The Value of Non-Value-Maximizing Managers

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Abstract

Companies pursue multiple goals, such as financial returns and environmental and social performance. Conventional wisdom suggests they should appoint managers who share investors' preferences across these different goals. We show that, when performance measurement is asymmetric, appointing a manager who is biased towards the worse-measured activity ("impact") may instead be optimal. Doing so allows for stronger incentives on the better-measured activity ("profits") without distorting resource allocation. Strong financial incentives need not indicate that the manager lacks intrinsic motivation; instead, they counteract his intrinsic motivation for impact. Similarly, strong financial incentives need not imply that a mission-focused firm is greenwashing; it pursues its mission by appointing a biased manager rather than through the incentive contract. In a market equilibrium with a continuum of managers, we characterize the optimal level of bias and how it affects the level and structure of pay. The framework offers new insights into executive incentives, corporate purpose, and organizational culture.

Keywords: executive compensation, incentives, sustainability, ESG, private benefits, managerial preferences.

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1 Introduction

Organizations routinely face decisions that require trading off multiple dimensions of performance. A board may care about both financial returns and environmental and social ("ES") impact; a hospital about treatment and preventive care; a university about research output and teaching quality. These decisions may involve allocating resources such as money or time, setting the organization's priorities, or determining its strategy. It might seem optimal to appoint an unbiased leader who shares the organization's overall objective and can be relied upon to make these decisions in pursuit of that objective.

However, some companies select CEOs who appear to be biased towards one particular goal. Several executives, such as BlackRock's Larry Fink and former Disney boss Bob Chapek, have been criticized for prioritizing ES impact over financial returns – for example through efforts to combat climate change, promote diversity, equity, and inclusion ("DEI"), or support social justice initiatives. Such actions, and even the appointment of these CEOs, are sometimes dismissed as "woke capitalism". Other leaders, such as Tesla's Elon Musk or Meta's Mark Zuckerberg, are viewed as prioritizing technological innovation and ambitious scientific vision even at the expense of shareholder value.

This paper shows that such practices may be optimal. Central to our result is the observation that, across different dimensions, measured performance may diverge from actual output to varying degrees. For example, shareholder value can be proxied by the stock price in an efficient market, but many aspects of ES impact are qualitative and third-party quantitative ratings are inconsistent (Berg, Kölbel, and Rigobon, 2022). Focusing contractual incentives on the better-measured dimensions may lead the CEO to neglect the worse-measured ones (Holmström and Milgrom, 1991). Hiring managers whose intrinsic preferences are biased towards the latter allows the board to use high-powered incentives on the former, while relying on the manager's bias to prevent excessive neglect of the less visible factors. Thus, appointing agents misaligned with the principal's objective can help achieve her objective: non-value-maximizing managers can be value-maximizing.

We build a parsimonious principal-agent model in which a manager allocates a fixed resource across two activities. For clarity, we will refer to the better-measured activity as "profits" and the worse-measured activity as "impact", although the model admits many other interpretations. Even under this interpretation, "impact" has several applications, such as ES impact, scientific innovation and technological progress, or brand strength and customer reputation. The manager privately observes the productivity of each activity. Output of an activity is increasing in both productivity and the resources allocated to it. While output is non-contractible, an imperfect measure of performance is available and contractible for each activity. The principal's overall objective is a weighted sum of the output of both activities, minus the manager's pay and an

adjustment cost of deviating from a default allocation. Like output, this objective is also non-contractible. The manager maximizes his pay minus the adjustment cost of deviating from his default allocation; the latter reflects his bias and may differ from the principal's.

Strong incentives on a given dimension induce the manager to respond to his private information about that dimension, rather than adhere to his default allocation. However, if measured performance diverges from true output, strong performance incentives lead the manager to prioritize the former at the expense of the latter (Kerr (1975), Baker (1992)). As a result, optimal incentive contracts place greater weight on profits and less weight on impact, because profits are more precisely measured. This asymmetry, however, creates a systematic bias in the manager's decision, leading him to allocate too many resources to profits. Reducing incentives for profits is not a solution, as it would reduce the manager's responsiveness to his private information. Increasing incentives for impact is not a solution either, as it would lead him to improve measured impact rather than actual impact – to "hit the target, miss the point."

We show how this distortion can be mitigated through managerial selection. When impact is poorly measured, the principal optimally appoints a manager who intrinsically values it more than she does. This bias allows the principal to offer high-powered incentives for profits, where they are most effective, without causing the manager to neglect impact. Note that bias is different from intrinsic motivation. In a single-activity model, it is well-known that an intrinsically motivated manager (e.g. one with a low cost of effort, a private benefit of effort, or an intrinsic preference for the activity the effort contributes to) is valuable because it attenuates the agency problem (Bénabou and Tirole (2003), Besley and Ghatak (2005), Carlin and Gervais (2009)). In our setting, there are two activities that conflict with each other. Thus, while bias creates "intrinsic motivation" for impact, it is at the expense of profits. Indeed, in a first-best world where the principal can observe productivity and the resource allocation decision, bias is unambiguously costly. In addition, unlike in single-activity models where the activity (e.g. effort) is always beneficial to the principal, here the manager many pursue excessive impact.

Our results also contrast the standard multitasking model which predicts low-powered incentives across all tasks when tasks are substitutes (Holmström and Milgrom (1991)). In models of multitasking with imperfect performance measurement, Prendergast (2007, 2008) shows that the principal can hire "biased agents" whose bias is suited to a particular task. The solution is to use job design by allocating different types of agents to different tasks within an organization. In our model, the agent only has one task – allocating resources – so that job design is not a solution; it is thus particularly applicable to CEOs, who are responsible for all of a company's major activities. Instead, the solution is a combination of bias and financial incentives.

The model produces empirical predictions for the link between bias and incentives. We find that increasing the manager's bias towards impact not only reduces the optimal incentives for impact, but also increase his incentives for profits. This result rationalizes some otherwise

puzzling practices. Many companies state a purpose beyond shareholder value, yet the vast majority of executive incentives are tied to the stock price (Bebchuk and Tallarita, 2023), leading to criticism that purpose statements are "greenwashing". Vladasel et al. (2024) find that many social enterprises simultaneously offer a social mission and monetary rewards for (more easily measured) commercial tasks. However, given the difficulties in measuring impact, the optimal way to pursue it may be to appoint an impact-conscious manager – in which case strong financial incentives are needed to ensure that resources are not excessively allocated to impact at the expense of profitability. Separately, strong financial incentives are often criticized on the grounds that intrinsic motivation should be sufficient to motivate managerial effort: if the CEO requires incentives to deliver exceptional performance, the board has hired the wrong CEO (see the survey of Edmans, Gosling, and Jenter (2023)). Our model shows that financial incentives are fully consistent with an intrinsically motivated CEO. Indeed, the CEO may be intrinsically motivated towards an action (impact) that creates value and enhances the principal's objective, up to a point. Financial incentives are needed to ensure that he does not pursue impact beyond that point.

Our framework also provides cross-sectional predictions for the types of companies that should appoint biased managers. Bias is more valuable when the manager's private information is more important, when performance measurement is particularly asymmetric, and when deviations from the principal's preferred allocation are costly.

We next extend the analysis to an economy with heterogeneous firms and managers. Firms differ in the quality of their performance measurement, while managers differ in their biases. In a matching equilibrium we show that firms with worse measurement of impact hire managers who are more biased toward impact. Up to a point, managers who are more biased towards impact earn more rents: this bias is valuable when firms measure impact poorly and so financial incentives are ineffective. Managers who are intrinsically biased away from shareholder value may actually have greater potential to create shareholder value, given the endogenous response of financial incentives, and thus earn higher pay. However, when the bias is too high, the manager destroys value as his chosen allocation deviates too much from the principal's. Unlike in the single-firm model, a manager who is more biased towards profits may actually receive stronger incentives for profits. This is because he is optimally matched with a firm that measures impact well and thus offers high impact incentives. In turn, this increases the profit incentives he receives to mitigate the distortionary effect of unbalanced incentives.

The manager's bias for a particular activity may stem from a number of sources. One is personal preferences, which may be shaped by his background and upbringing. A second is organizational factors such as corporate culture. For example, if a firm has issued a purpose statement committing to impact, has a historical reputation for delivering it, or employs colleagues who value it, the manager may face social or reputational pressure to deliver impact.

Interestingly, our model predicts that improved measurement of impact (e.g. through superior ES reporting standards) may optimally shift corporate culture away from impact, as impact can instead be incentivized through compensation contracts. Conversely, improvements in financial reporting may lead boards to place greater emphasis on impact in public statements, to encourage managers to deliver it. The model thus rationalizes apparent overcommitment to impact (e.g. through public statements or targets even in the absence of financial incentives), even if impact is poorly measured and may be detrimental to shareholder value. Such a commitment may reflect an optimal response to the superior measurement of profits.

This paper principally contributes to two literatures: one on performance measurement and multitasking and a second on motivated agents. Baker (1992) and Holmström and Milgrom (1991) show that when some dimensions of performance are easier to measure than others, incentive pay distorts behavior toward the better-measured dimensions. A large literature on motivated agents studies how organizations respond by seeking alignment between mission and agent type: mission-oriented firms attract or choose agents whose preferences match organizational goals, reducing the need for monetary incentives (Besley and Ghatak (2005, 2006); Cassar and Armouti-Hansen (2020)). We instead show that asymmetric measurement can make misalignment optimal: the principal may prefer a manager who is biased toward the worse-measured activity.

Our paper is closest to work showing that some misalignment can be valuable. Prendergast (2007, 2008) and Holmström (2017) show that biased agents or job design can help organizations cope with incomplete contracting and differences in task measurability. Kajackaite and Sliwka (2020) show that even money-maximizing shareholders may prefer a prosocial manager because such a manager can raise employee motivation. We differ by studying a single manager who makes one resource-allocation decision across substitute activities, so tasks cannot be unbundled across agents. In this setting, managerial bias and explicit incentives are complements rather than substitutes: bias toward the poorly measured activity supports stronger incentives on the better-measured one.

Bénabou and Tirole (2016) also analyze multitasking when incentive pay can skew effort toward contractible activities, but their main force operates through competition and screening in the labor market. By contrast, our central mechanism arises already in a simple one-principal, one-agent model; the matching extension then shows how differences in measurement technologies shape who is hired, how much the manager is paid, and the structure of incentives in equilibrium.

Finally, our paper is related to research on the consequences of managers focusing on narrow financial metrics. Aghion and Stein (2008) and Ben-David and Chinco (2026) study settings in which managerial decisions are shaped by metrics such as profit margins or short-term EPS, motivating our assumption of managers who overweight imperfect proxies for firm value. We

instead ask when shareholders optimally respond by appointing a manager biased toward the worse-measured activity.

2 Model

We consider a principal-agent model of resource allocation. A principal (board acting on behalf of shareholders) hires an agent (manager) who receives private information about the productivity of potential allocations of the firm's resources.[1] Both the principal and agent have preferences about the resource allocation, for reasons described shortly, and incur a cost from deviating from a baseline allocation. If the principal and agent's baseline resource allocations are the same, we say that the agent is "aligned".

The firm produces unverifiable output V_i on two dimensions $i = 1, 2$. On each dimension, its performance is measured by the metric P_i. Output and performance are affected by an unobservable allocation decision, a. This decision can reflect the allocation of time, money or other resources, or the choice of strategy. As in Baker (1992), output and performance are affected by shocks $\boldsymbol{\epsilon} \equiv \{\epsilon_1^v, \epsilon_2^v, \epsilon_1^p, \epsilon_2^p\}$ which are privately observed by the manager. Output and performance on both dimensions are:

$$V_1(a, \boldsymbol{\epsilon}) = a\epsilon_1^v \qquad \text{and} \qquad V_2(a, \boldsymbol{\epsilon}) = (1-a)\epsilon_2^v \tag{1}$$

$$P_1(a, \boldsymbol{\epsilon}) = a\epsilon_1^p \qquad \text{and} \qquad P_2(a, \boldsymbol{\epsilon}) = (1-a)\epsilon_2^p \tag{2}$$

For $i \in \{1, 2\}$ and $j \in \{v, p\}$, the random variable ϵ_i^j has a standard deviation σ_i^j, and a mean normalized to $\mathbb{E}\left[\epsilon_i^j\right] = 1$.[2] The correlation coefficient between output and measured performance on dimension i is: $\rho_i \equiv \frac{cov(\epsilon_i^v, \epsilon_i^p)}{\sigma_i^v \sigma_i^p}$. Shocks to performance and output are independent across dimensions, so that:[3]

$$cov(\epsilon_i^p, \epsilon_j^v) = 0 \;\text{ and }\; cov(\epsilon_i^p, \epsilon_j^p) = 0 \qquad \forall i \neq j.$$

The manager thus makes a single resource allocation decision, a, which affects both outputs and performance measures. This differs from the multitasking framework (Holmström and Milgrom (1991)), in which a manager with multiple tasks chooses separate effort levels for each task. While both frameworks allow for allocations across tasks to be substitutes, they differ

[1] Private information may be interpreted literally; alternatively, it may result from the manager's expertise, thus allowing him to use public information to make superior resource allocation decisions. For example, an experienced CEO may observe industry trends and use them to determine the optimal scale of investment.

[2] Baker (1992) makes a similar assumption by equating the expectation of the performance P to the expectation of the outcome V.

[3] This does not imply that performance will be independent across dimensions: increasing a improves V_1 ad the expense of V_2. Instead, we are only assuming that shocks to performance are independent across dimensions.

in several important ways. First, in a multitasking model, individual tasks can in principle be allocated to different agents (Prendergast (2007, 2008), Holmström (2017)). By contrast, the resource allocation model involves a single task, and thus is most applicable to CEOs who are responsible for all major activities. Second, a resource allocation decision means that prioritizing one activity necessarily comes at the expense of the other. As a result, our notion of bias differs from intrinsic motivation, which can increase effort on one task without necessarily automatically effort on others, and so bias is not always desirable for the principal. Third, with a single action, preferences over allocations can be summarized by a single parameter, making it straightforward to compare the objectives of the principal and the agent.

The principal's objective function is:

$$\mathbb{E}\left[V_1(a,\boldsymbol{\epsilon}) + V_2(a,\boldsymbol{\epsilon}) - W(a,\boldsymbol{\epsilon}) - \frac{k}{2}\left(a - a^\star\right)^2\right]$$

where $W(a,\boldsymbol{\epsilon})$ is the manager's payoff, and $k > 0$. The last term captures the cost to the firm of deviating from a baseline resource allocation $a^\star$, which may reflect adjustment costs (e.g., if a^* represents a historical or approved allocation) or investor preferences.

The principal's objective is noncontractible, since output is noncontractible. For example, the outputs may be impact and profits, and shareholders care about both as in models of responsible investing. Alternatively, the objective function might refer to long-term shareholder value, where V_1 and V_2 are financially material actions that both contribute to shareholder value. However, if long-term shareholder value is not reflected in the stock price for many years (e.g. one of the dimensions is investment in a new technology that the market is unable to value in the short term), and there is a limit to how long the firm can escrow the manager's equity (e.g. due to his consumption needs), then shareholder value is not contractible. If the principal's objective were contractible, the agency problem would be simple to solve as the principal would contract on it.

As in Baker (1992), the principal offers a linear incentive contract $\{S, b_1, b_2\}$ such that the manager's payoff is equal to:

$$W(a,\boldsymbol{\epsilon}) = S + b_1 P_1(a,\boldsymbol{\epsilon}) + b_2 P_2(a,\boldsymbol{\epsilon})$$

Linear contracts are a standard assumption in this literature (Baker (1992), Besley and Ghatak (2005), Fischer and Huddart (2008), Bénabou and Tirole (2016)). The Online Appendix provides one potential microfoundation: if the manager can spread or contract the distributions of the performance measures, then he can game any nonlinear contract. Only linear contracts are robust to such manipulation, as also shown by Barron, Georgiadis, and Swinkels (2020).

The manager's reservation utility is given by $\overline{U}$. Given a contract $\{S, b_1, b_2\}$, the manager's

information $\boldsymbol{\epsilon}$, and resource allocation a, the manager's expected utility is:

$$\mathbb{E}\left[S + b_1 P_1(a, \boldsymbol{\epsilon}) + b_2 P_2(a, \boldsymbol{\epsilon}) - \frac{c}{2}(a - \alpha)^2\right] \tag{3}$$

where $c > 0$ parameterizes the cost to the manager of deviating from his preferred resource allocation α. The manager has preferences over the resource allocation decision, as in models of motivated agents (e.g., Akerlof and Kranton (2005); Besley and Ghatak (2005)). Empirically, there is ample evidence that agents have nonpecuniary preferences over actions, and that such preferences are heterogeneous across individuals (e.g., Wrzesniewski et al. (1997); Cassar and Meier (2018), Fehr and Charness (2025)).[4] There is a continuum of different managers that the firm can hire, each of which have a different α, where $\alpha \in [\underline{\alpha}, \overline{\alpha}]$.

3 Analysis

This section solves for both the type of manager that the firm hires and the compensation contract that it offers. We begin by characterizing the first-best, which arises when the resource allocation a is contractible and there is no asymmetric information (i.e. the principal observes the state $\boldsymbol{\epsilon}$). Then, the principal can dictate a state-contingent allocation $a(\boldsymbol{\epsilon})$ and pays a fixed wage w. She chooses $a(\boldsymbol{\epsilon})$ to maximize her expected payoff subject to the manager's participation constraint:

$$\max_{a(\boldsymbol{\epsilon}),\, \alpha} \ \mathbb{E}\left[a\,\epsilon_1^v + (1 - a)\,\epsilon_2^v - w - \frac{k}{2}(a - a^\star)^2\right] \tag{4}$$

$$\text{s.t.} \quad \mathbb{E}\left[w - \frac{c}{2}(a - \alpha)^2\right] \geq \overline{U} \tag{5}$$

The participation constraint will bind at the optimum. Substituting for w from the binding participation constraint into the objective function, and optimizating pointwise over a for each realization of $\boldsymbol{\epsilon}$, yields the first-best state-contingent allocation:

$$a^{FB}(\boldsymbol{\epsilon}) = \frac{c\alpha + ka^\star + \epsilon_1^v - \epsilon_2^v}{c + k}. \tag{6}$$

Substituting back into in (4) and optimizing over α shows that the principal hires an aligned manager, i.e. $\alpha = a^\star$. Intuitively, this minimizes the manager's expected disutility from deviation, which must be compensated to satisfy the participation constraint. Then, the first-best

[4]Many empirical studies find that personal values affect decisions. For example, the personal values of social enterprises' CEOs affect their attention to social goals (Stevens et al. (2015)); corporate researchers prefer science-oriented research and are willing to take a pay cut to work on fundamental research (Stern (2004)); medical doctors are reluctant to consider the costs of treatment they prescribe because this is inconsistent with their "fundamental motivations" (Hall (1996)).

allocation is:

$$a^{FB}(\boldsymbol{\epsilon}) = a^\star + \frac{\epsilon_1^v - \epsilon_2^v}{c+k}. \tag{7}$$

The allocation depends on the output shocks ϵ_1^v and ϵ_2^v, not the performance shocks ϵ_1^p and ϵ_2^p. The wedge between output and measured performance, which is the main friction in the second-best, is irrelevant in the first-best when the principal observes the state and directly controls a. As a result, hiring a biased manager ($\alpha \neq a^\star$) is never optimal: it raises the disutility from deviation and thus the cost of compensation, and does not improve the allocation a as it can be dictated anyway.

We now study the equilibrium outcome when the resource allocation decision is non-contractible, i.e. the second-best outcome. We solve the model backwards, starting with the manager's resource allocation decision, then deriving the optimal contract, and finally the manager's bias α that the principal prefers. We start by deriving several preliminary results.

Lemma 1 *For a given contract $\{S, b_1, b_2\}$, the manager optimally chooses the following resource allocation:*

$$a = \alpha + \frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c}$$

The optimally chosen resource allocation is additive in two terms. The first is the manager's baseline resource allocation α. This is what he would choose in the absence of financial incentives. The second term captures the deviation from this baseline level due to his information and incentives, scaled by the cost c of deviating. The higher the sensitivity of pay to performance on dimension 1 (as measured by b_1) and the more allocating resources to this dimension improves performance (depending on ϵ_1^p), the more the manager allocates resources to the first dimension by increasing a. Importantly, his allocation decision depends on the effect on performance ϵ_1^p rather than the effect on output ϵ_1^v. The distinction between ϵ_1^p and ϵ_1^v means that it may be suboptimal to have strong incentives for a dimension that is poorly measured: the manager may increase a if ϵ_1^p is high, even if ϵ_1^v is low. For example, a bank manager may increase the number of loans even if the quality of such loans is low. Likewise, the higher b_2 and ϵ_2^p, the more the manager allocates resources to the second dimension by decreasing a.

Lemma 2 determines the optimal pay-performance sensitivity ("PPS") to both dimensions of performance. The fixed wage S is set to keep the manager at his reservation utility given the incentives derived in Lemma 2.

Lemma 2 *The optimal sensitivity of pay to performance on both dimensions is:*

$$b_1 = \frac{c\left(\rho_1\sigma_1^p\sigma_1^v\left(\sigma_2^{p2}+1\right)+\rho_2\sigma_2^p\sigma_2^v+\sigma_2^{p2}k\left(a^\star-\alpha\right)\right)}{(c+k)\left(\sigma_1^{p2}\sigma_2^{p2}+\sigma_1^{p2}+\sigma_2^{p2}\right)} \tag{8}$$

$$b_2 = \frac{c\left(\rho_2\sigma_2^p\sigma_2^v\left(\sigma_1^{p2}+1\right)+\rho_1\sigma_1^p\sigma_1^v+\sigma_1^{p2}k\left(\alpha-a^\star\right)\right)}{(c+k)\left(\sigma_1^{p2}\sigma_2^{p2}+\sigma_1^{p2}+\sigma_2^{p2}\right)} \tag{9}$$

Incentives b_i are increasing in measurement quality ρ_i and ρ_j, output volatility σ_i^{v2} and σ_j^{v2}, and the manager's deviation cost c.

Lemma 2 shows that PPS on dimension i is additive in three terms.

First, it is increasing in $\rho_i\sigma_i^v\sigma_i^p$, similar to Baker (1992). PPS is more sensitive to performance on a dimension that is well-measured, i.e. there is a high correlation ρ_i between performance and output. It is also increasing in uncertainty σ_i^v about the production technology, as this makes it particularly valuable to make the manager responsive to his private information.

Second, PPS b_i on dimension i is increasing in PPS on the other dimension (j), as captured by the term $\rho_j\sigma_j^p\sigma_j^v$. This is a standard effect when tasks are substitutes so that the balance of incentives matters. Suppose that PPS increases on dimension j due to a rise in ρ_j, σ_j^v, or σ_j^p. To deter excessive resource allocation away from dimension i, b_i increases as well. Thus, improvements in performance measurement on one dimension increase PPS on both dimensions – a spillover effect.

Third, PPS depends on the difference between the resource allocation preferred by the manager, α, and the one preferred by the principal, $a^\star$. Intuitively, the principal uses PPS to better align the manager's interests with respect to the resource allocation decision. For example, when the manager is biased toward dimension 2 relative to the principal (i.e. $\alpha < a^\star$), PPS increases on dimension 1 and decreases on dimension 2. Intuitively, the contract counteracts the manager's bias

Proposition 1 gives our main result: the firm's optimal choice of the manager's bias α.

Proposition 1 *The firm appoints a manager with the following preferred resource allocation:*

$$\alpha = a^\star + \frac{\rho_2\sigma_2^p\sigma_2^v\sigma_1^{p2}-\rho_1\sigma_1^p\sigma_1^v\sigma_2^{p2}}{c\left(\sigma_1^{p2}\sigma_2^{p2}+\sigma_1^{p2}+\sigma_2^{p2}\right)+k\sigma_1^{p2}\sigma_2^{p2}}$$

The manager's preferred resource allocation α is increasing in ρ_2 and decreasing in ρ_1.

Thus, it appoints a manager with $\alpha < a^\star$ if and only if:

$$\rho_2 \frac{\sigma_2^v}{\sigma_2^p} < \rho_1 \frac{\sigma_1^v}{\sigma_1^p}.$$

This condition shows how the principal's preference for the manager's type depends on the performance measurement system. The principal will rather appoint a biased manager with $\alpha < a^\star$ if ρ_1 is sufficiently high or if ρ_2 is sufficiently low. Intuitively, the principal will rather appoint a manager with a stronger preference for dimension 1 if performance is sufficiently poorly measured on that dimension, or if it is sufficiently well-measured on dimension 2. This allows to provide strong incentives on the well-measured dimension while relying on the manager's bias to mitigate excessive neglect of the poorly-measured dimension.

For example, with normalized volatilities $\sigma_1^v = \sigma_1^p = \sigma_2^v = \sigma_2^p = 1$, performance is better measured on dimension 1 when $\rho_1 > \rho_2$. In this case, the principal would rather appoint a manager who is relatively biased towards dimension 2, i.e. $\alpha < a^\star$. The optimal bias will be greater when output volatility on both dimensions is high, i.e., when the manager's private information matters more. Intuitively, financial incentives are higher-powered to make the manager more responsive to his private information. To partly offset the effect of stronger incentives on resource allocation, the principal appoints a manager who is more biased towards dimension 2.

One application is to product design, where the two dimensions are low cost and high quality. Cost is very-well measured, so that ρ_1 is high, but quality is not, so that ρ_2 is low. The firm then optimally hires a product manager who cares more than he does about quality, and gives stronger incentives on the cost dimension.

In a second application, the first dimension is profitability and the second is impact. Assume that profitability is well-measured due to accounting standards, and can vary a lot across potential investment. As a result, both ρ_1 and σ_1^v are high, and so it is particularly valuable for the manager to be responsive to the productivity signal ϵ_1^p. This is achieved with a high b_1, as shown in equation (8). If impact is poorly measured, due to being difficult to quantify and varying across companies, then ρ_2 is low. Then, the firm optimally hires a manager biased toward impact, i.e. $\alpha < a^\star$. This further increases the sensitivity of pay to profitability (see equation (8)) and reduces the sensitivity of pay to impact (see equation (9)).

A special case of Proposition 1 is where the second term is zero, and so the firm hires an aligned manager ($\alpha = a^\star$). Corollary 1 gives sufficient conditions for this to be the case.

Corollary 1 *The principal prefers to appoint an aligned manager in any of the following cases:*
(i) There is no information asymmetry between the firm and manager about the optimal resource allocation, i.e. $\sigma_1^v = \sigma_2^v = 0$*;*
(ii) Performance measurement is unrelated to output, i.e. $\rho_1 = \rho_2 = 0$*;*
(iii) Performance measures perfectly reveals output, i.e. $\rho_1 = \rho_2 = 1$*;*

(iv) Performance on one dimension reveals the resource allocation but is unrelated to output, i.e. $\sigma_1^p = 0$ *or* $\sigma_2^p = 0$.

In case (i), $\sigma_1^v = \sigma_2^v = 0$ and the manager's private information is irrelevant for output. Then, the only role of incentives is to elicit the principal's preferred allocation, $a = a^\star$, in a framework with symmetric information. This can simply be achieved by hiring a manager with the same preferences ($\alpha = a^\star$), and not providing any financial incentives ($b_1 = b_2 = 0$).

In case (ii), $\rho_1 = \rho_2 = 0$ and performance measures are pure noise. Thus, the optimal financial incentives are zero. The principal instead achieves her objective by hiring an aligned manager ($\alpha = a^\star$).

In case (iii), output is contractible and so the principal can achieve the first-best outcome using financial incentives. However, the manager's preferences still matter because they affect his disutility from deviation and thus the required compensation. The firm thus hires an aligned manager.[5]

In case (iv), measured performance is perfectly informative about the manager's choice of a. For example, if $\sigma_1^p = 0$, performance on dimension 1 perfectly reveals the choice of a, and it is unrelated to the manager's ϵ_1^v on that dimension.[6] The manager is given incentives on dimension 1 not to incentivize him to use information on dimension 1 (as he has none), but because he is given incentives on dimension 2 to incentivize him to use his information on dimension 2. The latter would cause the manager to overweight dimension 2 if it were not counterbalanced by incentives on dimension 1. Thus, hiring an aligned manager allows the firm to offer balanced incentives with $b_1 = b_2$ at a level driven by the quality of performance measurement on dimension 2 (see Lemma 2 with $\sigma_1^p = 0$ and $\alpha = a^\star$). Aligned preferences and balanced incentives lead to the manager implementing the firm's preferred resource allocation.

For example, some monitoring technologies allow to know the time spent by an office worker in front of his desk, as opposed to collaborative meetings (see Raith (2008), where the contract can also be contingent on inputs).

In summary, the relation between output and performance on both dimensions determines which manager is hired and the sensitivity of pay to performance on both dimensions. When performance is a good measure of output on dimension i, the manager should be highly responsive to his signal, ϵ_i^p. To avoid excessive resource allocation on the well-measured dimension at the expense of the poorly measured dimension because of the difference in the sensitivity of pay to performance on these two dimensions, the principal optimally appoints a manager who is biased in favor of the latter.

[5]Interestingly, this is no longer true if performance measures are perfectly informative ($\rho_1 = \rho_2 = 1$) but do not have the same volatility as output. Intuitively, in this case, pay-for-performance optimally varies across performance measures, so that it is generally suboptimal to hire a perfectly aligned agent.

[6]Note that the result in case (iv) still holds in the special case $\sigma_1^v = 0$, i.e. when output (not just performance) on the first dimension is a deterministic function of the resource allocation.

4 Matching in competitive markets

The baseline analysis shows that a firm with asymmetric performance measurement optimally hires a biased manager. We now extend the model to the case of a continuum of firms which differ in their performance measurement, while retaining a continuum of managers with heterogeneous preferences. We study the matching between firms and managers, as well as which managers receive the highest rents (in the single-firm model, the hired manager receives his reservation wage and thus zero rents). We also show that, unlike the single-firm model, impact-motivated managers need not receive weaker impact incentives, because they may be matched with firms that can measure impact more precisely.

4.1 Setup

We consider an economy populated by a continuum of firms and managers. Firms differ only in the quality of their impact measurement ρ_2: the type of firm i, ρ_2^i, is distributed on $[\underline{\rho}, \bar{\rho}]$ with CDF F_ρ. The quality of profit measurement ρ_1 is common across firms. This allows firms to be indexed by a single parameter, ρ_2^i. It is also empirically motivated: profit is measured relatively uniformly across firms due to accounting standards, while impact measurement varies substantially depending on the nature of impact activities.

As before, managers differ only in their preferred resource allocations α: the type of manager i, α^i, is distributed on $[\underline{\alpha}, \overline{\alpha}]$ with CDF F_A. We simplify the model by analyzing the normalized-volatility case with $\sigma_1^v = \sigma_2^v = \sigma_1^p = \sigma_2^p = 1$, so that only the correlation coefficients differ across the two dimensions.

We consider a matching model with transferable utility . Let $Y(\rho_1, \rho_2; \alpha)$ denote the total surplus from a firm-manager match – the principal's objective function plus the manager's expected utility. It is given by:

$$Y(\rho_1, \rho_2; \alpha) = \mathbb{E}\left[V_1 + V_2 - \frac{k}{2}(a - a^\star)^2 - \frac{c}{2}(a - \alpha)^2\right] \tag{10}$$

when the principal optimally chooses (b_1, b_2) and the manager optimally chooses a.

An equilibrium of the model is such that: (i) all firm-manager matches are stable, i.e., no pair that includes a manager and a firm currently not matched can increase their payoffs by leaving their respective match and forming a new match ; (ii) all firms offer the manager the optimal contract that maximizes the joint surplus ; (iii) all managers choose the optimal resource allocation given their contracts.

4.2 Matching equilibrium

We start with a Lemma which states that the matching assignment depends on the cross-derivative of the surplus with respect to the two matching variables (Legros and Newman (2007)).

Lemma 3 *The surplus of a match $Y(\rho_1, \rho_2^i, \alpha^i)$ is supermodular in ρ_2^i and α^i:*

$$\frac{\partial^2 Y(\rho_1, \rho_2^i, \alpha^i)}{\partial \rho_2^i \partial \alpha^i} > 0 \tag{11}$$

The positive cross-derivative means that better impact measurement (higher ρ_2) generates more surplus when combined with a manager who is more profit-focused (higher α). Intuitively, since financial performance is better measured than impact for most firms (common ρ_1 and heterogeneous ρ_2^i), a firm with relatively good impact measurement has a performance measurement system which is less asymmetric across the two dimensions. This allows the firm to provide stronger impact incentives. Thus, the manager's profit focus and the firm's good impact measurement are complements – together they enable more efficient allocations.

Supermodularity in a matching model with transferable utility leads to positive assortative matching, as shown in Proposition 2:

Proposition 2 *The matching equilibrium involves positive assortative matching: principals with high ρ_2^i are matched with agents with high α^i. The matching function $\rho_2(\alpha)$, which gives the type ρ_2^i of the principal matched with a manager with type α^i, is strictly increasing.*

Proposition 2 states that firms with the best impact measurement (highest ρ_2) hire the most profit-motivated managers (highest α). Positive assortative matching arises because profit-focused agents and good impact measurement are complements, as shown in Lemma 3. An impact-focused manager creates more value at firms with poor impact measurement, where his preferences substitute for weak incentives.

The matching is characterized by the quantile condition:

$$F_A(\alpha^i) = F_\rho(\rho_2(\alpha^i)) \tag{12}$$

Equivalently, the matching function can be written as:

$$\rho_2(\alpha^i) = F_\rho^{-1}(F_A(\alpha^i)) \tag{13}$$

4.3 Equilibrium rents

We now characterize the rents earned by different managers in the matching equilibrium. The rent $U(\alpha^i)$ of a manager with type α^i is defined as:

$$U(\alpha^i) \equiv \mathbb{E}\left[W(a,\epsilon)|\alpha=\alpha^i\right] - \frac{c}{2}(a-\alpha^i)^2 - \overline{U} \tag{14}$$

where a is optimally chosen and $\overline{U}$ is the manager's reservation utility.

Proposition 3 *The marginal rent earned by a manager with type α is:*

$$U'(\alpha) = \frac{k}{3(c+k)}\left(\rho_2(\alpha) - \rho_1 - (3c+k)(\alpha - a^\star)\right), \tag{15}$$

and the rent schedule is:

$$U(\alpha) = U(\underline{\alpha}) + \int_{\underline{\alpha}}^{\alpha}\left\{\frac{k(\rho_2(x)-\rho_1)}{3(c+k)} - \frac{k(3c+k)}{3(c+k)}(x-a^\star)\right\}dx. \tag{16}$$

The marginal agency rent is higher if the firm has better impact measurement (higher ρ_2), which increases the value of profit-focused managers; it is lower with better financial measurement (higher ρ_1), which reduces the value of such managers. Ceteris paribus, the agency rent is lower if the manager is more misaligned, because of the higher deadweight loss.

The agency rent function $U(\alpha)$ is generally non-monotonic: agents with extreme biases (very high or very low α) may earn lower rents than agents with intermediate biases, depending on the distribution of firm types and model parameters.

We can derive a closed-form characterization when firms' impact measurement quality ρ_2 and managers' preferences α are uniformly distributed.

Corollary 2 *Assume $\rho_2 \sim \mathcal{U}[\underline{\rho},\bar{\rho}]$ and $\alpha \sim \mathcal{U}[\underline{\alpha},\overline{\alpha}]$.*
(i) If $a^\star \in (\underline{\alpha},\overline{\alpha})$, $\rho_1 \in (\underline{\rho},\bar{\rho})$, and $\frac{\bar{\rho}-\underline{\rho}}{\overline{\alpha}-\underline{\alpha}} < 3c+k$, then the rent function $U(\alpha)$ is single-peaked, with a unique interior maximizer α^* satisfying

$$\alpha^* = a^\star + \frac{\rho_2(\alpha^*) - \rho_1}{3c+k}, \tag{17}$$

where $\rho_2(\alpha) = \underline{\rho} + \frac{\alpha-\underline{\alpha}}{\overline{\alpha}-\underline{\alpha}}(\bar{\rho}-\underline{\rho})$.
(ii) $\alpha^* < a^\star$ if and only if $\rho_1 > \rho_2(\alpha^*)$; in particular, if $\rho_1 > \underline{\rho} + \frac{\bar{\rho}-\underline{\rho}}{\overline{\alpha}-\underline{\alpha}}(a^\star - \underline{\alpha})$, then the interior maximizer (if it exists) is such that $\alpha^* < a^\star$.

Intuitively, managers who earn the highest rents are those whose bias complements the average impact measurement technology in the economy. $\rho_2(\alpha^*)$ is the firm that hires the

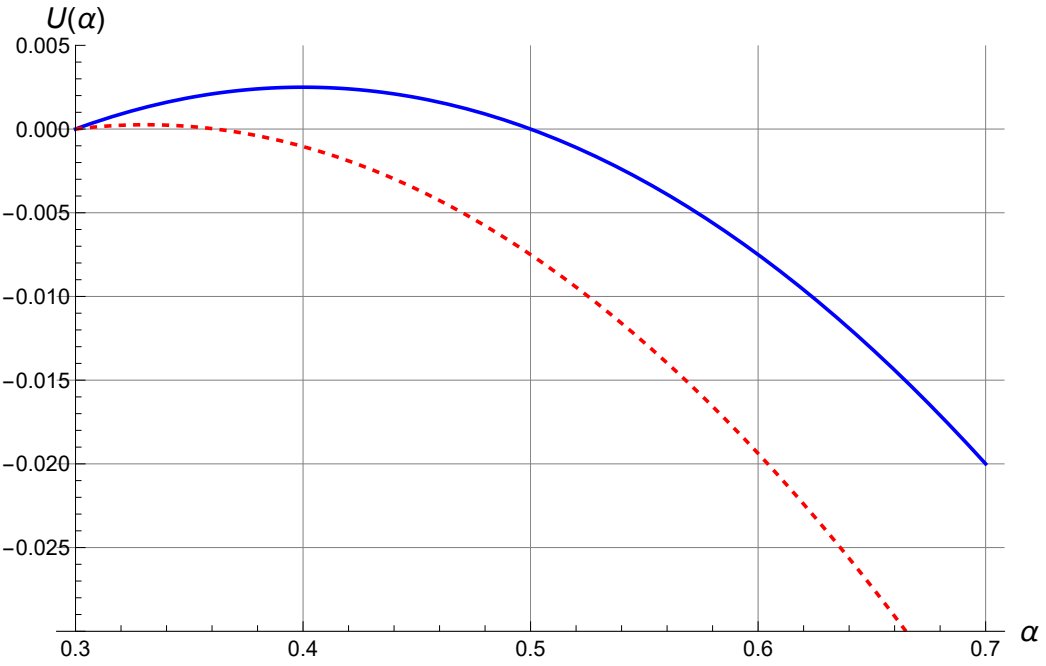


Figure 1: Comparison of rent schedules under different impact measurement quality in Example 1. The solid blue line is the agency rent in the first case with $\rho_2 \in [0.3, 0.7]$. The dashed red line is the agency rent in the second case with $\rho_2 \in [0.1, 0.4]$.

manager with fully congruent preferences ($\alpha = \alpha^*$). The impact measurement technology of that firm lies in between the lower bound $\underline{\rho}$ and the upper bound $\bar{\rho}$; higher α^* means that it is closer to the upper bound $\bar{\rho}$. It can thus be seen as a weighted average of the impact measurement technologies in the economy. When $\rho_1 > \rho_2(\alpha^*)$, i.e. when profits are sufficiently well-measured compared to impact, the managers who earn the highest rents are those who are more biased toward impact than principals. Their bias is valuable because it substitutes for the poor measurement of impact. However, if the bias is too large, the manager's bias towards impact is too large to be corrected with financial incentives, and the manager creates less value and earns fewer rents.

In Example 1, we solve numerically for the manager's rent as a function of his bias.

Example 1 *We consider two cases:*

Case 1: $\rho_2 \sim \mathcal{U}[0.3, 0.7]$, $\alpha \sim \mathcal{U}[0.3, 0.7]$, $a^\star = 0.5$, $\rho_1 = 0.9$, $c = k = 1$. *The highest rent is at* $\alpha^* = 0.36$, *which is below* $a^\star = 0.5$*: the manager is impact-biased relative to the principal. Thus, impact-motivated managers earn the highest rents when financial measurement is much better than impact measurement.*

Case 2: $\rho_2 \sim \mathcal{U}[0.1, 0.4]$ *while all other parameters are unchanged. Impact measurement is worse than in case 1. The highest rent is now at* $\alpha^* = 0.30$*: it is earned by an even more impact-biased manager than in the first case.*

Figure 1 depicts the two rent schedules. As impact measurement worsens, the demand for more impact-motivated managers increases. This raises rents overall, as the least valuable manager type must still be willing to participate, with a rent of zero. Moreover, when impact measurement is moderately poor, the highest rent is earned by a manager with an intermediate bias, whereas when impact measurement is very poor, the highest rent accrues to the manager with the most extreme bias.

4.4 Equilibrium incentives

Having solved for which manager a firm hires and the level of rents he receives, we finally study the financial incentives he is given. We decompose the effect of manager type on incentives into two components: a direct effect holding the matched firm constant, and an indirect sorting effect.

Proposition 4 *Consider two managers with types $\alpha_H > \alpha_L$ (manager H is more profit-motivated). There are two effects:*
(i) Direct effect: Holding firm type constant, manager H receives weaker financial incentives and stronger impact incentives.
(ii) Sorting effect: Under positive assortative matching, manager H is matched to a firm with better impact measurement: $\rho_2(\alpha_H) > \rho_2(\alpha_L)$. This increases optimal incentives on both dimensions.
The overall effect on impact incentives is positive. The overall effect on financial incentives is positive if the firm's adjustment cost k is sufficiently large, and negative otherwise.

Both the direct effect and the sorting effect are positive for impact incentives, so that more profit-motivated managers always receive higher-powered impact incentives. Holding firm type constant, impact incentives are high to compensate for their low impact motivation. Moroever, such managers are matched with firms that measure impact well, further increasing the incentives they are given for impact. However, these two effects work in opposite directions for financial incentives. Holding firm type constant, more profit-motivated managers always receive weaker financial incentives, since they already have an intrinsic preference for profits. They are hired by firms that measure impact well, which increases the incentives they are given for impact, in turn increasing their incentives for profits to ensure that they do not excessively neglect the latter (the spillover effect in Lemma 2).

When the firm's adjustment cost k is sufficiently large relative to the matching slope $\rho_2'(\alpha)$ (which can be expressed as a function of model primitives via equation (13)), the direct effect dominates, so that more profit-motivated managers receive lower-powered financial incentives, as in the single-firm model of Section 2. However, when $\rho_2'(\alpha)$ is sufficiently large relative

to k, the sorting effect dominates, so that more profit-motivated managers receive stronger financial incentives, in contrast to Section 2. Intuitively, when there is either high variation in firm measurement or low variation in managers' types, managers with only slightly different types will be matched to firms with substantially different performance measurement, so that differences in firm types matter more than differences in managers' types.

To illustrate these two regimes, Figure 2 uses the same parameter values as in Example 1 but varies k to show when the direct effect or the sorting effect dominates. In Panel A, with $k = 2$, the direct effect dominates: more impact-motivated managers get stronger financial incentives and weaker impact incentives. In Panel B, with $k = 0.5$, the sorting effect dominates: more impact-motivated managers get stronger incentives on both dimensions.

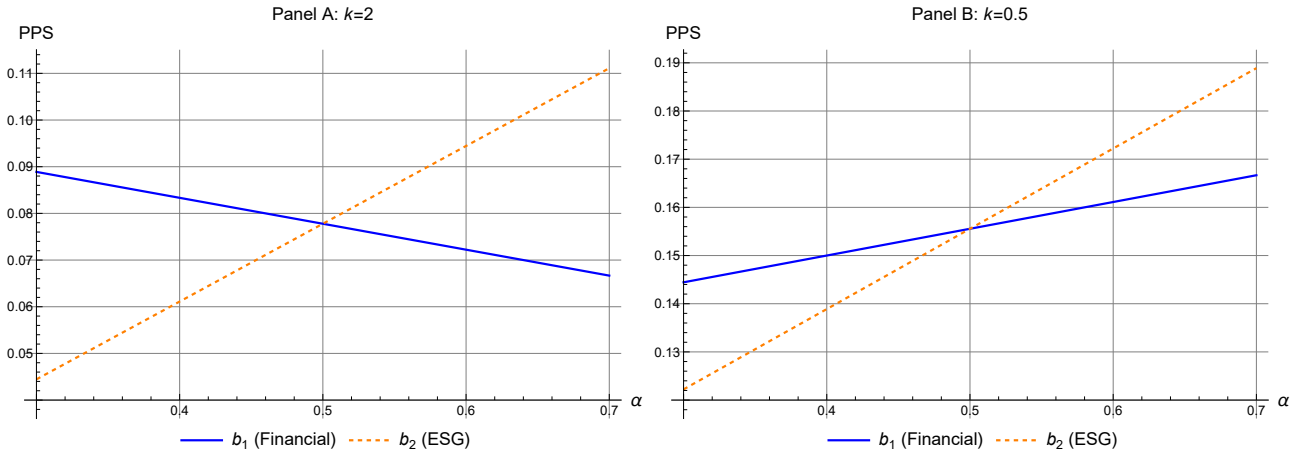


Figure 2: Equilibrium incentive slopes as a function of agent type.

When principals care enough their preferred resource allocation (high k), more impact-motivated managers (low α) receive higher-powered financial incentives and lower impact incentives. Their impact motivation substitutes for explicit impact incentives, allowing firms to provide high-powered incentives on the well-measured financial dimension. This can explain why impact-motivated CEOs are mostly compensated based on financial metrics despite their sustainability focus.

5 Empirical implications

The model yields testable predictions about the joint distribution of measurement quality, managerial type, incentive contracts, and compensation. This section translates the main results into empirical implications. For concreteness, we often focus on the case in which the two dimensions are profit and impact, but analogous implications hold for other applications.

Implication 1 *Organizations with worse measurement on a given dimension should appoint managers who are more biased toward that dimension.*

Implication 1, the main prediction of the model, concerns managerial selection. It holds in both the single-firm model of Section 3 and the matching model of Section 4.

Empirically, a stronger preference for impact might be reflected in donations, affiliations, and voting records (Christensen et al. (2017), Di Giuli and Kostovetsky (2014)). It can also be identified via exogenous shocks to impact preferences (e.g. Cronqvist and Yu (2017)). Better impact measurement would be reflected in a higher correlation between impact ratings or scores (Berg, Kölbel, and Rigobon (2022)), the availability and granularity of impact disclosure, industry exposure to impact scrutiny, or the existence of third-party verification.

Implication 2 *A manager who is more biased toward the poorly measured dimension should receive lower-powered incentives on that dimension.*

Implication 2 concerns incentives. For example, more impact-motivated executives should have weaker impact-based pay and stronger financial-related pay such as equity-based compensation. It also holds in both the single-firm and multi-firm models.

Implication 3 *A manager who is more biased toward the poorly measured dimension should receive higher-powered incentives on the well-measured dimension if firms face significant adjustment costs or if there is little variation in performance measurement across organizations. Otherwise, he receives lower-powered incentives on the well-measured dimension.*

Implication 3 emphasizes that the effects of performance measurement and managerial selection on incentives for the well-measured dimension (e.g. profits) act in opposite directions. The direct effect identified in the single-firm model of Section 3 is that a manager more biased towards impact will receive higher-powered incentives on profits. The matching model of section 4 identifies a potentially offsetting effect, which will dominate if there is enough variation in the quality of impact measurement across firms.

Implication 4 *When principals or agents care sufficiently about the resource allocation decision, the highest agency rent is obtained by a manager with an intermediate type. Otherwise, the highest agency rent is obtained by a manager with an extreme type.*

As already highlighted in Corollary 2, the agency rent can be either monotonic or nonmonotonic in the manager's type. Implication 4 emphasizes that when principals and agents have sufficiently weak intrinsic preferences for the resource allocation decision, agents who are more biased toward the poorly measured dimension will be in higher demand.

The model also predicts responses to changes in measurement or in the distribution of manager types.

Implication 5 *Following a generalized improvement in the quality of performance measurement on some dimension, organizations will have a weaker preference for agents biased toward this dimension, and agents will receive stronger incentives on this dimension.*

For example, if impact performance becomes better measured following mandatory disclosure regulation, firms will have a stronger preference for profit-oriented executives. They may still prefer executives with an impact bias (if impact performance measurement is still worse than financial performance measurement) but their preferred bias will now be more moderate. In addition, a generalized improvement in performance measurement – which does not affect the ranking of firms on this dimension and therefore does not affect the equilibrium matching – results in higher-powered incentives on this dimension, so that agents are more responsive to their information.

6 Applications

We now consider several applications of our stylized model, and discuss the empirical implications in this context.

6.1 Executive compensation

In the private sector, firm value is a contractible performance measure that is very closely aligned with the objective of shareholders (Baker (1992)). Yet, some relevant business activities may not be reflected in firm value. Firms which provide social initiatives and missions that are valuable to their workers tend to improve the satisfaction, motivation, attraction, and retention of their employees (Kitzmueller and Shimshack (2012), Henderson and Van den Steen (2015), Cassar and Meier (2018)), which improves future financial performance (Edmans (2011), Edmans et al. (2024)). However, many of these activities are usually poorly measured, and potential measures might be easy to game.

Our model suggests that this could be addressed by hiring managers who prefer to allocate resources on these dimensions, and then incentivize these managers on the financial dimension with explicit incentives based on firm value. Our model predicts that incentives on the financial dimension will be higher-powered when a manager has a weaker intrinsic preference for financial performance, and when boards have a stronger preference for financial returns, e.g. when the shareholder value paradigm is prevalent.[7]

However, the model cautions against targeting minimum impact weights in executive compensation. An increase in the sensitivity of executive compensation to impact performance is

[7]In addition, as in Baker (1992), these incentives will be all the more high-powered that stock market valuation provides a better measure of firm value, for example due to improvements in stock market efficiency.

only warranted following improvements in impact measurement quality. It would otherwise increase gaming rather than improve impact outcomes. These improvements in performance measurement can take the form of increased disclosure or third-party verification such as sustainability audits. This has implications for policies targeting impact-based incentives, including recommendations made by proxy advisors.

Finally, the model determines the conditions under which diversity among managers is valuable. In the impact application, it is potentially welfare increasing for managers to have diverse preferences when the relative quality of performance measurement across dimensions varies across firms. For example, some firms have good measures of their impact activities, whereas others do not. Only the latter will value managers who are biased toward impact. This has implications for policies that homogeneize or diversify the pool of available managers, such as MBA admissions and curricula, and for the value of cognitive diversity in corporations (Edmans, Flammer, and Glossner (2025)).

6.2 Universities

A research university employs faculty members who are at the same time researchers and instructors. These faculty members face a resource allocation problem in how to allocate their time between teaching and research.

Some institutions that care more about the quantity of research produced will find it easy to incentivize on this dimension, for example with bonus pay that depends on publications. If in addition they mostly teach undergraduate students who may not recognize or value high-quality teaching, measures of teaching quality such as student evaluations will be uninformative and easy to game. In this case, explicitly incentivizing teaching could backfire. Accordingly, these schools will hire professors with an intrinsic motivation for teaching, and possibly cultivate it by creating a "teaching culture".

Other institutions care about research quality and societal impact, which are hard to measure especially in the short-term. If in addition they mostly teach mature students such as MBAs, MSc, and PhDs, who tend to be better able to recognize and appreciate valuable teaching, then teaching quality can usually be better assessed. These schools or universities will hire professors who are intrinsically motivated by research and provide high-powered teaching incentives. The latter can be achieved by generous overload payments for extra teaching, including executive education.

In summary, the model predicts that universities will tend to build a workforce and a culture around the dimension that is easier to game, and provide explicit incentives on the dimension where performance is a good measure of output. [8]

[8] Alternatively, if all measures are easy to game, then incentives will be low-powered on all dimensions, as also

6.3 Healthcare

Medical doctors can allocate their time to actions, such as performing surgeries or prescribing drugs, that tend to improve a measurable short term outcome. They can alternatively allocate their time to better understand individual cases as well as provide authoritative guidance and advice to patients and their relatives. This tends to improve immeasurable long-term outcomes. Of course, in some cases surgery will be the best course of action for the patient, whereas in other cases it will not be, and the medical doctor who interacts with the patient is best placed to make this assessment.

The model suggests that hospitals should hire doctors with an intrinsic preference for better understanding individual cases as well as providing guidance and advice to patients, and incentivize them based on short-term outcomes. By contrast, in recent years, various forms of performance pay in hospitals has arguably led to the overuse of revenue-generating tests and procedures, and to under-investments in low-margin work such as preventive care and cooperation between specialists (Gawande (2009)). Our model suggests that the blame may lie not in the introduction of financial incentives per se, but instead in the failure to select medical doctors with an intrinsic preference for understanding cases and providing advice. Such doctors tend to create a culture of "putting the patient first", especially if they care a lot (with a high cost c of deviating from their preferred resource allocation).

Alternatively, if hospitals have only limited control over the recruitment or education of doctors, they should reduce monetary incentives for measured performance when doctors are less concerned about the allocation of their time. According to Lester Dyke, a cardiac surgeon quoted by Gawande (2009), "We took a wrong turn when doctors stopped being doctors and became businessmen."

7 Conclusion

This paper provides a new theory of managerial selection and incentive provision. We consider a manager with private information in charge of making a resource allocation decision. When performance is imperfectly and asymmetrically measured, the principal will rather appoint a biased manager, i.e., a manager with different preferences about the resource allocation decision. We show that the principal will rather appoint a manager who is biased toward allocating resources to the dimension of performance which is more poorly measured. This implies that a change in some aspect of the measurement technology will also change the type of preferences valued by the principal.

The model can explain the concomitance of high-powered explicit incentives on a dimension of

predicted by other models.

performance which is well-measured, and low-powered incentives on a poorly measured dimension of performance, even if these dimensions are substitutes. The appointment of a biased manager accentuates the difference in pay-for-performance across dimensions. This highlights a new reason for the importance of jointly determining compensation policy and hiring policy.

Our results echo the notion that an important part of education is to endow agents destined for careers in some field with preferences appropriate for this field (Akerlof and Kranton (2005), Van den Steen (2010)). Our contribution to this literature is to point out that the most relevant values depend on the multifaceted and asymmetric nature of performance measurement.

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9 Appendix

Proof of Lemma 1: The agent chooses a to maximize his objective function in equation (3). At the time of choosing his actions, the agent observes ϵ_1^p and ϵ_2^p, so that his objective function can be rewritten as:

$$S + b_1 a\epsilon_1^p + b_2(1-a)\epsilon_2^p - \frac{c}{2}(a-\alpha)^2$$

This objective function is concave in a, so that the optimum is given by the first-order condition:

$$b_1\epsilon_1^p - b_2\epsilon_2^p - c(a-\alpha) = 0$$

Rearranging gives the expression in Lemma 1. ■

Proof of Lemma 2: Plugging equation (**??**) into equation (**??**), the objective function of the principal is:

$$\max_{b,S} \mathbb{E}\left[V_1(a,\epsilon) + V_2(a,\epsilon) - S - b_1 P_1(a,\epsilon) - b_2 P_2(a,\epsilon) - \frac{k}{2}(a-a^\star)^2\right] \tag{18}$$

The participation constraint and incentive constraint are respectively:

$$S + b_1 P_1(a,\epsilon) + b_2 P_2(a,\epsilon) - \frac{c}{2}(a-\alpha)^2 \geq \overline{U} \tag{19}$$

$$b_1\epsilon_1^p - b_2\epsilon_2^p - c(a-\alpha) = 0 \quad \Leftrightarrow \quad a = \alpha + \frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c} \tag{20}$$

Substituting in equation (18) for the binding participation constraint in equation (19), the principal's optimization program rewrites as:

$$\max_{b} \mathbb{E}\left[V_1(a,\epsilon) + V_2(a,\epsilon) - \frac{c}{2}(a-\alpha)^2 - \overline{U} - \frac{k}{2}(a-a^\star)^2\right] \tag{21}$$

This objective function can be rewritten as:

$$\mathbb{E}\left[\left(\alpha + \frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c}\right)\epsilon_1^v + \left(1 - \alpha - \frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c}\right)\epsilon_2^v - \frac{c}{2}\left(\frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c}\right)^2 - \overline{U} - \frac{k}{2}\left(\alpha - a^\star + \frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c}\right)^2\right]$$

The first-order condition with respect to b_1 is:

$$\mathbb{E}\left[\frac{\epsilon_1^p}{c}\epsilon_1^v - \frac{\epsilon_1^p}{c}\epsilon_2^v - c\epsilon_1^p\left(\frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c^2}\right) - k\frac{\epsilon_1^p}{c}\left(\alpha - a^\star + \frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c}\right)\right] = 0$$

$$\Leftrightarrow \mathbb{E}\left[\epsilon_1^p\epsilon_1^v\right] - \mathbb{E}\left[\epsilon_1^p\epsilon_2^v\right] - b_1\mathbb{E}\left[\epsilon_1^{p2}\right] + b_2\mathbb{E}\left[\epsilon_1^p\epsilon_2^p\right] - k\left((\alpha - a^\star)\mathbb{E}\left[\epsilon_1^p\right] + \frac{b_1}{c}\mathbb{E}\left[\epsilon_1^{p2}\right] - \frac{b_2}{c}\mathbb{E}\left[\epsilon_1^p\epsilon_2^p\right]\right) = 0$$

$$\Leftrightarrow b_1 = \frac{\mathbb{E}\left[\epsilon_1^p\epsilon_1^v\right] - \mathbb{E}\left[\epsilon_1^p\epsilon_2^v\right] - k(\alpha - a^\star)\mathbb{E}\left[\epsilon_1^p\right] + b_2\left(1 + \frac{k}{c}\right)\mathbb{E}\left[\epsilon_1^p\epsilon_2^p\right]}{\left(1 + \frac{k}{c}\right)\mathbb{E}\left[\epsilon_1^{p2}\right]}$$

$$- k(\alpha - a^\star) + b_2\left(1 + \frac{k}{c}\right)\left(1 + \frac{k}{c}\right)\left(\sigma_1^{p2} + 1\right)$$

$$\Leftrightarrow b_1 = \frac{\rho_1\sigma_1^v\sigma_1^p - k(\alpha - a^\star)}{\left(1 + \frac{k}{c}\right)\left(\sigma_1^{p2} + 1\right)} + b_2\frac{1}{\sigma_1^{p2} + 1} \tag{22}$$

Likewise, the first-order condition with respect to b_2 is:

$$\mathbb{E}\left[-\frac{\epsilon_2^p}{c}\epsilon_1^v + \frac{\epsilon_2^p}{c}\epsilon_2^v + c\epsilon_2^p\left(\frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c^2}\right) + k\frac{\epsilon_2^p}{c}\left(\alpha - a^\star + \frac{b_1\epsilon_1^p - b_2\epsilon_2^p}{c}\right)\right] = 0$$

$$\Leftrightarrow\ b_2 = \frac{\rho_2\sigma_2^v\sigma_2^p + k(\alpha - a^\star)}{\left(1 + \frac{k}{c}\right)\left(\sigma_2^{p2} + 1\right)} + b_1\frac{1}{\sigma_2^{p2} + 1} \tag{23}$$

Solving equations (22) and (23) for b_1 and b_2 yields:

$$b_1 = \frac{c\left(\sigma_2^{p2}\left(-k\left(\alpha - a^\star\right)\right) + \rho_2\sigma_2^p\sigma_2^v + \rho_1\sigma_1^p\sigma_1^v\left(\sigma_2^{p2} + 1\right)\right)}{(c + k)\left(\sigma_1^{p2}\sigma_2^{p2} + \sigma_1^{p2} + \sigma_2^{p2}\right)} \tag{24}$$

$$b_2 = \frac{c\left(\sigma_1^{p2}k\left(\alpha - a^\star\right) + \rho_1\sigma_1^p\sigma_1^v + \rho_2\sigma_2^p\sigma_2^v\left(\sigma_1^{p2} + 1\right)\right)}{(c + k)\left(\sigma_1^{p2}\sigma_2^{p2} + \sigma_1^{p2} + \sigma_2^{p2}\right)} \tag{25}$$

■

Proof of Proposition 1: The principal's objective function is:

$$\begin{aligned}
&\mathbb{E}\Bigg[\left(\alpha+\frac{b_1\epsilon_1^p-b_2\epsilon_2^p}{c}\right)\epsilon_1^v+\left(1-\alpha-\frac{b_1\epsilon_1^p-b_2\epsilon_2^p}{c}\right)\epsilon_2^v \\
&-\frac{c}{2}\left(\frac{b_1\epsilon_1^p-b_2\epsilon_2^p}{c}\right)^2-\overline{U}-\frac{k}{2}\left(\alpha-a^\star+\frac{b_1\epsilon_1^p-b_2\epsilon_2^p}{c}\right)^2\Bigg] \\
&=\left(\alpha\mathbb{E}\left[\epsilon_1^v\right]+\frac{b_1\mathbb{E}\left[\epsilon_1^p\epsilon_1^v\right]-b_2\mathbb{E}\left[\epsilon_2^p\epsilon_1^v\right]}{c}\right)+\left((1-\alpha)\mathbb{E}\left[\epsilon_2^v\right]-\frac{b_1\mathbb{E}\left[\epsilon_1^p\epsilon_2^v\right]-b_2\mathbb{E}\left[\epsilon_2^p\epsilon_2^v\right]}{c}\right) \\
&-\frac{1}{2c}\mathbb{E}\left[\left(b_1\epsilon_1^p-b_2\epsilon_2^p\right)^2\right]-\overline{U}-\frac{k}{2}\mathbb{E}\left[\left(\alpha-a^\star+\frac{b_1\epsilon_1^p-b_2\epsilon_2^p}{c}\right)^2\right] \\
&=1+\frac{1}{c}\left(b_1\left(\mathbb{E}\left[\epsilon_1^p\epsilon_1^v\right]-1\right)+b_2\left(\mathbb{E}\left[\epsilon_2^p\epsilon_2^v\right]-1\right)\right) \\
&-\frac{1}{2c}\left(b_1^2\mathbb{E}\left[\epsilon_1^{p2}\right]+b_2^2\mathbb{E}\left[\epsilon_2^{p2}\right]-2b_1b_2\right)-\overline{U}-\frac{k}{2}\mathbb{E}\left[\left(\alpha-a^\star+\frac{b_1\epsilon_1^p-b_2\epsilon_2^p}{c}\right)^2\right] \qquad (26)
\end{aligned}$$

where b_1 and b_2 are described in Lemma 2. Differentiating this objective function with respect to α holding b_1 and b_2 constant gives:

$$k\left(a^\star-\alpha+\frac{-b_1+b_2}{c}\right) \qquad (27)$$

Since the objective function of the principal is concave in α, setting this derivative to zero gives:

$$\alpha=a^\star+\frac{b_2-b_1}{c} \qquad (28)$$

Combining with the optimal values of b_1 and b_2 in Lemma 2 and reorganizing gives equation (**??**). ■

Proof of Corollary 1: The proofs of parts (i)-(iii) are special cases of the proof of Proposition 1.

The proof of part (iv) builds on the proof of Proposition 1. Evaluating the first derivative of the principal's objective function with respect to α in equation (27) at $\sigma_1^p=0$ (substituting for the optimal values of b_1 and b_2) gives:

$$\frac{ck}{c+k}\left(a^\star-\alpha\right) \qquad (29)$$

This expression has the same sign as $a^\star-\alpha$. Thus, if $\alpha<a^\star$, the principal would increase its objective function by increasing α; if $\alpha>a^\star$, the principal would increase its objective function by decreasing α. Therefore, the principal's objective function is maximized at $\alpha=a^\star$. Plugging back into the optimal values of b_1 and b_2 yields $b_1=b_2$. ■

Proof of Lemma 3: The surplus when the contract is chosen optimally is:

$$Y(\rho_1, \rho_2; \alpha) = 1 + \frac{b_1\rho_1 + b_2\rho_2}{c} - \frac{k\Delta^2}{2} - \Delta\frac{k(b_1 - b_2)}{c} - (b_1^2 + b_2^2 - b_1 b_2)\frac{c+k}{c^2} \tag{30}$$

where $\Delta \equiv \alpha - a^\star$, and with optimal incentive slopes:

$$b_1(\rho_1, \rho_2, \alpha) = \frac{c(-k\Delta + 2\rho_1 + \rho_2)}{3(c+k)} \tag{31}$$

$$b_2(\rho_1, \rho_2, \alpha) = \frac{c(k\Delta + \rho_1 + 2\rho_2)}{3(c+k)} \tag{32}$$

Substituting the optimal b_1, b_2 into equation (30) and simplifying yields the surplus in the form $Y = 1 + \frac{\frac{1}{3}(\rho_1^2+\rho_1\rho_2+\rho_2^2)+\frac{k}{3}(\rho_2-\rho_1)\Delta-\frac{k(3c+k)}{6}\Delta^2}{c+k}$. Taking the derivative with respect to α (using $\frac{\partial\Delta}{\partial\alpha} = 1$):

$$\frac{\partial Y}{\partial \alpha} = \frac{k(\rho_2 - \rho_1)}{3(c+k)} - \frac{k(3c+k)}{3(c+k)}(\alpha - a^\star). \tag{33}$$

Now taking the derivative with respect to ρ_2:

$$\frac{\partial^2 Y}{\partial \rho_2 \partial \alpha} = \frac{k}{3(c+k)} > 0 \tag{34}$$

This establishes supermodularity. ■

Proof of Proposition 3: The optimal incentive slopes are in equations (31) and (32), with $\Delta \equiv \alpha - a^\star$, and the joint surplus of a match is in equation (30). Substituting the optimal b_1, b_2 and simplifying yields:

$$Y(\rho_1, \rho_2; \alpha) = 1 + \frac{\frac{1}{3}(\rho_1^2 + \rho_1\rho_2 + \rho_2^2) + \frac{k}{3}(\rho_2 - \rho_1)\Delta - \frac{k(3c+k)}{6}\Delta^2}{c+k}.$$

Differentiating with respect to α (with $\frac{\partial\Delta}{\partial\alpha} = 1$):

$$\frac{\partial Y}{\partial \alpha} = \frac{k(\rho_2 - \rho_1)}{3(c+k)} - \frac{k(3c+k)}{3(c+k)}(\alpha - a^\star). \tag{35}$$

In a transferable-utility matching equilibrium, the marginal rent equals the marginal surplus generated by the agent (Terviö (2008)): when agent type α is matched with firm type $\rho_2(\alpha)$, we have $U'(\alpha) = \frac{\partial Y(\rho_1, \rho_2(\alpha); \alpha)}{\partial \alpha}$ (the partial with respect to agent type, evaluated at the matched

firm). So:

$$U'(\alpha) = \frac{k}{3(c+k)}\left[\rho_2(\alpha) - \rho_1 - (3c+k)(\alpha - a^\star)\right]. \tag{36}$$

The rent schedule follows from the fundamental theorem of calculus: $U(\alpha) = U(\underline{\alpha}) + \int_{\underline{\alpha}}^{\alpha} U'(x)dx$. ■

Proof of Corollary 2: $U'(\alpha)$ is given in equation (36). Under uniform distributions, $F_A(\alpha) = \frac{\alpha - \underline{\alpha}}{\overline{\alpha} - \underline{\alpha}}$ and $F_\rho^{-1}(q) = \underline{\rho} + q(\bar{\rho} - \underline{\rho})$, so that:

$$\rho_2(\alpha) = \underline{\rho} + \frac{\alpha - \underline{\alpha}}{\overline{\alpha} - \underline{\alpha}}(\bar{\rho} - \underline{\rho}), \qquad \rho_2'(\alpha) = \frac{\bar{\rho} - \underline{\rho}}{\overline{\alpha} - \underline{\alpha}} \equiv m > 0.$$

Therefore:

$$U''(\alpha) = \frac{k}{3(c+k)}\big[\rho_2'(\alpha) - (3c+k)\big] = \frac{k}{3(c+k)}\big(m - (3c+k)\big).$$

If $m < 3c + k$, then $U''(\alpha) < 0$ for all α, so $U(\cdot)$ is strictly concave and single-peaked with a unique interior maximizer. The first-order condition $U'^*) = 0$ gives

$$\rho_2(\alpha^*) - \rho_1 - (3c+k)(\alpha^* - a^\star) = 0 \quad \Leftrightarrow \quad \alpha^* = a^\star + \frac{\rho_2(\alpha^*) - \rho_1}{3c+k}.$$

Substituting $\rho_2(\alpha^*) = \underline{\rho} + m(\alpha^* - \underline{\alpha})$ yields $\underline{\rho} + m(\alpha^* - \underline{\alpha}) = \rho_1 + (3c+k)(\alpha^* - a^\star)$, so $(m - (3c+k))\alpha^* = \rho_1 - \underline{\rho} + m\underline{\alpha} - (3c+k)a^\star$, and:

$$\alpha^* = \frac{\rho_1 - \underline{\rho} + m\underline{\alpha} - (3c+k)a^\star}{m - (3c+k)} = a^\star + \frac{\rho_1 - \underline{\rho} - m(a^\star - \underline{\alpha})}{m - (3c+k)} = a^\star + \frac{\underline{\rho} - \rho_1 + m(a^\star - \underline{\alpha})}{(3c+k) - m}.$$

So part (i) holds. For part (ii), $\alpha^* < a^\star$ if and only if $\frac{\rho_2(\alpha^*) - \rho_1}{3c+k} < 0$, i.e., $\rho_1 > \rho_2(\alpha^*)$. ■

Proof of Proposition 4: The optimal incentive slopes are in equations (31) and (32). In equilibrium, type α is matched with firm type $\rho_2(\alpha)$, so $b_i(\alpha) = b_i(\rho_1, \rho_2(\alpha), \alpha)$ for $i = 1, 2$.

Direct effect (holding ρ_2 constant):

$$\frac{\partial b_1}{\partial \alpha} = -\frac{ck}{3(c+k)} < 0, \qquad \frac{\partial b_2}{\partial \alpha} = \frac{ck}{3(c+k)} > 0. \tag{37}$$

This completes part (i).

Sorting effect: under positive assortative matching, $\rho_2'(\alpha) > 0$. We have

$$\frac{\partial b_1}{\partial \rho_2} = \frac{c}{3(c+k)} > 0, \qquad \frac{\partial b_2}{\partial \rho_2} = \frac{2c}{3(c+k)} > 0.$$

This completes part (ii).

Overall effect: by the chain rule,

$$\frac{db_1}{d\alpha} = \frac{\partial b_1}{\partial \alpha} + \frac{\partial b_1}{\partial \rho_2}\,\rho_2'(\alpha) = \frac{c}{3(c+k)}\left(-k + \rho_2'(\alpha)\right), \tag{38}$$

$$\frac{db_2}{d\alpha} = \frac{\partial b_2}{\partial \alpha} + \frac{\partial b_2}{\partial \rho_2}\,\rho_2'(\alpha) = \frac{c}{3(c+k)}\left(k + 2\rho_2'(\alpha)\right) > 0. \tag{39}$$

So we always have $\frac{db_2}{d\alpha} > 0$. Next, $\frac{db_1}{d\alpha}$ has the sign of $-k + \rho_2'(\alpha)$. Thus $\frac{db_1}{d\alpha} < 0$ when $k > \rho_2'(\alpha)$ and $\frac{db_1}{d\alpha} > 0$ when $\rho_2'(\alpha) > k$. Under uniform distributions, $\rho_2'(\alpha) = \frac{\bar{\rho}-\underline{\rho}}{\bar{\alpha}-\underline{\alpha}}$, so $\frac{db_1}{d\alpha} \gtrless 0$ according to $\frac{\bar{\rho}-\underline{\rho}}{\bar{\alpha}-\underline{\alpha}} \gtrless k$. ■

Online Appendix
The Value of Non-Value-Maximizing Managers

Microfoundation for linear contracts

This Appendix adapts an argument from Barron, Georgiadis, and Swinkels (2020) to our setting.

We extend the model to account for the ex-post riskiness of the performance measure and the manager's ability to affect it. Suppose that the performance measure is as defined in the main text but is also noisy ex-post, so that $P_1(a, \boldsymbol{\epsilon}) = a\epsilon_1^p + \varepsilon_1$ and $P_2(a, \boldsymbol{\epsilon}) = (1-a)\epsilon_2^p + \varepsilon_2$ where $\varepsilon_i \sim \mathcal{N}(0,1)$ for $i = 1, 2$ are pure risks independent from other random variables that are unobservable.[9] Suppose also that, conditional on a, the agent can implement arbitrary mean-preserving spreads and mean-preserving contractions of each performance measure distribution, independently across dimensions. Formally:

Assumption 1 *After choosing a resource allocation a, the agent can costlessly replace each performance measure P_i by any random variable $\tilde{P}_i$ such that:*

$$\mathbb{E}[\tilde{P}_i|a] = \mathbb{E}[P_i|a], \qquad i = 1, 2.$$

A contract is defined as robust if every feasible joint distribution $(\tilde{P}_1, \tilde{P}_2)$ satisfying the mean constraints in Assumption 1 yields the same expected payment. Now consider a general contract $W(P_1, P_2)$ which can be a nonlinear function of performance measures.

Claim 2 *A contract $W(P_1, P_2) = S + \phi(P_1, P_2)$ is robust to the manipulation described in Assumption 1 if and only if:*

$$\phi(P_1, P_2) = b_0 + b_1 P_1 + b_2 P_2,$$

for some constants b_0, b_1, b_2.

Proof of Claim 2: Given a resource allocation a, define $\mu_i \equiv \mathbb{E}[P_i|a]$ for $i = 1, 2$. Consider an arbitrary measurable contract $\phi : \mathbb{R}^2 \to \mathbb{R}$. The agent's problem at the manipulation stage is:

$$\sup_{(\tilde{P}_1, \tilde{P}_2)} \mathbb{E}\big[\phi(\tilde{P}_1, \tilde{P}_2)|a\big] \quad \text{s.t.} \quad \mathbb{E}[\tilde{P}_i|a] = \mu_i \ \text{ for } i = 1, 2.$$

[9] With universal risk neutrality, the presence of this pure risk does not change any of the relevant outcomes of the model.

Fix an arbitrary value $p_2 \in \mathbb{R}$ and define the univariate function of p_1:

$$g_{p_2}(p_1) \equiv \phi(p_1, p_2).$$

Suppose that the function g_{p_2} is not affine in p_1. Then there exist x, y, and $\lambda \in (0,1)$ such that:

$$g_{p_2}(\lambda x + (1-\lambda)y) \;\neq\; \lambda g_{p_2}(x) + (1-\lambda) g_{p_2}(y).$$

There are two cases. First, if:

$$g_{p_2}(\lambda x + (1-\lambda)y) < \lambda g_{p_2}(x) + (1-\lambda) g_{p_2}(y), \tag{40}$$

then let $\tilde{P}_1$ take values x and y with probabilities λ and $1-\lambda$, respectively, and set $P_1 = \lambda x + (1-\lambda)y$ (i.e. P_1 is a constant). Then $\mathbb{E}[\tilde{P}_1|a] = \mathbb{E}[P_1|a]$, and

$$g_{p_2}\big(\mathbb{E}[\tilde{P}_1|a]\big) < \mathbb{E}\big[g_{p_2}(\tilde{P}_1)|a\big],$$

so the agent strictly increases his expected compensation with a mean-preserving spread. Second, if the inequality in equation (40) is reversed, a mean-preserving contraction yields the same conclusion.

Thus robustness requires that g_{p_2} be affine for every p_2, i.e.

$$\phi(p_1, p_2) = \xi(p_2) + \beta(p_2) p_1$$

for some functions ξ and β. By symmetry, fixing p_1 and applying the same argument to $\phi(p_1, \cdot)$, robustness requires:

$$\phi(p_1, p_2) = \gamma(p_1) + \delta(p_1) p_2.$$

for some functions γ and δ. In sum, robustness requires:

$$\phi(p_1, p_2) = A + B p_1 + C p_2 + D p_1 p_2$$

for some constants A, B, C, D.

We now show by contradiction that a robust contract is such that $D = 0$. Suppose $D \neq 0$. Consider random variables $(\tilde{P}_1, \tilde{P}_2)$ taking values (x, y) and (y, x) with equal probability $1/2$, where $x \neq y$, and satisfying

$$\mathbb{E}[\tilde{P}_1|a] = \mathbb{E}[\tilde{P}_2|a] = \tfrac{x+y}{2}.$$

Then

$$\mathbb{E}[\tilde{P}_1 \tilde{P}_2|a] = \tfrac{1}{2}(xy + yx) = xy \neq \left(\tfrac{x+y}{2}\right)^2 = \mathbb{E}[\tilde{P}_1|a]\mathbb{E}[\tilde{P}_2|a].$$

This shows that the agent can change $\mathbb{E}[\phi(\tilde{P}_1, \tilde{P}_2)|a]$ without changing the means of the performance measures, contradicting robustness. Therefore $D = 0$.

If ϕ is linear, then for any admissible $(\tilde{P}_1, \tilde{P}_2)$, we can write:

$$\mathbb{E}[\phi(\tilde{P}_1, \tilde{P}_2)|a] = b_0 + b_1\mathbb{E}[\tilde{P}_1|a] + b_2\mathbb{E}[\tilde{P}_2|a],$$

which depends only on the means of the performance measures. Thus, no distributional manipulation can change the agent's expected pay. ■