theory (Raith 2008). *Competition* is constructed from six questions, taken from Khandwalla (1972), that ask the respondent to describe the rate of change in their work environments. A representative question is "What is the rate of change in competitor strategies?" *Firm size* is the natural logarithm of the number of employees working for the firm. *Capital market pressure* is the natural logarithm of 1 plus the percentage of equity owned by "anonymous shareholders," as provided by the respondents. Respondent-specific controls are indicator variables and include *gender* (1 if female, 0 otherwise), *Auditor (CPA) qualification* (1 if CPA, 0 otherwise), and whether the respondent is *embedded in controlling department* (1 if yes, 0 otherwise).

The survey asks respondents what percentage of their salaries they would be willing to give up to guarantee job security for one year, two years, and five years. Answer

categories are 0 percent, 1–5 percent, 5–10 percent, 10–15 percent, 15–20 percent, 20–25 percent, and more than 25 percent. We take the mean of their answers to these three alternative periods as a measure of *Job Insecurity*. Table 1 indicates that the majority of respondents are not willing to sacrifice pay for job security (the median answer category is 1). The survey also asks respondents to report the likelihood that they will still be working for their current firm 10 years from today (1 if *respondent has long horizon in firm*, that is, if the respondent reports a higher than 50 percent probability that they will still be working at their current firm 10 years from now, and 0 otherwise). About three-quarters of the sample report that they have a long horizon in the firm. Another survey question asks if *the respondent's job is at headquarter level* (1 if yes, 0 otherwise). About half of the respondents are working at the firm's headquarters.

3.3.3 Caveats about the operationalization of the theoretical model

Our interest is in describing the association between constructs that—at least conceptually—emerge endogenously in organizations (i.e., the incentive compensation and performance measurement as well as the activities of those working in the organization). The complex and subtle interrelations among these constructs pose significant challenges empirically. For this reason, we use our theoretical model to derive predictions about the associations that are expected to arise in equilibrium, and estimate *reduced form* regressions to test our hypothesized relations.

Relatedly, while the model helps in characterizing the expected associations between the variables of interest, challenges remain in operationalizing the theory to measurable constructs. For example, the only exogenous parameters of interest, given the structure of the model, are the individuals' sensitivities to the social norms, s_a and s_u. The survey does not literally ask about individual sensitivities to social norms, due to concerns about the psychometric properties of the survey questions if we were to do so. Indeed, rather than asking about the respondents' own sensitivity to social norms, the survey asks about their perceptions of the social norms in their organizational unit (Burks and Krupka 2012). Because social norms are endogenous, however, the individual sensitivities map into the social norms themselves. Hence, in some sense, we argue that the survey data allows us to test the endogenous variable associations suggested by the theory.

Furthermore, in theory, altruistic preferences are the outcome of the agent's personal norms and their sensitivity to social norms. In the survey, we do not measure the agent's personal norms, but this does not present a threat to our inferences. The analysis in Subsection 2.2 suggests that personal norms do not affect the principal's choice of incentive parameters, and the effect of the personal norms on the agent's actions is not in conflict with the effect of the sensitivities to social norms.

There are other instances where we concede some slippage between the model and our empirical operationalization. We argue, however, that these instances balance the demands of asking psychometrically valid survey questions and the need to be as close as possible to the theoretical construct. For example, our model employs the incentive rate for total performance ($\beta^* + \delta^*$), whereas our proxy is the agent's performance-dependent pay relative to the fixed compensation, which in terms of the model equals

$\Delta_i^* = (\beta^* + \delta^*)\left[\frac{\beta^*}{\beta^*+\delta^*}y_i + \left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)Y\right]/f^*$. As y_i and Y are are normally distributed, Δ_i^* is unlimited. However, assuming that the contract investigated in the model reflects the "incentive zone" of a manager's compensation contract, our survey question about the maximum percentage the manager can earn as performance-dependent pay, compared to his fixed salary, proxies for $\beta^* + \delta^*$, as in this case $\beta^* + \delta^* \propto \max\{\Delta_i^*\}$.

4 Results

4.1 Model and econometric issues

Our theory derives eight testable predictions of the equilibrium relation between altruistic preferences—captured by *Focus-on-others* (to reflect the sensitivity to social norms for the desirable action, s_a) and *Focus-on-self* (to reflect the sensitivity to social norms for the undesirable action, s_u)—and the incentive contract parameters $\beta^* + \delta^*$ and $\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)$ (i.e., *Incentive rate for total performance* and *%Weight on aggregate performance*), as well as the equilibrium effort in the form of the desirable action a_i^* (*Supply of effort*) and the undesirable action u_i^* (*Degree of accounting manipulation*). These predictions are summarized in Proposition 1, which also highlights that the predictions related to altruistic preferences are ultimately linked to the agent's sensitivity to social norms, with no role for his personal norms, despite the latter being an ingredient in the agent's utility function that describes him as altruistic or egoistic.

As a first test of our theoretical predictions, we consider the simple correlations between our proxies for s_a (*Focus-on-others)* and s_u (*Focus-on-self*) and the incentive rate, the weight on aggregate performance measures, and the manager's efforts in the form of the desirable action and the undesirable action. Table 3 presents the correlation table for the variables used in this study. Proposition 1 (i) centers on s_a, i.e., the focus-on-others, and predicts a positive correlation with the incentive rate for total performance, $\beta^* + \delta^*$, with the degree of work unit desirable action, a_i^*, and with the degree of work unit undesirable action, u_i^*. In addition, the proposition predicts a negative correlation between s_a and the percentage weight on aggregate performance, $\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)$. We find mixed results for these predictions in the correlations. There is little evidence of an association between *Focus-on-others* and *Incentive rate for total performance* ($\rho = -0.01$). However, we find a significant negative correlation between *Focus-on-others* and *%Weight on aggregate performance* ($\rho = -0.08$). In addition, as predicted, we find a significant positive correlation with the degree of work unit desired action, as captured by *Supply of effort* ($\rho = 0.11$). At the same time, we find an unexpected significant *negative* correlation between *Focus-on-others* and the *Degree of accounting manipulation* ($\rho = -0.12$).

Proposition 1 (ii) considers the role of the focus-on-self preference (s_u). From the proposition, it follows that *Focus-on-self* should exhibit a negative correlation with *Incentive rate for total performance* and *Supply of Effort* and a positive correlation with

Table 3 Pearson correlations between variables of interest and control variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(2)	-0.03	1.00						
(3)	-0.01	-0.07	1.00					
(4)	-0.08	0.06	0.23	1.00				
(5)	0.11	-0.08	0.23	0.09	1.00			
(6)	-0.12	0.10	0.02	0.03	0.13	1.00		
(7)	0.03	0.04	-0.07	-0.04	-0.05	0.05	1.00	
(8)	0.08	-0.04	0.02	0.07	0.02	-0.05	0.03	1.00
(9)	-0.10	0.02	0.04	-0.18	0.02	0.03	0.13	0.01
(10)	-0.13	0.00	0.09	0.05	0.13	0.22	0.10	0.13
(11)	0.00	0.04	0.17	-0.15	0.11	0.13	0.07	-0.02
(12)	0.00	0.01	0.21	-0.08	0.13	0.15	-0.01	-0.06
(13)	0.05	0.13	-0.05	-0.10	-0.10	0.02	0.03	0.05
(14)	0.03	0.03	0.02	0.12	-0.10	-0.19	-0.03	0.00
(15)	0.01	0.06	-0.04	0.01	-0.08	-0.09	0.01	0.02
(16)	-0.02	0.02	0.04	0.11	0.04	0.05	0.00	-0.06
(17)	0.09	0.05	0.00	0.00	0.02	-0.08	0.06	0.01
(18)	0.08	-0.06	-0.03	0.21	0.03	-0.12	-0.08	0.15

Table 3 (continued)

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(2)									
(3)									
(4)									
(5)									
(6)									
(7)									
(8)									
(9)	1.00								
(10)	0.10	1.00							
(11)	0.24	0.13	1.00						
(12)	0.13	0.15	0.48	1.00					
(13)	0.04	0.01	0.05	-0.02	1.00				
(14)	-0.13	-0.09	-0.22	-0.15	-0.02	1.00			
(15)	0.02	0.02	0.01	-0.01	0.10	0.04	1.00		
(16)	-0.11	0.11	-0.01	-0.01	-0.02	0.15	0.06	1.00	
(17)	0.01	0.00	0.07	0.08	-0.02	0.03	-0.03	0.01	1.00
(18)	-0.25	-0.06	-0.44	-0.31	-0.04	0.23	-0.27	0.05	-0.04

This table presents the pairwise Pearson correlation coefficients between the variables of interest and the control variables used in the study. Correlation coefficients above 0.065 (in absolute value) are significant at the ten percent level. (1) *Focus-on-others* is the measure of altruistic preferences (s_a) related to the social norm for desirable actions using the Arnaud (2010) instrument, (2) *Focus-on-self* is the measure of altruistic preferences (s_u) related to the social norm for undesirable actions using the Arnaud (2010) instrument, (3) *Incentive rate for total performance* is the maximum percentage respondents can earn as performance dependent pay, compared to their fixed salaries, (4) *%Weight on aggregate performance* is the percentage weight placed by the superior on aggregate performance measures (e.g., firm-wide profits) when periodically evaluating performance, (5) *Degree of desirable action* is the *Supply of effort*, the actual number of hours worked compared with the number of contracted hours scaled by the number of contracted hours, (6) *Degree of undesirable action* is based on the Merchant (1990) instrument of *accounting manipulation*, (7) *Structure* is a measure of decentralization based on the Vancil (1978) instrument, (8) *Within-firm interdependencies* is a measure of spillovers between different work units based on Bouwens and Van Lent (2007), (9) *Information asymmetry* is a measure of the knowledge differences between the superior and the respondent based on Dunk (1993), (10) *Competition* is based on Khandwalla (1972) and measures the rate of change in the work environment of the respondent, (11) *Firm size* is the natural log of the number of employees working for the firm, (12) *Capital market pressure* is the natural log of 1 plus the percentage of equity owned by "anonymous shareholders," (13) *Gender* is an indicator variable that equals 1 if the respondent is female, (14) *Auditor (CPA) qualification* is an indicator variable that equals 1 if the respondent is a CPA, (15) *Embedded in controlling department* is an indicator variable that equals 1 if the respondent's job is in the firm's controlling department, (16) *Job insecurity* is based on the amount of fixed salary the respondent is willing to give up to guarantee job security, (17) *Long horizon in firm* is an indicator variable that takes the value of 1 if respondents report that the likelihood that they will be working at their current firm 10 years from today is higher than 50 percent, (18) *Respondent's job is at headquarters* is an indicator variable that equals 1 if the respondent is working at the firm's headquarters. N = 557.

Degree of accounting manipulation, provided the costs associated with these actions are sufficiently small. On the other hand, *Focus-on-self* is expected to be positively correlated with *%Weight on aggregate performance*. Our evidence in Table 3 is largely consistent with these predictions.

While this correlation evidence is broadly consistent with our theoretical predictions (especially for *Focus-on-self*), it should not be taken at face value. Prior research has identified many important determinants of accounting manipulation (i.e., the undesirable action), as well as determinants of the manager's supply of desirable action and incentive contracts. It is imperative to control for these known influences while estimating the equilibrium change in the incentive contract parameters, as well as in desirable and undesirable actions given an exogenous change in the altruistic preferences. To achieve this, we estimate the reduced form parameters of the following system of equations using equation-by-equation OLS (Wooldridge 2002, p. 255), since with identical control variables across the four equations, no efficiency gains can be obtained using seemingly unrelated regressions.

$$\begin{aligned} X_k = {} & \mu_0 + \mu_1\, Focus\text{-}on\text{-}others + \mu_2\ \ Focus\text{-}on\text{-}self \\ & + \Sigma_i\, \delta_i\, Firm\ structure\ controls \\ & + \Sigma_j\, \lambda_j\, Respondent\ controls \\ & + \Sigma_l\, \phi_l\, Industry + \theta_k, k = a, b, c, d, \end{aligned} \tag{11k}$$

where the dependent variable X_k represents the incentive rate (X_a), percentage weight on aggregate performance (X_b), supply of effort (X_c), and degree of accounting manipulation (X_d). Our theory yields predictions for how these dependent variables change in equilibrium with a change in the managers' altruistic preferences. We can thus focus directly on the coefficients of interest (μ_1, μ_2 of the associated regression). All reported inferences are based on robust standard errors (two-tailed). These estimates should be interpreted as (conditional) correlations that are evaluated against their consistency with the theoretical model.

4.2 Is there a relation between altruistic preferences and incentive contract design?

Our theory suggests that incentive contract design varies with managers' altruism. In particular, for focus-on-others (capturing the sensitivity to the social norm for desirable actions, s_a), Proposition 1 (i) predicts a positive association with the incentive rate and a negative association with the percentage weight placed on aggregate performance measures. In contrast, for focus-on-self (capturing the sensitivity to the social norm for undesirable actions, s_u), Proposition 1 (ii) predicts a negative association with the incentive rate and a positive association with the percentage weight placed on aggregate performance measures.

Table 4 presents the estimation results when *Incentive rate* is the dependent variable in Column (1). We predict that $\beta^* + \delta^*$ increases for higher levels of *Focus-on-others* but decreases for higher scores on *Focus-on-self*. Thus, empirically, we expect $\mu_1 > 0$ and $\mu_2 < 0$. We include a broad range of control variables, consistent with earlier studies that examine the determinants of incentive contract design (Bushman et al.

Table 4 Reduced form regressions of predictions summarized in Proposition 1

	(1) Incentive Rate for Total Performance	(2) % Weight on Aggregate Performance	(3) Degree of Desirable Action (Supply of Effort)	(4) Degree of Undesirable Action (Accounting Manipulation)
Work climate – Focus-on-others	0.461	-2.489*	2.282***	-0.063*
P.S. (+,–, +, +)	(1.152)	(1.387)	(0.753)	(0.036)
Work climate – Focus-on-self	-2.191*	3.508**	-0.950	0.093**
P.S. (–, +, –, ?)	(1.287)	(1.385)	(0.941)	(0.037)
Firm-level controls				
Structure	-2.561*	-1.054	-1.144	0.030
	(1.489)	(1.434)	(0.756)	(0.037)
Within-firm interdependencies	0.782	2.713*	-0.078	-0.037
	(1.544)	(1.529)	(1.015)	(0.044)
Information asymmetry	0.372	-3.396**	0.488	-0.040
	(1.248)	(1.424)	(0.711)	(0.036)
Competition	1.429	1.190	2.234**	0.140***
	(1.929)	(1.470)	(0.924)	(0.038)
Firm size (log)	1.592**	-0.750	0.613*	0.005
	(0.663)	(0.600)	(0.354)	(0.018)
Capital market pressure	1.988***	-0.132	0.454	0.024
	(0.668)	(0.655)	(0.366)	(0.019)
Respondent-specific controls				
= 1 if female	-3.751	-8.863***	-5.206***	0.059
	(3.987)	(3.404)	(1.778)	(0.098)
= 1 if auditor (CPA) qualification	4.655*	2.235	-3.009**	-0.244***
	(2.437)	(2.597)	(1.403)	(0.066)
= 1 if embedded in controlling department	-2.414	9.005*	-2.327	-0.282*
	(3.225)	(5.423)	(2.187)	(0.144)
Job insecurity	0.364	2.032*	0.824	0.047*
	(1.436)	(1.221)	(0.610)	(0.027)
= 1 if respondent has a long horizon in firm	-1.023	0.998	0.480	-0.151*
	(3.066)	(2.807)	(1.660)	(0.080)
= 1 if respondent's job is at headquarter level	1.541	8.309***	2.521	-0.123
	(3.313)	(2.892)	(1.690)	(0.080)
Intercept	4.529	33.449***	14.765***	0.291
	(8.834)	(10.291)	(4.988)	(0.331)
N	556	557	557	557
R-squared	0.125	0.173	0.111	0.164
F-statistic	5.541	4.783	4.084	4.374
Prob > F	0.00	0.00	0.00	0.00

This table presents equation-by-equation OLS regression estimates of the reduced form parameters associated with the predictions summarized in Proposition 1

$X_k = \mu_0 + \mu_1\, Focus-on-others + \mu_2\, Focus-on-self + \sum_i \delta_i Firm\ structure\ controls + \sum_j \lambda_j\, Respondent\ controls + \sum_l \varphi_l\, Industry + \theta_k,\ k = a, b, c, d$

where the dependent variable X_k represents the incentive rate (X_a), the percentage weight on aggregate performance (X_b), the degree of work unit desirable action, supply of effort (X_c) and undesirable action, accounting manipulation (X_d).

Variable definitions are as follows: (1) *Focus-on-others* is the measure of altruistic preferences (s_a) related to the social norm for desirable actions using the Arnaud (2010) instrument, (2) *Focus-on-self* is the measure of altruistic preferences (s_u) related to the social norm for undesirable actions using the Arnaud (2010) instrument, (3) *Incentive rate for total performance* is the maximum percentage respondents can earn as performance dependent pay, compared to their fixed salaries, (4) *%Weight on aggregate performance* is the percentage weight placed by the superior on aggregate performance measures (e.g., firm-wide profits) when periodically evaluating performance, (5) *Degree of desirable action* is the *Supply of effort*, the actual number of hours worked compared with the number of contracted hours scaled by the number of contracted hours, (6) *Degree of undesirable action* is based on the Merchant (1990) instrument of *accounting manipulation*, (7) *Structure* is a measure of decentralization based on the Vancil (1978) instrument, (8) *Within-firm interdependencies* is a measure of spillovers between different work units based on Bouwens and van Lent (2007), (9) *Information asymmetry* is a measure of the knowledge differences between the superior and the respondent based on Dunk (1993), (10) *Competition* is based on Khandwalla (1972) and measures the rate of change in the work environment of the respondent, (11) *Firm size* is the natural log of the number of employees working for the firm, (12) *Capital market pressure* is the natural log of 1 plus the percentage of equity owned by "anonymous shareholders," (13) *Gender* is an indicator variable that equals 1 if the respondent is female, (14) *Auditor (CPA) qualification* is an indicator variable that equals 1 if the respondent is a CPA, (15) *Embedded in controlling department* is an indicator variable that equals 1 if the respondent's job is in the firm's controlling department, (16) *Job insecurity* is based on the amount of fixed salary the respondent is willing to give up to guarantee job security, (17) *Long horizon in firm* is an indicator variable that takes the value of 1 if respondents report that the likelihood that they will be working at their current firm 10 years from today is higher than 50 percent, (18) *Respondent's job is at headquarter level* is an indicator variable that equals 1 if the respondent is working at the firm's headquarters. ***, **, and * denote significance at the 1, 5, and 10 percent levels (two-tailed). Inferences are based on robust standard errors. All regressions include industry fixed effects.

1995, 1996; Nagar 2002). Together, these studies find that environmental conditions, salient aspects of the organizational design such as structure, and within-firm dependencies are significantly associated with contract design. To account for any remaining heterogeneity between the firms that is not captured by our control variables, we also include a set of indicator variables for each of the industries represented in the sample. Controlling for these factors and for heterogeneity across respondents reduces the likelihood of correlated omitted variable bias in the estimation of our variables of interest (Demski and Sappington 1999).

Our estimate on *Focus-on-others* (μ_1) equals 0.461, which is not significant at conventional levels ($p > 0.1$). Turning attention to *Focus-on-self*, we find a negative and significant estimate ($\mu_2 = -2.191$, $p < 0.1$).

Next, we concentrate on the use of aggregate performance measures in incentive contracts. We predict that a *Focus-on-others* (*Focus-on-self*) decreases (increases) $\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)$, the percentage weight placed on aggregate performance measures. In terms of our empirical model, Proposition 1 implies $\mu_1 < 0$ and $\mu_2 > 0$. Table 4 presents the results of estimating Equation (11b) in Column (2). We find a negative relation between *Focus-on-others* and the percentage weight placed on aggregate performance measures in incentive contracts. The estimated coefficient equals -2.489 ($p < 0.1$). In addition, we find, as predicted, a positive and significant coefficient estimate on *Focus-*

on-self ($\mu_2 = 3.508$, $p < 0.05$). To gauge the economic magnitude of these estimates, we consider the effect of changing the *Focus-on-others* (*Focus-on-self*) variable from its 25th percentile to its 75th percentile value on the performance measure weight. We find that the predicted performance measure weight decreases by 10.6 percent (increases by 13.1 percent) relative to the sample mean. Thus, consistent with our expectations, the incentive weight on aggregate measures is lower (higher) when focus-on-others (focus-on-self) is more pronounced.

Note that the percentage weight on the aggregate performance measures variable is bounded between 0 and 100 percent. However, the tenor of our results does not change if we use the logit transformed version of the variable in our analyses, that is, if we transform the percentage weight x by $\ln(x/(1-x))$. This transformation changes x to an unbounded range and ensures that the predicted values from an OLS regression fall within 0 and 100 percent.

Turning to the control variables, we find that firm-level controls in particular explain the incentive rate. Indeed, larger firms and firms with stronger capital market pressure have higher pay-for-performance sensitivity. When examining the weight on aggregate performance measures, we find evidence that the presence of within-firm interdependencies increases their use. In contrast, higher levels of information asymmetry are associated with lower use of aggregate performance measures, which is consistent with prior evidence (e.g., Bouwens and van Lent 2007). Female respondents report that a lower percentage weight is placed on aggregate measures, but respondents who are embedded in the controlling department or whose job is at the headquarters' level report a higher weight on these measures. Finally, we also find a positive association between job insecurity and the weight on aggregate performance measures.

4.3 Is there a relation between altruistic preferences and the managers' actions?

Proposition 1 (i) predicts that focus-on-others (capturing the sensitivity to the social norm for desirable actions) is positively associated with both supply of effort (capturing desirable actions) and accounting manipulations (capturing undesirable actions). The model also predicts (in Proposition 1 (ii)) that focus-on-self (capturing the sensitivity to the social norm for undesirable actions) is negatively associated with the manager's actions (albeit under the condition that the undesirable action is costly to the firm; otherwise, the sign reverses). We first test our predictions for the manager's supply of effort, then turn to the manager's work unit engagement in accounting manipulation. Our results are presented in Table 4 (Column 3). Consistent with our prediction, for *Focus-on-others*, we find a strongly significant positive effect ($\mu_1 = 2.282$, $p < 0.01$). Our model also implies $\mu_2 < 0$, and we indeed find a negative estimate of the coefficient on *Focus-on-self*, which is consistent with our predictions ($\mu_2 = -0.950$) but not significant at conventional levels.

We examine the relation between altruistic preferences and the manager's engagement in undesirable actions in Column (4) of Table 4. We find that *Focus-on-others* is negatively associated with *Degree of accounting manipulation* ($\mu_1 = -0.063$, $p < 0.1$), contrary to expectations. We also find that *Focus-on-self* is significantly positively associated with *Degree of accounting manipulation* ($\mu_2 = 0.093$, $p < 0.05$), which is consistent with a parametrization of our model in which the costs associated with these actions are low.

With respect to the economic significance of our findings, we cannot readily evaluate the ordinal scale of the proxy for the *Degree of accounting manipulation*. However, *Supply of effort* is the percentage of hours actually worked compared to the contracted hours. It follows that a change in the *Focus-on-others* variable from its 25th percentile to its 75th percentile sample value increases the supply of effort by approximately 11.2 percent relative to the sample mean (recall that this variable is in percentages of actual hours worked compared to the contract).

Turning to the control variables for Eq. (11c), we find that work units with higher competition and work units that are part of larger firms have higher *Supply of effort.* Female respondents supply less effort; that is, they work fewer hours than contracted. Similarly, respondents with a professional CPA degree also work significantly fewer hours.

The results for the control variables in Eq. (11d) indicate that *Competition* is strongly and positively associated with the *Degree of accounting manipulation*. None of the remaining firm level controls is significant. In contrast, we find consistent evidence that respondent characteristics are an important determinant of the *Degree of accounting manipulation*. Respondents who have a CPA qualification indicate a significantly lower degree of work unit involvement in budget overruns or channel stuffing and related activities than those without such a qualification. A CPA's education strongly emphasizes the code of conduct for auditors, and CPA students are routinely trained to deal with moral questions. After graduation, CPAs join a professional society with a shared culture that reinforces the importance of professional norms. It is important to note that work climate continues to be a significant predictor of behavior in the presence of what can be perceived to be individual social behavior, as captured by the respondents' membership in the auditing profession.

We also find that when respondents work in a controlling or finance department the *Degree of accounting manipulation* is lower. It is possible that in these cases their jobs require them to be especially vigilant about data integrity. Again, it may be the case that a respondent's individual professional values mitigate any incentives to engage in undesirable actions that potentially compromise data integrity. Consistent with earlier work (e.g., Dechow and Sloan 1991), we find that respondents with longer horizons in the firm report that their unit engages less in accounting manipulations. We also find that respondents who have higher degrees of job insecurity have higher levels of accounting manipulations. In both Eq. (11c) and (11d), we include industry fixed effects to control for unobserved heterogeneity.

5 Discussion and conclusions

We provide a parsimonious model to examine how altruism is associated with incentive contract design and with the actions of managers. We argue that such preferences can be empirically measured using a set of questions designed to capture an organizational unit's work climate. We measure two dimensions of work climate, a "focus on self" and a "focus on others." In work climates where the prevailing preference is a focus on self—defined as what is right for oneself, even if it is to the detriment of others—we find that managers supply less effort and engage significantly more in undesirable actions. It is an open question how a

firm responds when the prevailing altruistic preferences (or lack thereof) encourage undesirable actions. One potential solution is to employ contractual remedies to mitigate the negative implications of a self-focused work climate. Indeed, we show that both the incentive rate and the choice of performance measures in incentive contracts vary with the prevalent work climates. Those working in work climates with a high focus-on-self have incentive contracts in which (i) aggregate accounting performance measures (i.e., measures that summarize the performance of not just the focal manager but also others in the firm) receive significantly higher weight, and (ii) performance-based pay is lower. Intuitively, aggregate measures provide self-focused managers with incentives to internalize the effect of their decisions on the wealth of other managers and the value of the firm. Our findings are consistent with the interpretation that firms with a self-focused work climate let managers internalize the externalities of their actions by increasing the use of aggregate measures.

On the other hand, we show that if the work climate is more consistent with a focus on others, then firms use incentive contracts that put a lower weight on aggregate accounting performance measures but do not significantly change their incentive rate. Managers in these work climates (and under such incentive contracts) provide more effort and engage less in accounting manipulation.

Our proxy for altruistic preferences is based on validated instruments from the management literature and relies on data gathered from the firms' employees, who are arguably the most knowledgeable persons about the work climate. That said, in our empirical model we do not distinguish between the personal norms of the agent and the extent to which the agent is influenced by the behavior of others in the organization through the social norms. Both of these factors are distinct elements of the agent's utility function that ultimately describe his altruism or egotism. Fortunately, our theoretical model suggests that it is the latter, not the former, which is important in understanding how altruism affects incentive contracts.

We combine the rich descriptions of individual behavior in the management literatures with economic theoretical models to provide insights into the consequences of social norms within firms. By exploiting the membership of the professional association of financial controllers, we are able to base our analyses on a comparatively large dataset of more than 550 observations. Our results document that altruistic preferences play an important role both in firms' incentive contract design and managerial behavior. While this is only a partial investigation of the many facets associated with corporate climates, we demonstrate how firms use formal control practices in different climates.

Appendix 1

Proof of Lemma 1 Given $c_i = f_i + \beta_i y_i + \delta_i Y$, the definition of performance measures y_i and Y in expressions (1) and (2), $Y = \sum_{i=1}^{N} y_i$, and the definition of the agent's cost of effort in (3) and (4), the certainty equivalent of agent $i = 1, \ldots, N$ is characterized by

$$CE_i = f_i + \beta_i\left(a_i + u_i + \sum_{j=1;j\neq i}^{N}\left(ma_j - \mu u_j\right)\right) + \delta_i\left(\sum_{i=1}^{N} ba_i - zu_i\right) - \frac{1}{2}\left(a_i - (1-s_a)p_a - s_a\widehat{a}_i\right)^2 - \frac{1}{2}\left(u_i - (1-s_u)p_u - s_u\widehat{u}_i\right)^2 - \frac{r}{2}\left(\beta_i^2\sigma_y^2 + 2\beta_i\delta_i\sigma_{yY} + \delta_i^2\sigma_Y^2\right), \tag{12}$$

where $b = (N-1)m + 1$, $z = (N-1)\mu - 1$, $\widehat{a}_i = \frac{1}{N-1}\sum_{j=1;j\neq i}^{N} a_j$, $\widehat{u}_i = \frac{1}{N-1}\sum_{j=1;j\neq i}^{N} u_j$, $\sigma_{yY} = ((N-1)\rho + 1)\sigma_y^2$, and $\sigma_Y^2 = N((N-1)\rho + 1)\sigma_y^2$, with parameters $m \in (0, 1/(N-1))$, $\mu > 1/(N-1)$, and $\rho \in [-1/(N-1), 1]$, such that $b \in (1, 2)$ and $z > 0$.

Differentiating (12) with respect to a_i and u_i yields the agent's incentive compatibility constraints:

$$\beta_i + \delta_i b - \left(a_i - (1-s_a)p_a - s_a\widehat{a}_i\right) = 0 \text{ and} \tag{13}$$

$$\beta_i - \delta_i z - \left(u_i - (1-s_u)p_u - s_u\widehat{u}_i\right) = 0. \tag{14}$$

Solving (13) and (14) for a_i and u_i yields $a_i^* = \beta_i + \delta_i b + (1-s_a)p_a + s_a\widehat{a}_i$ and $u_i^* = \beta_i - \delta_i z + (1-s_u)p_u + s_u\widehat{u}_i$.

The social norms to agent i, $\widehat{a}_i$ and $\widehat{u}_i$, are given by the average conjectured actions. In equilibrium, conjectures are true, implying that $\widehat{a}_i = \frac{1}{N-1}\sum_{j=1;j\neq i}^{N} a_j^*$ and $\widehat{u}_i = \frac{1}{N-1}\sum_{j=1;j\neq i}^{N} u_j^*$. For instance, the desirable action is given by $a_i^* = \beta_i + \delta_i b + (1-s_a)p_a + s_a\frac{1}{N-1}\left(\sum_{j=1;j\neq i}^{N} a_j^*\right)$. Adding $s_a/(N-1)a_i^*$ to both sides yields

$$\left(1 + \frac{s_a}{N-1}\right)a_i^* = \beta_i + \delta_i b + (1-s_a)p_a + \frac{s_a}{N-1}\left(\sum_{j=1}^{N} a_j^*\right). \tag{15}$$

Summing up (15) over all N agents yields

$$\left(1 + \frac{s_a}{N-1}\right)\left(\sum_{i=1}^{N} a_i^*\right) = \left(\sum_{i=1}^{N}\beta_i + \delta_i b\right) + N(1-s_a)p_a + s_a\frac{N}{N-1}\left(\sum_{j=1}^{N} a_j^*\right), \text{ or}$$

$$\left(\sum_{j=1}^{N} a_j^*\right) = Np_a + \frac{1}{1-s_a}\left(\sum_{j=1}^{N}\beta_j + \delta_j b\right). \tag{16}$$

Substituting (16) into (15) and solving for a_i^* yields (5). Expression (6) is derived in the same fashion. Noting symmetry, $\beta_1 = \ldots = \beta_N = \beta$ and $\delta_1 = \ldots = \delta_N = \delta$, the optimal actions in (5) and (6) simplify to

$$a_i^* = p_a + \frac{(\beta + \delta b)}{(1-s_a)} \text{ and } u_i^* = p_u + \frac{(\beta - \delta z)}{(1-s_u)}. \tag{17}$$

From the agent's individual rationality constraint it follows that the agent's expected compensation equals cost of effort plus risk premium. Thus, the firm's output net of the agents' compensation is given by

$$\begin{aligned}\pi = \mathrm{E}\left[Y - \sum_{i=1}^{N} c_i\right] = \sum_{i=1}^{N}\Bigg(ba_i - zu_i - \frac{1}{2}\left(a_i - (1-s_a)p_a - s_a\widehat{a}_i\right)^2 \\ - \frac{1}{2}\left(u_i - (1-s_u)p_u - s_u\widehat{u}_i\right)^2 - \frac{r}{2}\left(\beta^2\sigma_y^2 + 2\beta\delta\sigma_{yY} + \delta^2\sigma_Y^2\right)\Bigg).\end{aligned} \tag{18}$$

Using the agent's equilibrium actions, ${a_i}^* = \beta + \delta b + (1-s_a)p_a + s_a\widehat{a}_i$ and ${u_i}^* = \beta - \delta z + (1-s_u)p_u + s_u\widehat{u}_i$, the agent's cost of effort simplifies to $\frac{1}{2}(\beta + \delta b)^2 + \frac{1}{2}(\beta - \delta z)^2$. Substituting the cost of effort and a_i^* and u_i^* according to (17) into (18) yields the principal's unconstrained decision problem. Differentiating with respect to β and δ yields the following first-order conditions:

$$\frac{d\pi}{d\beta} = \frac{b}{1-s_a} - \frac{z}{1-s_u} - \left(2 + r\sigma_y^2\right)\beta - \left(b - z + r\sigma_{yY}\right)\delta = 0 \text{ and} \tag{19}$$

$$\frac{d\pi}{d\delta} = \frac{b^2}{1-s_a} + \frac{z^2}{1-s_u} - \left(b - z + r\sigma_{yY}\right)\beta - \left(b^2 + z^2 + r\sigma_Y^2\right)\delta = 0. \tag{20}$$

Solving (19) and (20) for β and δ yields the optimal incentive rates on y_i and Y in Lemma 1.

In the following, we use $\beta^* \geq 0$ and $\delta^* \geq 0$ to derive some parameter constraints that will be useful to sign the comparative statics in Proposition 1. Using (8), $\beta^* \geq 0$ if, and only if,

$$bz(b+z)\left(\frac{1}{1-s_a} - \frac{1}{1-s_u}\right) + r\left(\frac{b\left(\sigma_Y^2 - b\sigma_{yY}\right)}{(1-s_a)} - \frac{z\left(\sigma_Y^2 + z\sigma_{yY}\right)}{(1-s_u)}\right) > 0. \tag{21}$$

(21) has to hold for any s_a and s_u, particularly for $s_a = s_u = 0$. Thus, (21) simplifies to $r\left(b\left(\sigma_Y^2 - b\sigma_{yY}\right) - z\left(\sigma_Y^2 + z\sigma_{yY}\right)\right) > 0$, or

$$\frac{b-z}{b^2+z^2} > \frac{\sigma_{yY}}{\sigma_Y^2}. \tag{22}$$

Noting $\sigma_{yY} \geq 0$, (22) implies $z \leq b$. Substituting $\sigma_{yY} = ((N-1)\rho + 1)\sigma_y^2$ and $\sigma_Y^2 = N((N-1)\rho + 1)\sigma_y^2$, (22) simplifies to $z(N+z) < b(N-b)$. There are two roots for z that satisfy this condition, and the positive root is critical, implying

$$z < \min\left\{\frac{1}{2}\left(-N + \sqrt{N^2 + 4b(N-b)}\right), b\right\} = \frac{1}{2}\left(-N + \sqrt{N^2 + 4b(N-b)}\right). \tag{23}$$

Using (9), $\delta^* \geq 0$ if, and only if,

$$(b+z)\left(\frac{b}{1-s_a} + \frac{z}{1-s_u}\right) + r\left(\frac{b\left(-\sigma_{yY} + b\sigma_y^2\right)}{(1-s_a)} + \frac{z\left(\sigma_{yY} + z\sigma_y^2\right)}{(1-s_u)}\right) > 0. \tag{24}$$

Again, (24) has to hold for any s_a and s_u, particularly for $s_a = s_u = 0$. Thus, (24) implies

$$\frac{(b-z)}{\left(b^2+z^2\right)} < \frac{1}{r\sigma_{yY}}\frac{(b+z)^2}{\left(b^2+z^2\right)} + \frac{\sigma_y^2}{\sigma_{yY}}. \tag{25}$$

We note that a feasible set of parameters that satisfies (22) and (25) requires $\frac{\sigma_{yY}}{\sigma_Y^2} < \frac{1}{r\sigma_{yY}}\frac{(b+z)^2}{\left(b^2+z^2\right)} + \frac{\sigma_y^2}{\sigma_{yY}}$. Using the definitions for σ_y^2 and σ_{yY} shows that this condition is always satisfied.

Benchmark setting with no altruistic preferences

We obtain (10) by substituting $s_a = s_u = 0$ into $\frac{\delta^*}{\beta^*}$, where δ^* and β^* are given by (8) and (9). Alternatively, we note that with $s_a = s_u = 0$, the setting described in Sect. 2.1 is a standard two-task LEN-setting with two performance measures. Applying Feltham and Xie (1994), it is straightforward that the optimal ratio of incentive rates for the contract $c_i = f + \beta y_i + \delta Y$ is given by

$$\frac{\delta^*}{\beta^*} = \frac{\left(\frac{d\mathrm{E}[Y]}{da_i}\left(\frac{d\mathrm{E}[Y]}{da_i} - \frac{d\mathrm{E}[y_i]}{da_i}\frac{\sigma_{yY}}{\sigma_y^2}\right) + \frac{d\mathrm{E}[Y]}{du_i}\left(\frac{d\mathrm{E}[Y]}{du_i} - \frac{d\mathrm{E}[y_i]}{du_i}\frac{\sigma_{yY}}{\sigma_y^2}\right) + \frac{\Delta}{r\sigma_y^2}\right)/\left[\sigma_Y^2\right]}{\left(\frac{d\mathrm{E}[Y]}{da_i}\left(\frac{d\mathrm{E}[y_i]}{da_i} - \frac{d\mathrm{E}[Y]}{da_i}\frac{\sigma_{yY}}{\sigma_Y^2}\right) + \frac{d\mathrm{E}[Y]}{du_i}\left(\frac{d\mathrm{E}[y_i]}{du_i} - \frac{d\mathrm{E}[Y]}{du_i}\frac{\sigma_{yY}}{\sigma_Y^2}\right)\right)/\left[\sigma_y^2\right]},$$

where the $d\mathrm{E}[\cdot]/d\cdot$s represent the marginal productivities of the performance measures, the σs represent the variances and the covariance of the performance measures, and $\Delta = \left(\frac{d\mathrm{E}[Y]}{da_i}\frac{d\mathrm{E}[y_i]}{du_i} - \frac{d\mathrm{E}[Y]}{du_i}\frac{d\mathrm{E}[y_i]}{da_i}\right)^2$ is the level of non-congruity of y_i and Y. For each performance measure, the sensitivities to the agent's desirable and undesirable actions are adjusted, because some information on each action is included in the other performance measure (Banker and Datar 1989). Substituting our setting's parameters, $\frac{d\mathrm{E}[y_i]}{da_i} = \frac{d\mathrm{E}[y_i]}{du_i} = 1$, $\frac{d\mathrm{E}[Y]}{da_i} = b$, and $\frac{d\mathrm{E}[Y]}{du_i} = -z$ and simplifying yields $\Delta = (b+z)^2$ and (10).

Comparative statics of incentive rates

Using (8) and (9), we have

$$\frac{d\beta^*}{ds_a} = \frac{b\left(z(b+z) + r\left(\sigma_Y^2 - b\sigma_{yY}\right)\right)}{(1-s_a)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right) - \left(b-z+r\sigma_{yY}\right)^2\right)} > 0, \tag{26}$$

because $\sigma_Y^2 - b\sigma_{yY} = (N-b)((N-1)\rho+1)\sigma_y^2 > 0$ and the denominator is positive,

$$(b+z)^2 + r\left(2\left(\sigma_Y^2 - (b-z)\sigma_{yY}\right) + \left(b^2+z^2\right)\sigma_y^2 + r\left(\sigma_y^2\sigma_Y^2 - \sigma_{yY}^2\right)\right) > 0, \tag{27}$$

because $\sigma_Y^2-(b-z)\sigma_{yY}\geq\sigma_Y^2-b\sigma_{yY}$ and $\sigma_y^2\sigma_Y^2-\sigma_{yY}^2\geq 0$.

$$\frac{d\beta^*}{ds_u}=-\frac{z\left(b(b+z)+r\left(\sigma_Y^2+z\sigma_{yY}\right)\right)}{(1-s_u)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2\right)}<0; \tag{28}$$

$$\frac{d\delta^*}{ds_a}=\frac{b\left(b+z-r\left(\sigma_{yY}-b\sigma_y^2\right)\right)}{(1-s_a)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2\right)}. \tag{29}$$

$\sigma_{yY}-b\sigma_y^2<0$, or $\rho<(b-1)/(N-1)$, is a sufficient condition for $\frac{d\delta^*}{ds_a}>0$.

$$\frac{d\delta^*}{ds_u}=\frac{z\left(b+z+r\left(\sigma_{yY}+z\sigma_y^2\right)\right)}{(1-s_u)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2\right)}>0. \tag{30}$$

Proof of Proposition 1: The incentive parameters are given in (8) and (9) and the agent's actions follow from substituting (8) and (9) into (7). We obtain the following comparative statics:

$$\frac{d\left(\beta^*+\delta^*\right)}{ds_a}=\frac{b\left((b+z)(1+z)+r\left(\sigma_Y^2-(1+b)\sigma_{yY}+b\sigma_y^2\right)\right)}{(1-s_a)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2\right)}. \tag{31}$$

The first term in the numerator is positive. Substituting $\sigma_Y^2=N((N-1)\rho+1)\sigma_y^2$ and $\sigma_{yY}=((N-1)\rho+1)\sigma_y^2$ into (31), the second term in the numerator is $r(N-1)[1+(N-1-b)\rho]\sigma_y^2$. When $(N-1-b)>0$, $1+(N-1-b)\rho>0$ if $\rho>-1/(N-1-b)$, which is weaker than $\rho>-1/(N-1)$; when $(N-1-b)<0$, $1+(N-1-b)\rho>0$ if $\rho<-1/(N-1-b)$, where $-1/(N-1-b)>1$ because $N\geq 2$ and $b<2$. Thus, the second term in the numerator is positive and $\frac{d\left(\beta^*+\delta^*\right)}{ds_a}>0$.

We note that $\frac{d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)}{ds_a}=\frac{\frac{d\beta^*}{ds_a}\left(\beta^*+\delta^*\right)-\delta^*\left(\frac{d\beta^*}{ds_a}+\frac{d\delta^*}{ds_a}\right)}{\left(\beta^*+\delta^*\right)^2}$. Thus, when β^* is more elastic than δ^* with respect to s_a, or when $\frac{d\beta^*/ds_a}{\beta^*/s_a}>\frac{d\delta^*/ds_a}{\delta^*/s_a}$, then $\frac{d\left(1-\frac{\beta^*}{\beta^*+\delta}\right)}{ds_a}<0$. Using (27),

$$\frac{d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)}{ds_a}$$
$$=-\frac{bz(b+z)\left((b+z)^2+r\left(2\left(\sigma_Y^2-(b-z)\sigma_{yY}\right)+\left(b^2+z^2\right)\sigma_y^2+r\left(\sigma_y^2\sigma_Y^2-\sigma_{yY}^2\right)\right)\right)}{(1-s_a)^2(1-s_u)\left((b+z)\left(\frac{b(1+z)}{1-s_a}-\frac{(b-1)z}{1-s_u}\right)+r\left(\frac{b\left(\sigma_Y^2-(1+b)\sigma_{yY}+b\sigma_y^2\right)}{1-s_a}-\frac{z\left(\sigma_Y^2+(z-1)\sigma_{yY}-z\sigma_y^2\right)}{1-s_u}\right)\right)^2}<0. \tag{32}$$

From (32), it follows that β^* is more elastic than δ^* with respect to s_a.

$$\frac{da_i^*}{ds_a} = \frac{1}{(1-s_a)^2}\left(\beta^* + \delta^* b\right) + \frac{1}{(1-s_a)}\frac{d\left(\beta^* + \delta^* b\right)}{ds_a}. \tag{33}$$

The first term is non-negative because β^*, $\delta^* \geq 0$. The second term is characterized by

$$\frac{d\left(\beta^* + \delta^* b\right)}{ds_a} = \frac{b\left((b+z)^2 + r\left(\sigma_Y^2 - 2b\sigma_{yY} + b^2\sigma_y^2\right)\right)}{(1-s_a)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right) - \left(b-z+r\sigma_{yY}\right)^2\right)}. \tag{34}$$

The first term in the numerator is positive. Further, $\sigma_Y^2 - 2b\sigma_{yY} + b^2\sigma_y^2 > \sigma_Y^2 - 2b\sigma_y\sigma_Y + b^2\sigma_y^2 = (\sigma_Y - b\sigma_y)^2 > 0$ because $\sigma_{yY} < \sigma_y\sigma_Y$. Thus, $\frac{d\left(\beta^* + \delta^* b\right)}{ds_a} > 0$, and $\frac{da_i^*}{ds_a} > 0$.

$$\frac{du_i^*}{ds_a} = \frac{br\left(\sigma_Y^2 - (b-z)\sigma_{yY} - bz\sigma_y^2\right)}{(1-s_u)(1-s_a)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right) - \left(b-z+r\sigma_{yY}\right)^2\right)}. \tag{35}$$

Using $\sigma_Y^2 = N((N-1)\rho + 1)\sigma_y^2$ and $\sigma_{yY} = ((N-1)\rho + 1)\sigma_y^2$ in (35), the numerator simplifies to

$$(N - b - z(b-1) + (N-1)(N-b+z)\rho)\sigma_y^2. \tag{36}$$

The first three terms in (36) are positive, $N - b - z(b-1) > 0$, if z is not too large, i.e., $z < (N-b)/(b-1)$. This condition is weaker than the condition $z < \frac{1}{2}\left(-N + \sqrt{N^2 + 4b(N-b)}\right)$ from (23). Hence, the expression (36) is positive if ρ is not too negative, i.e., if $\rho > \underline{\rho} = -\frac{(N-b-z(b-1))}{(N-1)(N-b+z)}$. Thus, $\frac{du_i^*}{ds_a} > 0$ if $\rho > \underline{\rho}$. We note that $\rho > \underline{\rho}$ is stronger than the condition for positive semi-definiteness, i.e., $-\frac{(N-b-z(b-1))}{(N-1)(N-b+z)} > -\frac{1}{(N-1)}$.

$$\frac{d\left(\beta^* + \delta^*\right)}{ds_u} = -\frac{z\left[(b+z)(b-1) + r\left(\sigma_Y^2 + (z-1)\sigma_{yY} - z\sigma_y^2\right)\right]}{(1-s_u)^2\left[\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right) - \left(b-z+r\sigma_{yY}\right)^2\right]}. \tag{37}$$

Using $\sigma_Y^2 = N((N-1)\rho + 1)\sigma_y^2$ and $\sigma_{yY} = ((N-1)\rho + 1)\sigma_y^2$ in (37), the numerator simplifies to

$$z\left[(b+z)(b-1) + r(N-1)(1 + (N-1+z)\rho)\sigma_y^2\right]. \tag{38}$$

The first term is positive. The second term is positive if ρ is not too negative, i.e., if $\rho > -\frac{1}{(N-1+z)}$, which is weaker than $\rho > \underline{\rho}$. Thus, $\rho > \underline{\rho}$ is a sufficient condition for $\frac{d\left(\beta^* + \delta^*\right)}{ds_u} < 0$.

$$\frac{d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)}{ds_u} = \frac{bz(b+z)\left((b+z)^2+r\left(2\left(\sigma_Y^2-(b-z)\sigma_{yY}\right)+\left(b^2+z^2\right)\sigma_y^2+r\left(\sigma_y^2\sigma_Y^2-\sigma_{yY}^2\right)\right)\right)}{(1-s_u)^2(1-s_a)\left((b+z)\left(\frac{b(1+z)}{1-s_a}-\frac{(b-1)z}{1-s_u}\right)+r\left(\frac{b\left(\sigma_Y^2-(1+b)\sigma_{yY}+b\sigma_y^2\right)}{1-s_a}-\frac{z\left(\sigma_Y^2+(z-1)\sigma_Y^2-z\sigma_y^2\right)}{1-s_u}\right)\right)^2} > 0, \tag{39}$$

because $\frac{d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)}{ds_u} = \left(-\frac{1-s_a}{1-s_u}\right)\frac{d\left(1-\frac{\beta^*}{\beta^*+\delta^*}\right)}{ds_a}$.

$$\frac{da_i^*}{ds_u} = -\frac{zr\left(\sigma_Y^2-(b-z)\sigma_{yY}-bz\sigma_y^2\right)}{(1-s_a)(1-s_u)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2\right)}. \tag{40}$$

Using the expression for $\frac{du_i^*}{ds_a}$ in (35), we note that $\frac{da_i^*}{ds_u} < 0$ if $\rho > \underline{\rho}$.

$$\frac{du_i^*}{ds_u} = \frac{1}{(1-s_u)^2}\left(\beta^*-\delta^* z\right)+\frac{1}{(1-s_u)}\frac{d\left(\beta^*-\delta^* z\right)}{ds_u}, \tag{41}$$

where

$$\frac{d\left(\beta^*-\delta^* z\right)}{ds_u} = -\frac{z\left((b+z)^2+r\left(\sigma_Y^2+2z\sigma_{yY}+z^2\sigma_y^2\right)\right)}{(1-s_u)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2\right)} < 0. \tag{42}$$

The first term is positive because $\beta^*-\delta^* z = (1-s_u)u_i^2 \geq 0$, and the second term is negative and zero when $z=0$. Thus, $\frac{du_i^*}{ds_u} > 0$ if z is not too large. To identify the cutoff for z, note that $\frac{d^2u_i^*}{ds_u ds_a} > 0$ implies that the slope $\frac{du_i^*}{ds_u}$ is amplified by s_a. Hence, to detect the sign of $\frac{du_i^*}{ds_u}$, we set without loss of generality $s_a = 0$ and obtain

$$\left.\frac{du_i^*}{ds_u}\right|_{s_a=0} = \frac{-\frac{2z\left[(b+z)^2+r\left(\sigma_Y^2+2z\sigma_{yY}+z^2\sigma_y^2\right)\right]}{1-s_u}+br\left(\sigma_Y^2-(b-z)\sigma_{yY}-bz\sigma_y^2\right)}{(1-s_u)^2\left(\left(2+r\sigma_y^2\right)\left(b^2+z^2+r\sigma_Y^2\right)-\left(b-z+r\sigma_{yY}\right)^2\right)}. \tag{43}$$

In the numerator, the first term increases in z and s_u, whereas the second term is ambiguous in z. When $z=0$, $\left.\frac{du_i^*}{ds_u}\right|_{s_a=0} > 0$. Thus, there is a cutoff $\overline{z}$ where $z < \overline{z}$ is sufficient for $\frac{du_i^*}{ds_u} > 0$. Since $\lim_{z\to\infty}\left(\left.\frac{du_i^*}{ds_u}\right|_{s_a=0}\right) < 0$, the cutoff $\overline{z}$ is the positive root when solving the numerator of (43) to zero.

Appendix 2

Panel A

	Mean	Std. Dev.	Min.	Median	Max.	Factor pattern
Degree of undesirable action (1=never occurs, 7=occurs frequently) Cronbach's alpha=0.65 Please indicate how often your unit:						
Defers a needed expenditure	3.620	1.439	1.00	4.00	7.00	0.545
Accelerates sales	3.108	1.649	1.00	3.00	7.00	0.543
Shifts funds between accounts to avoid budget overruns	2.759	1.445	1.00	2.00	7.00	0.526
Buys equipment from outside so that the asset is capitalized rather than expensed in the period	2.478	1.501	1.00	2.00	7.00	0.533

This panel presents summary statistics and psychometric properties of the *degree of undesirable action (accounting manipulation)* (our measure of work unit undesirable action) variable. For each item in the latent construct, the panel documents the mean, median, and standard deviation, as well as the maximum and minimum values. The panel also reports, for each item, the factor loadings and the Cronbach's alpha of the latent construct.

Panel B: Summary statistics and cross loadings on manifest indicators of latent independent variables

	Summary statistics		Cross loadings					
	Mean	Std. Dev.	1	2	3	4	5	6
(1) Focus-on-self (1=strongly disagree, 7=strongly agree) Cronbach's alpha=0.86								
People around here are mostly out for themselves.	3.370	1.410	**0.678**	-0.095	0.035	0.001	0.020	-0.038
People in my department think of their own welfare first when faced with a difficult decision.	3.551	1.362	**0.858**	0.035	0.011	0.011	0.010	-0.004
In my department people's primary concern is their own personal benefit.	3.310	1.414	**0.875**	0.019	-0.015	-0.006	-0.023	0.014
(2) Focus-on-others (1=strongly disagree, 7=strongly agree) Cronbach's alpha=0.81								
In my department it is expected that you will always do what is right for society.	4.158	1.240	0.024	**0.650**	-0.004	-0.025	0.006	-0.065

	Summary statistics		Cross loadings					
	Mean	Std. Dev.	1	2	3	4	5	6
People around here have a strong sense of responsibility to society and humanity.	4.384	1.206	-0.131	**0.672**	0.062	-0.053	0.031	-0.052
What is best for everyone in the department is the major consideration.	4.115	1.152	0.037	**0.766**	-0.022	0.047	-0.002	0.006
The most important concern is the good of all the people in the department.	4.050	1.222	0.081	**0.723**	-0.027	0.020	-0.049	0.050
People in my department are actively concerned about their peers' interests.	4.218	1.132	-0.077	**0.578**	0.002	-0.004	0.025	0.050
(3) Structure (1=highly centralized, 5=highly decentralized) Cronbach's alpha=0.75								
What is the organizational structure of the overall company?	2.732	1.175	0.040	-0.006	**0.423**	-0.052	0.116	0.063
What is the organizational structure of individual operations?	3.162	1.063	-0.023	-0.007	**0.852**	0.012	-0.024	-0.008
What is the organizational structure of individual units?	3.136	1.072	0.021	0.012	**0.823**	0.019	-0.022	-0.010
(4) Within-firm interdependencies (1=no impact at all, 7=a very significant impact) Cronbach's alpha=0.76								
To what extent do your unit's actions impact on work carried out in other organizational units?	4.973	1.759	-0.016	0.005	0.022	**0.700**	-0.023	0.046
To what extent do actions of managers of other units of the firm impact on work carried out in your own unit?	4.630	1.750	0.025	-0.011	-0.030	**0.706**	0.023	0.017
(5) Information asymmetry (1=my superior, 4=my superior and I equally, 7=I) Cronbach's alpha=0.93								
Compared with your superior, who is in possession of better information regarding the activities undertaken in your unit?	4.425	1.719	0.005	0.036	-0.015	0.056	**0.809**	0.000
Compared with your superior, who is more familiar with the input–output relations inherent in the internal operations of your unit?	4.562	1.612	-0.042	0.007	-0.029	0.016	**0.856**	0.004
Compared with your superior, who is more certain about the performance potential of your unit?	4.325	1.574	0.030	0.012	0.020	-0.021	**0.852**	0.020

	Summary statistics		Cross loadings					
	Mean	Std. Dev.	1	2	3	4	5	6
Compared with your superior, who is more familiar technically with the work of your unit?	4.817	1.647	-0.033	-0.005	0.008	0.012	**0.787**	-0.015
Compared with your superior, who is better able to assess the potential impact on your activities of factors external to your unit?	4.111	1.549	0.018	-0.032	0.013	-0.039	**0.765**	0.000
Compared with your superior, who has a better understanding of what can be achieved in your unit?	4.352	1.538	0.027	-0.014	0.033	-0.021	**0.869**	-0.009
(6) Competition (1=highly stable, infrequent change, 7=highly volatile, constant change) Cronbach's alpha=0.81								
What is the rate of change in the buying patterns and requirements of customers?	4.234	1.554	-0.004	0.000	0.010	-0.064	-0.002	**0.781**
What is the rate of change in distributors' attitudes?	3.743	1.370	0.029	0.016	0.003	-0.004	0.023	**0.707**
What is the rate of change in industry buying patterns?	4.048	1.445	0.019	-0.005	-0.021	-0.108	-0.009	**0.754**
What is the rate of change in competitor strategies?	4.155	1.403	-0.022	-0.008	0.036	0.008	-0.045	**0.648**
What is the rate of change in technical development relevant to your unit's business?	3.795	1.518	-0.014	-0.014	-0.016	0.176	0.059	**0.476**
What is the rate of change in changes in (service) production process?	3.742	1.438	-0.045	0.008	0.020	0.146	-0.011	**0.494**

Panel C

This panel presents the questionnaire item used to obtain data for *Weight Placed on Aggregate Performance Measures*.

Indicate the weights your superior places on each of these measures when he or she discusses your performance. Your answers should total 100%.

1	Stock-price-related measures	%
2	Firm-level performance measures (e.g., firm output, firm ROI, firm profit margins, firm income)	
3	Measures summarizing the total performance of the unit of which your unit is a part (e.g., your work for a business unit which is part of a larger division—inasmuch as your performance evaluation depends on *divisional-level* measures, you should then report the weight on these divisional measures)	%

4	Measures summarizing the total performance of your unit (e.g., your unit's income, unit EVA or ROI, unit output)	%
5	Measures that provide performance information on specific aspects within your business unit (e.g., R&D, production efficiency or quality programs, unit product costs)	%
6	Other measures not mentioned (please specify) ……	%
	Total	100%

The variable "weight placed on aggregate performance measures" is constructed by summing the answers to (1), (2), and (3).

Panel D

This panel presents the instruments for variables that are not subject to psychometric testing and variables used in convergent validity tests.

Age

What is your age?

Total work experience

How long is your total working experience (in years)?

Tenure in current firm

How long have you been working in this firm (in years)?

Length of reporting relation with superior

How many years have you reported to your current superior (in years)?

Tenure in current position

How long have you been in your current position?

Number of people reporting directly to respondent

How many people report to you directly?

= 1 if female

Are you male or female?

= 1 if auditor (CPA) qualification

Are you a Registered Accountant?

= 1 if embedded in controlling department

Are you part of the finance or accounting department?

Job insecurity

What percentage of your income would you be willing to give up if your job could be guaranteed for n year(s).

(3 items, n = 1, 2, and 5) (Answer categories: 0%, 1–5%, 5–10%, 10–15%, 15–20%, 20–25%, > 25%).

= 1 if respondent has long horizon in firm

Assign a probability to the following: What is the likelihood that you will be in your current firm 10 years from today?

= 1 if respondent job is at headquarter level

Is your position at the firm-level?

Incentive rate for total performance

If your base salary is 100%, what is the maximum percentage you could earn on top of your base salary (as cash bonus or other compensation)?

Supply of effort

How many hours do you work according to your contract in your organization?

On average, how many hours do you actually work per week?

Firm size

What is the total size of the organization you work for (in full time equivalents employees)?

Capital market pressure

What is the percentage of equity in your company owned by anonymous shareholders?

Unused holiday allowance

How many days of paid holiday per year are you entitled to (according to your contract)?

How many days do you actually take as holiday each year?

Appendix 3

Remedies undertaken against common method variance and single respondent bias

Remedy and Rational	Implementation
Procedural:	
Separation of measurement: Reduce the likelihood that the mindset of the respondent biases the observed relation between dependent and independent variables, eliminating the effects of consistency motifs, implicit theories, social desirability tendencies, dispositional and transient mood states, and tendencies to acquiesce or respond in a lenient manner (Podsakoff et al. 2003).	The survey uses different response formats (Likert scales, open-ended questions) and the items on ethical work climate, weight on performance measures, and earnings management were placed far apart from each other in the questionnaire. Items were not grouped by variable and the questions were not labeled on the basis of the reported constructs ("degree of work unit undesirable action", etc.) Finally, the survey was presented to respondents as a "salary benchmark study"; this stated objective reduces the possibility that respondents guessed the research question and/or formed implicit theories when answering the questions.
Protecting respondent anonymity and reduce evaluation apprehension: This technique decreases respondent's tendency to make socially desirable responses and/or be acquiescent or lenient.	The cover screen of the internet survey and the invitation email assured respondents complete anonymity. The survey assured respondents that there were no right or wrong answers and that they should answer questions honestly.

Remedy and Rational	Implementation
Reducing item ambiguity: Problems in comprehension can be a source of method variance. Careful attention to the wording of items can reduce item ambiguity.	The questionnaire avoided or defined ambiguous or unfamiliar terms, avoided double-barreled questions and avoided complicated syntax. The survey also used different scale endpoints and formats for the dependent and independent variables to reduce method variance due to commonalities in scale endpoints and anchoring effects. Items avoided the use of bipolar numerical scale values and provided verbal labels for the midpoints of scales to mitigate acquiescence bias (Tourangeau et al. 2000).
Statistical:	
Harman's (1967) *single-factor test:* If a substantial amount of common method variance exists then either a single factor will emerge or one factor will account for the majority of covariance among the variables.	We load all the items associated with each variable in the study into an exploratory factor analysis and examine the unrotated factor solution to determine the number of factors that are necessary for the variance in the variables. This test strongly reject that one single factor is sufficient to account for the variance (p-value < 1%).
Correlational marker technique: If a variable can be identified that is theoretically unrelated to at least one other variable in a study, preferably the dependent variable, then it can be used as a marker variable in controlling for common method variance (Lindell and Whitney 2001).	We used the number of annual paid holidays available to the respondent as the marker variable, as it was theoretically unrelated to many other variables and especially to degree of undesirable action and weight on performance measures. All our significant zero-order correlations remained significant after the partial correlation adjustment, suggesting that common method variance was not a serious problem in our study.

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Data availability Data is from a proprietary source and subject to confidentiality agreements.

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