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Diversity and Empowerment in Organizations

Daniel Habermacher and Nicolás Riquelme*

Abstract

We study how diversity and participatory decision-making affect organizational performance. Our model involves a manager who can acquire costly information to guide project selection, and a worker responsible for its implementation. We model diversity as heterogeneous beliefs between the organization's members and participatory decision-making as how much the worker's perspective influences project choice—related to notions of empowerment and inclusion. Our findings show that higher diversity enhances decision-making and implementation outcomes when the manager can access high-quality information and the worker is sufficiently empowered. When information acquisition is covert, the manager cannot signal her commitment to reducing disagreement, thus eliminating any benefits of increasing diversity. When communication is strategic, the associated credibility loss dilutes the manager's benefits from acquiring information, but the conflict of interest decreases with information quality. Our results imply that the 'business case for diversity' requires complementary organizational processes that foster informational transparency and trust among members.

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Keywords: Diversity, Worker Empowerment, Information Acquisition, Moral Hazard, Firm Performance.

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1 Introduction

Diversity has become a key component of organizational life. The need to mobilize an expanding range of informational resources to improve decision-making, problem-solving, and innovation calls for teams whose members bring diverse knowledge, expertise, and perspectives. Organizations have thus invested heavily in diversity, equity, and inclusion (DEI) initiatives, especially in the last decade.[1] With a top-down implementation approach, firms created specialized roles and training programs to champion DEI goals. However, many initiatives failed to engage the broader workforce and were not integrated into daily processes, leading to unintended consequences that undermined their effectiveness (Leslie, 2019; Burnett and Aguinis, 2024).[2] Faced with mixed outcomes, high costs, and increasing political and regulatory backlash, many organizations have scaled back DEI programs, underscoring the need for integrated approaches that articulate the strategic value of diversity. In this paper, we aim to understand the failures in implementing DEI initiatives that impaired their long-term sustainability.

The effects of diversity on organizational performance —both beneficial and detrimental— have long been analyzed by the management literature (Cummings, 2004; Van Knippenberg and Mell, 2016; Martins, 2020). On one hand, greater team diversity is associated with a richer pool of task-relevant information and perspectives, which may add to the quality of decision-making. On the other hand, it has been shown to trigger subgroup categorizations, where people tend to favor members of their ingroup over outgroup members. Which of these processes dominates typically depends on environmental and institutional factors, such as leadership styles and how organizational processes affect members' participation in decision-making (Downey et al., 2015; Hellerstedt et al., 2024). Indeed, the recent backlash against diversity may reflect a fundamental misstep in its definition, as it has been mostly associated with race and gender. Such a narrow definition may have exacerbated social categorizations, undermining participatory decision-making (Leslie,

[1] In many cases guided by mainstream consultancy firms such as McKinsey and BCG, who have praised the benefits of diversity on organizational performance among the business community since the mid-2010s. See, for instance, https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/why-diversity-matters and https://www.bcg.com/publications/2017/diversity-at-work, accessed January 7, 2025.

[2] The backlash against diversity has been subject of recent debate in the business community. See, for instance, https://hbr.org/2023/03/to-overcome-resistance-to-dei-understand-whats-driving-it, https://hbr.org/2024/09/how-dei-can-survive-this-era-of-backlash, https://sloanreview.mit.edu/article/how-to-stand-up-when-it-comes-to-diversity-equity-and-inclusion/, and https://sloanreview.mit.edu/article/countering-the-corporate-diversity-backlash/.

2019; Burnett and Aguinis, 2024). As a response, business scholars are currently pushing for a broader definition of diversity that emphasizes complexity and reflects the varied perspectives and knowledge stemming from differences in skills, experiences, and cultural identities.[3] Our analysis considers this broad perspective on diversity and, unlike previous treatments in Economics, introduces a notion of participative decision-making that resonates with claims for empowerment and inclusion (Nishii, 2013; Martins, 2020; Hellerstedt et al., 2024).

We build upon the literature on principal-agent relations with project selection and costly implementation (Zabojnik, 2002; Bester and Krähmer, 2008; Landier et al., 2009; Blanes i Vidal and Möller, 2016). An organization comprises two members: the manager (she), who has access to information needed for project selection, and the worker (he), who has access to the technology required for its implementation. Both information acquisition and implementation require individual effort. We introduce diversity in players' perspectives and a measure of participative decision-making that we associate with worker empowerment.

Diversity in our framework is captured by the difference in members' beliefs about the best project for the organization, in line with seminal papers in Economics and Management (Che and Kartik, 2009; Van den Steen, 2010a; Sethi and Yildiz, 2016; Alonso and Câmara, 2016a,b). Such differences stem naturally from members' diverse backgrounds, training, and experiences. We define empowerment as the effective consideration of a member's beliefs in the decision-making process. This definition goes beyond the typical treatment in the literature: it is not a manager's prerogative on the allocation of authority over decisions (Dessein, 2002; Zabojnik, 2002), but rather a feature of organizational design—i.e., the team is forced to incorporate each member's perspectives at the project selection stage.[4]

Each member's payoffs depend on how much the selected project aligns with what she *believes* is the optimal project for the organization, and on whether the chosen project is successfully implemented. The game has two stages. At the information stage, the manager can invest in a signal that informs about the optimal project for the organization. The members disagree ex-ante about which project should be chosen, and new information reduces such disagreement. After

[3] See Van Knippenberg et al. (2020). Such calls have also been raised in the business community; see for instance, `https://hbr.org/2024/11/reframe-the-value-proposition-of-diversity`.

[4] At the organizational level, this reflects practices and processes that foster workers to express their opinions and bind managers to consider them (Nishii, 2013; Burnett and Aguinis, 2024). At the theoretical level, it can reflect the shift in bargaining power in a dynamic relationship (see Halac, 2015; Li et al., 2017; Rantakari, 2023; Delgado-Vega and Schneider, 2024).

the information stage, a project is selected according to both members' updated beliefs. Finally, at the project implementation stage, the worker can exert effort to increase the chances that the selected project is successful.

Our analysis concerns the manager's incentives to acquire information and the worker's incentives to exert effort. We start with the latter, fixing the information structure. The worker's effort decision depends on how much it increases the probability of successful implementation and how close the selected project is to his belief. We find that more diversity discourages the worker from exerting high effort, as in Landier et al. (2009); Van den Steen (2010a). However, information acquisition by the manager reduces this negative effect of diversity, and the reduction is larger the more precise the signal available to the manager.[5] Empowerment has a similar effect: the more the worker's beliefs affect project selection, the weaker the negative impact of diversity on his incentives. In other words, integrating the worker's perspectives facilitates project implementation.

The manager anticipates how information will affect the worker's behavior, but her incentives also depend on how information influences project selection. We identify two main forces driving her decision to acquire information. First, given the worker's effort decision, new information reduces disagreement and, hence, leads to a project closer to the organization's ideal. We call this the *alignment incentives* for information acquisition. Crucially to our argument, a more diverse environment enhances the manager's alignment incentives because it worsens the default project. Increasing worker empowerment has a similar effect.

The second force governing the manager's incentives relates to the potential effect of information on the worker's effort decision. Suppose that, absent information, the worker would not exert effort. When the manager acquires a sufficiently informative signal, it reduces the prior disagreement to a point that motivates the worker. We say that the worker is *reactive* to information in such cases,[6] and thus the manager has *motivational incentives* to acquire it. We find that more diversity weakens the manager's motivational incentives because the higher probability of success relates to a project farther from what she believes is best for the organization. Higher worker empowerment further reduces her incentives.

Our main contribution relates to the beneficial effects of diversity on organizational performance in environments characterized by high-quality information and participatory decision-making. In particular, we demonstrate that for each level of worker empowerment and given an initial level of diversity, there exists

[5]A perfectly informative signal renders diversity neutral on the worker's incentives.

[6]In a slightly different context, Landier et al. (2009) use similar terminology.

a range of (higher) diversity levels that lead to *both* better project selection and higher chances of successful implementation. Such beneficial effects are driven by the manager's expected return from acquiring information and critically depend on the quality of the information she can access. Indeed, when the manager's information is not sufficiently precise, more diversity can impair her acquisition incentives and demotivate workers as a consequence. We thus find a non-monotonic relationship between diversity and organizational performance: for each level of information quality, there exists an optimal level beyond which more diversity yields diminishing returns or even adverse outcomes.[7]

We then extend our basic setup in two directions to understand the conditions under which the beneficial effects of diversity take place. First, we relax the assumption that the manager's information acquisition is observable. With covert information acquisition, the manager cannot commit to reducing the posterior disagreement with the worker, for if he believed the manager has acquired information on-path, the (off-path) deviation to not acquiring would not be detected. As a result, the only incentive the manager has for information acquisition relates to reducing the residual variance of the resulting project. The incentives driving the beneficial effects of diversity in the baseline model thus disappear. This result highlights the critical role of informational transparency in DEI initiatives.

The second extension of the baseline model concerns strategic communication of information. The manager can send costless and non-verifiable (cheap talk) messages about the acquired signal (if any). We first show that diversity and worker empowerment preclude full revelation of the manager's information. Then, we derive the effective conflict of interest between sender and receiver in the communication game when the worker's effort decision only depends on the manager's acquisition decision (and not on her message).[8] We show that, in such cases, the communication stage is isomorphic to the model of communication of imperfect information in Moscarini (2007).[9] Like his paper, competence —i.e., access to high-quality information— implies credibility. Moreover, the amount of informa-

[7]Related results in the literature focus either on information acquisition incentives (Che and Kartik, 2009; Van den Steen, 2010a), or the use of information (Blanes i Vidal and Möller, 2007; Landier et al., 2009) or project selection (Bester and Krähmer, 2008; Blanes i Vidal and Möller, 2016) to motivate implementation effort. Instead, we show that more diversity can disincentivize information acquisition but can also (indirectly) incentivize effort at the implementation stage.

[8]In our model, the agent's effort decision may depend on the message announced on a putative equilibrium. We are analyzing this case as an extension of the canonical cheap talk model of Crawford and Sobel (1982) in a separate paper.

[9]Moscarini (2007) focuses exclusively on the communication problem. Our model embeds a communication stage in a broader problem featuring information acquisition and moral hazard.

tion transmitted in any communication equilibrium decreases in both the degree of diversity and worker empowerment. This informational loss dilutes the *aligment incentives* compared to the basic model, reducing the manager's expected return from information acquisition. The result suggests that firms embracing DEI initiatives must also invest in facilitating managers' access to high-quality (preferably hard) information to avoid harmful effects on incentives.

Our analysis resonates with the current discussion about the failures of DEI initiatives in firms. We formally characterize the benefits of diversity on performance in terms of information elaboration and exchange, currently regarded as the key mechanism behind the *business case for diversity* (Van Knippenberg et al., 2020; Hellerstedt et al., 2024). However, if the organization does not produce information of sufficient quality, higher diversity can discourage its acquisition, lower the quality of organizational decisions, and demotivate effort to implement such decisions. Our findings also underscore the need for organizational processes that support DEI initiatives that prevent information manipulation at the acquisition and communication stages; in particular, procedures promoting *informational transparency* about managers' access to high-quality information.[10]

Related literature. The relationship between diversity, team production, and authority is critical to understanding how varied inputs enhance organizational outcomes, and has been extensively studied. Seminal work by Van den Steen highlights the role of heterogeneous priors in shaping incentives within organizations, particularly through a manager's vision that aligns project selection and employee effort. This alignment fosters employee sorting, where individuals with similar beliefs gravitate towards the organization, contributing to a more homogeneous culture among decision-makers (Van den Steen, 2010d). Similarly, Van den Steen (2010a) examines the impact of cultural clashes in mergers and acquisitions, showing that larger cultural gaps reduce productive effort and coordination while incentivizing information acquisition as employees expect confirmation of their priors (see also Kartik et al., 2021). Our framework builds on these insights, focusing on how heterogeneous priors influence motivation and organizational performance. Unlike prior models, we treat productive effort and information acquisition as com-

[10] Schnackenberg and Tomlinson (2016) analyze different dimensions of organizational transparency and stakeholders' perceptions of management trustworthiness. The authors highlight the roles of information *reliability*, *accuracy*, and *disclosure*. The first of these relates to *"[the sender's] ability to successfully navigate complex data and master the technical aspects of compiling needed data to develop reliable information"* (pp 1797); whereas the last two relate to the sender's ability to manipulate information (through obstruction or language) to gain advantage.

plementary, enabling us to explore how diversity affects trust, empowerment, and overall effectiveness. We find that diversity has a non-monotonic impact on performance, mediated by the substitutive relationship between trust and empowerment.

Building on these foundational works, recent studies have further explored the effects of different forms of diversity on organizational performance, focusing on authority and implicit incentives. Glover and Kim (2021) show that heterogeneous teams foster implicit monitoring incentives when efforts are strategically complementary in repeated interactions. Similarly, Upton (2023) demonstrates that diversity in preferred projects can enhance implicit incentives for delegation in dynamic environments. Fehrler and Janas (2021), on the other hand, examine authority allocation in teams with imperfect information and career concerns, finding that delegation reduces information acquisition incentives but encourages truthful communication. In contrast to these studies, our model assumes task assignments and expertise, with interactions occurring in a one-shot setting. Here, improved performance arises not from implicit incentives or future punishments but from reduced disagreement after information acquisition.

Our paper also contributes to the strand of literature studying moral hazard with project selection. Endogenous authority allocation in these contexts can lead to a trade-off between adaptation and motivation. Zabojnik (2002) shows that delegation can be optimal even when the principal is better informed, as it incentivizes the agent to exert effort for successful implementation. Bester and Krähmer (2008) extend this by allowing principals to use monetary transfers, delegation, or project choice to motivate agents, finding that principals often trade off monetary incentives for projects closer to the agent's preferences, reducing the likelihood of delegation. In contrast, we emphasize the role of information as a motivator of effort, which leads to distinct predictions regarding organizational performance and authority allocation.[11]

In a seminal paper, Landier et al. (2009) study the optimal degree of (preference) disagreement between a decision-maker and an implementator. They find that preference divergence can induce the decision-maker to use available information to select a project she does not like a priory, thus motivating effort from the agent at the implementation stage.[12] We find such motivation also arises from

[11] Van den Steen's works (Van den Steen, 2010b,c) explore how disagreement and interpersonal dynamics influence authority allocation and decision-making in organizations, offering valuable insights complementary to our approach.

[12] Relatedly, Blanes i Vidal and Möller (2007) show that a manager is more willing to base her decision on hard evidence (as opposed to soft evidence) when that information is also observed by the agent (information sharing). This can be inefficient when the private, non-verifiable

information acquisition because it can mitigate the conflict of interest between principal and agent. Differently from Landier et al. (2009), we show that the agent's knowledge about the quality of the principal's information is essential for such beneficial effects of diversity.

In a recent paper, Delgado-Vega and Schneider (2024) offer a related view on the strategic management of diversity. The authors study how organizations engage with external diversity by selectively embracing competing perspectives to shape decision-making. In their model, a principal initially seeks to exclude an agent with misaligned interests but later strategically endorses him in exchange for moderation, highlighting how firms leverage competitive tensions to extract cooperation. Their results complement our findings on the non-monotonic relationship between diversity and organizational performance: moderate diversity can enhance decision-making and implementation, while excessive heterogeneity can undermine incentives for information acquisition and effort. Together, these insights suggest that diversity's benefits depend critically on institutional design and strategic management, both within and across organizations.

Effective communication and credibility are crucial for team performance. Under heterogeneous priors, Che and Kartik (2009); Van den Steen (2010a) show that strategic communication becomes less effective as belief differences widen. Che and Kartik (2009) highlight a trade-off between increased information acquisition and weakened communication incentives, which persists when the sender can manipulate information.[13] In our setting, unobservable information acquisition may eliminate diversity's benefits for incentives. Unlike Che and Kartik (2009), the sender's information quality plays a more critical role, as it also motivates worker effort. Using Moscarini (2007), we show that the conflict of interest between sender and receiver intensifies with diversity and worker participation but decreases with higher information quality.

The quality of the manager's information is critical throughout our analysis, aligning with evidence from management studies showing that trust—both among peers and in leadership—enhances worker performance. The degree of workers' participation in decision-making also plays a key role in mediating the effective-

information she possesses is more accurate than the publicly-observed evidence. In the context of the adaptation-motivation trade-off, Blanes i Vidal and Möller (2016) show that prioritizing motivation could be detrimental to information aggregation.

[13] Alonso and Câmara (2016a,b) suggest a potential role for information design. In a related paper, Bhattacharya et al. (2018) study the optimal conformation of diverse expert panels, showing that the optimal degree of (preference) diversity depends on whether the probability of being informed is sufficiently (positively) correlated.

ness of diversity. Nishii (2013) analyses how perceptions of inclusion mediate the effects of diversity on organizational performance,[14] finding a positive relationship between the degree of inclusion, trust between team members, and performance. Downey et al. (2015) find that workplace diversity practices foster trust among peers, with inclusion as a critical mediator.[15] In diverse environments with low inclusion, trust can substitute its mediating role on performance, a prediction our model also entertains.

The rest of the paper is organized as follows. In section 2 we set up our basic model. Section 3 characterizes the beneficial effects of diversity on organizational performance. In section 4, we extend the basic framework in two directions: covert information acquisition (section 4.1) and strategic communication (section 4.2.)

2 Model and notation

There are two players, manager (she) and worker (he). There is a state of the world θ for which each player i has different beliefs $\theta \sim_i \mathcal{N}(\mu_i, 1)$, with $i \in \{\text{M}, \text{W}\}$. We follow Sethi and Yildiz (2016) terminology in that player i's 'opinion' is μ_i. We use $\Delta\mu := |\mu_{\text{M}} - \mu_{\text{W}}| > 0$ as a measure of *diversity*. First, the manager has access to information in the form of a noisy signal, $s = \theta + \epsilon$, with $\epsilon \sim \mathcal{N}(0, \frac{1}{\tau})$. The parameter τ measures the signal's precision, which is common knowledge. So, she first decides whether to acquire the informative signal or not $a \in \{\text{A}, \text{NA}\}$. If acquired, she bears a cost $c_{\text{S}} > 0$. If it is not acquired, an uninformative signal with precision zero is drawn. Both players observe the realization of the signal.[16] Let $\tilde{s}$ denote the actual realization observed by the players. Then, a decision a and signal $\tilde{s}$ induce a posterior belief about θ for player i. Let $\mathbb{E}_i\big[\cdot \mid a, \tilde{s}\big]$ denote the expected value operator using player i's posterior belief induced by $(a, \tilde{s})$.

Players decide on a project z. We assume both players value matching the project to the state of the world θ, but their different opinions may create a conflict of interest between them. Whenever the manager acquires a signal, the associated update in beliefs unequivocally ameliorates such disagreement. We assume an exogenous decision rule over the project: $z := (1-\alpha)\,\mathbb{E}_{\text{M}}\big[\theta \mid a, \tilde{s}\big] + \alpha\,\mathbb{E}_{\text{W}}\big[\theta \mid a, \tilde{s}\big]$.

[14] Inclusive organizational climates in Nishii (2013) are those where employees feel valued, respected, and fully integrated into decision-making processes.

[15] Downey et al. (2015) define inclusion as *"...the degree to which employees feel part of essential organizational processes including influence over the decision-making process, involvement in critical work groups, and access to information and resources."* (pp. 37).

[16] The set-up is equivalent to the worker observing the manager's opinion about the state and the precision upon which that opinion is formed, as in Sethi and Yildiz (2012, 2016).

The parameter $\alpha \in (0,1]$ represents the worker's participation in project choice relative to that of the manager. We say the organization gives more empowerment to the worker if α is higher.[17]

The worker decides whether to exert effort on the implementation of the project or not, $e \in \{\text{E}, \text{NE}\}$. The cost of effort is $c_{\text{E}} > 0$. In case he exerts effort, the project succeeds with probability $\overline{p}$; otherwise, the probability of success is $\underline{p} < \overline{p}$.

Payoffs depend on whether the project decided is successfully implemented. In particular, if the probability of success is p, then player i's expected profit is $-p(\theta - z)^2 - (1-p)\, K_i$, where K_i is the opportunity cost of implementation for i.

The timing of the game is as follows:

1. Manager's acquisition decision, $a \in \{\text{A}, \text{NA}\}$.
2. Project selection stage, according to $z = (1-\alpha)\, \mathbb{E}_{\text{M}}\big[\theta \mid a, \tilde{s}\big] + \alpha\, \mathbb{E}_{\text{W}}\big[\theta \mid a, \tilde{s}\big]$
3. Worker's effort decision, $e \in \{\text{E}, \text{NE}\}$.
4. Payoffs realize.

A strategy for the manager consists of $x \in \{\text{A}, \text{NA}\}$; while that for the worker is a mapping $y : \{\text{A}, \text{NA}\} \times \mathbb{R} \to \{\text{E}, \text{NE}\}$. Let $\Delta p := \overline{p} - \underline{p}$ denote the marginal productivity of worker's effort. We interpret $\underline{p}$ as her experience or *procedural expertise*: the chances of success absent 'extra' effort. We use perfect Bayesian equilibrium (*equilibrium* henceforth), which is a pair $(\hat{x}, \hat{y})$ such that:

i) $\hat{y}(a, \tilde{s})$ is the solution to the following problem:

$$\max_{y \in \{\text{E},\text{NE}\}} -\big(\underline{p} + \Delta p\, \mathbb{1}_{y=\text{E}}\big)\, \mathbb{E}_{\text{W}}\left[(\theta - z)^2 \mid a, \tilde{s}\right] - \big(1 - \big(\underline{p} + \Delta p\, \mathbb{1}_{y=\text{E}}\big)\big)\; K_{\text{W}} - c_{\text{E}} \times \mathbb{1}_{y=\text{E}} \tag{1}$$

ii) $\hat{x}$ is the solution to:

$$\begin{aligned} \max_{x \in \{\text{A},\text{NA}\}} & -\underline{p} - \Delta p \mathbb{1}_{x=\text{A}} \mathbb{E}_{\text{M}}\left[\mathbb{1}_{\hat{y}(\text{A},\tilde{s})=\text{E}} \mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{A}, \tilde{s}\right] \mid \text{A}\right] \\ & - \Delta p \mathbb{1}_{x=\text{NA}}\; \mathbb{E}_{\text{M}}\left[\mathbb{1}_{\hat{y}(\text{NA},\tilde{s})=\text{E}} \mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{NA}, \tilde{s}\right] \mid \text{NA}\right] \\ - \big(1 - \big(\underline{p} & + \Delta p \left(\mathbb{1}_{x=\text{A}} \mathbb{E}_{\text{M}}\left[\mathbb{1}_{\hat{y}(\text{A},\tilde{s})=\text{E}} \mid \text{A}\right] + \mathbb{1}_{x=\text{NA}} \mathbb{E}_{\text{M}}\left[\mathbb{1}_{\hat{y}(\text{NA},\tilde{s})=\text{E}} \mid \text{NA}\right]\right)\big)\, K_{\text{M}} - c_{\text{S}} \times \mathbb{1}_{x=\text{A}} \end{aligned} \tag{2}$$

[17] The way we model participatory decision-making aligns with current notions in applied psychology and management literature (see footnote 15. More recently, Roberson and Scott (2024) coins the concept of *instrumental voice* as (diverse) team members' opportunities to participate in collective decision-making processes, which enhance the probability of reaching the best decisions possible.

Discussion of assumptions. We assume that an exogenous parameter α determines the result of the bargaining between manager and worker about the project to implement. This reduced-form way of modeling the bargaining process allows us to focus on the central strategic tension of the paper, which is information acquisition and effort implementation. Micro-foundations of this assumption can be found in Li et al. (2017); Rantakari (2023); Delgado-Vega and Schneider (2024).

We believe a key ingredient of our model is the observability of the source of the manager's information. When the worker observes the signal, he is perfectly aware of which information structure it comes from. In other words, the worker knows whether the manager exerted to obtain that information. In Section 4.1, we show that this is necessary for the beneficial effects of diversity on performance.

The fact that the signal realization is publicly observable is also important for our baseline results. This is a strong assumption we need to make our arguments transparent. We relax it in Section 4.2, showing that our results on the potential benefits of diversity on performance still hold but in a weaker sense.

3 Equilibrium Analysis

In this section, we present our main results. We first study the worker's effort decision and then the manager's acquisition decision.

3.1 Worker's effort decision

The project z depends on the manager's decision to acquire the informative signal. If the signal is acquired, we have that $\mathbb{E}_i\left[\theta \mid \text{A}, \tilde{s}\right] = \frac{1}{1+\tau}\mu_i + \frac{\tau}{1+\tau}\tilde{s}$. Otherwise, we have $\mathbb{E}_i\left[\theta \mid \text{NA}, \tilde{s}\right] = \mu_i$. Thus, the project z takes the following expression:

$$z = \begin{cases} (1-\alpha)\,\mu_{\text{M}} + \alpha\,\mu_{\text{W}} & \text{if } a = \text{NA}, \\ \frac{1}{(1+\tau)}\left[(1-\alpha)\,\mu_{\text{M}} + \alpha\,\mu_{\text{W}}\right] + \frac{\tau}{1+\tau}\tilde{s} & \text{if } a = \text{A}. \end{cases}$$

Note that the worker's optimal effort depends only *indirectly* on μ_{M}, i.e. only through its effect on z. In general, the worker chooses E if and only if

$$\Big[K_{\text{W}} - \underbrace{\text{Var}_{\text{W}}[\theta \mid a, \tilde{s}]}_{\text{residual variance}} - (1-\alpha)^2 \underbrace{\left(\mathbb{E}_{\text{M}}[\theta \mid a, \tilde{s}] - \mathbb{E}_{\text{W}}[\theta \mid a, \tilde{s}]\right)^2}_{\text{residual disagreement}}\Big]\,\Delta p \geq c_{\text{E}}.$$

The terms $\text{Var}_{\text{W}}[\theta \mid a, \tilde{s}]$ and $(\mathbb{E}_{\text{M}}[\theta \mid a, \tilde{s}] - \mathbb{E}_{\text{W}}[\theta \mid a, \tilde{s}])$ depend on the manager's acquisition decision and the signal realization. The latter represents the posterior disagreement between players. A smaller posterior disagreement, as well as a smaller residual variance, increases the chances that the worker exerts high effort. In addition, note that the effect of posterior disagreement on the worker's effort is increasing in the level of his participation in project choice.

The worker's problem in equation (1) shows that two complementary forces determine his expected returns from effort: one related to its opportunity costs and the other to its marginal productivity. On the one hand, the opportunity costs involve the payoff loss avoided when a given decision is implemented, K_{W}. Such a 'gain' from implementing the decision is decreasing in the prior disagreement with the manager $\Delta\mu$ and increasing in the signal precision. Note that the harmful effect of $\Delta\mu$ on the worker's incentives is smaller when the manager is expected to acquire information.

On the other hand, the marginal productivity of effort is the differential probability of successful implementation when effort is high. The worker's marginal productivity can also be related to his abilities and skills. As a general rule, it will be more profitable to motivate a skilled worker (higher Δp) than an unskilled one. However, the return of effort depends negatively on the worker's *procedural expertise*, $\underline{p}$; that is, a sufficiently high $\underline{p}$ means that additional effort is not much needed. We then have the following result:

Lemma 1 (Worker's optimal effort decision)**.** *There are cutoffs $\underline{c}_{\text{E}} < \bar{c}_{\text{E}}$ such that*

i) $\hat{y}(\text{NA}, \tilde{s}) = \text{E}$ *if and only if*

$$\underline{c}_{\text{E}} := \left[K_{\text{W}} - 1 - ((1-\alpha)\,\Delta\mu)^2\right]\Delta p \geq c_{\text{E}}. \tag{3}$$

ii) $\hat{y}(\text{A}, \tilde{s}) = \text{E}$ *if and only if*

$$\bar{c}_{\text{E}} := \left[K_{\text{W}} - \frac{1}{(1+\tau)} - \left(\frac{(1-\alpha)\,\Delta\mu}{1+\tau}\right)^2\right]\Delta p \geq c_{\text{E}}. \tag{4}$$

Note that the worker's effort decision, $\hat{y}(a, \tilde{s})$, does not depend on $\tilde{s}$. Also, since $\tau > 0$, if $\hat{y}(\text{NA}, \tilde{s}) = \text{E}$ then $\hat{y}(\text{A}, \tilde{s}) = \text{E}$; similarly, if $\hat{y}(\text{A}, \tilde{s}) = \text{NE}$ then $\hat{y}(\text{NA}, \tilde{s}) = \text{NE}$. Note that if $c_{\text{E}} \leq \underline{c}_{\text{E}}$, the worker always chooses E; if $c_{\text{E}} \geq \bar{c}_{\text{E}}$, the worker always chooses NE. If $\underline{c}_{\text{E}} < c_{\text{E}} < \bar{c}_{\text{E}}$, the worker always chooses E if and only the worker observes A. In addition, note that the left-hand sides (LHS) in both (3) and (4) are non-decreasing in the signal precision τ and decreasing in $\Delta\mu$.

3.2 Manager's information acquisition decision

The manager conjectures about worker's strategy $\hat{y}(a, \tilde{s})$ and solves the maximization problem in (2). In equilibrium, $\mathbb{1}_{\hat{y}(a,\tilde{s})=\text{E}}$ does not depend on $\tilde{s}$. Thus, a decision a determines the probability of success induced by the worker's strategy. We can then define $p_a := \overline{p}\mathbb{1}_{\hat{y}(a,\tilde{s})=\text{E}} + \underline{p}\mathbb{1}_{\hat{y}(a,\tilde{s})=\text{NE}}$ as the induced probability that actions a determines fixed $\hat{y}(a, \tilde{s})$. Note that $(p_{\text{A}} - p_{\text{NA}}) \in \{0, \Delta p\}$, and let $\Delta\mu_{\text{A}} := \mathbb{E}_{\text{M}}[\theta \mid \text{A}, \tilde{s}] - \mathbb{E}_{\text{W}}[\theta \mid \text{A}, \tilde{s}] = \frac{\Delta\mu}{(1+\tau)}$ denote the expected posterior disagreement when the manager acquires information. Then, his incentives to acquire information can be decomposed into two effects as follows:

$$\overbrace{p_{\text{NA}}\left[\mathbb{E}_{\text{M}}\left[\text{Var}_{\text{M}}[\theta \mid \text{NA}, \tilde{s}] - \text{Var}_{\text{M}}[\theta \mid \text{A}, \tilde{s}]\right] + \alpha^2\, \mathbb{E}_{\text{M}}\left[(\Delta\mu)^2 - (\Delta\mu_{\text{A}})^2\right]\right]}^{\text{alignment incentives}} + \\ + \underbrace{(p_{\text{A}} - p_{\text{NA}})\left[K_{\text{M}} - \mathbb{E}_{\text{M}}\left[\text{Var}_{\text{M}}[\theta \mid \text{A}, \tilde{s}]\right] - \alpha^2\, \mathbb{E}_{\text{M}}\left[(\Delta\mu_{\text{A}})^2\right]\right]}_{\text{motivational incentives}} \geq c_{\text{S}}.$$

The first term on the LHS represents the opportunity costs of acquiring information, which is *independent of how the worker will react to such additional information.* We refer to these as the manager's *alignment incentives* for information acquisition because its determinants relate to the common objectives between manager and worker. Indeed, such incentives depend on both the expected improvement in the quality of the selected project[18] and the expected reduction in posterior disagreement with the worker. The latter is given by the expression $\mathbb{E}_{\text{M}}\left[(\Delta\mu)^2 - (\Delta\mu_{\text{A}})^2\right]$ and constitutes the key mechanism driving beneficial effects from increasing diversity on performance. The prospect of reducing the posterior disagreement with the worker incentivizes the manager to acquire information.

In addition, the manager is motivated because *acquiring information may induce the worker to exert additional effort* in implementation.[19] The second term on the LHS represents her expected gains from acquiring information conditional on the worker responding (on-path) by increasing effort. In this case, more diversity *reduces* manager's incentives because the chosen project will be further away from her ideal. We refer to these as manager's *motivational incentives*, which are increasing in the marginal productivity of effort Δp, but decreasing worker's procedural expertise $\underline{p}$.

[18] By quality we mean how well the project is expected to match the state of the world.

[19] Note that this is a non-generic case, and we will later characterize the set of parameter values for which it holds.

Lemma 2 (Manager's optimal acquisition decision)**.** *The manager acquires the signal in equilibrium, $\hat{x} = \text{A}$, if and only if*

$$\underbrace{p_{\text{NA}}\left(\frac{\tau}{1+\tau}\right)\left[1+\frac{(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)}\right]}_{\textit{alignment incentives}}+\underbrace{(p_{\text{A}}-p_{\text{NA}})\left[K_{\text{M}}-\frac{1}{(1+\tau)}-\left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right]}_{\textit{motivational incentives}}\geq c_{\text{S}}. \tag{5}$$

We assume that K_{M} is sufficiently high so the motivational incentive is positive.[20] For this set of parameters, the manager benefits from the worker's effort. If $c_{\text{E}} \notin (\underline{c}_{\text{E}}, \overline{c}_{\text{E}})$, then $p_{\text{A}} = p_{\text{NA}}$ and the second term in the LHS of (5) disappears.

Similar to the analysis on the worker's incentives, condition (5) defines three cost cutoffs for the manager, depending on the worker's effort: $\underline{c}_{\text{S}}$, $\hat{c}_{\text{S}}$ and $\tilde{c}_{\text{S}}$. The first of these, $\underline{c}_{\text{S}}$, reflects the manager's incentives in (5) when $p_{\text{NA}} = p_{\text{A}} = \underline{p}$—i.e., the worker does not exert effort independently of her acquisition decision. Secondly, $\hat{c}_{\text{S}}$ represents the case where the worker always exerts effort and, therefore, $p_{\text{NA}} = p_{\text{A}} = \overline{p}$. Finally, $\tilde{c}_{\text{S}}$ represents the manager's incentives in (5) when the worker is *reactive*; that is, $p_{\text{NA}} = \underline{p}$ and $p_{\text{A}} = \overline{p}$. These cut-offs help us define the optimal strategy for the manager. A full characterization can be found in the proof of Proposition 1 in the appendix.

We now characterize the equilibrium where the outcome is (A, E) as a result of the complementarity between players' decisions; that is, the manager acquires information if and only if the worker exerts effort.

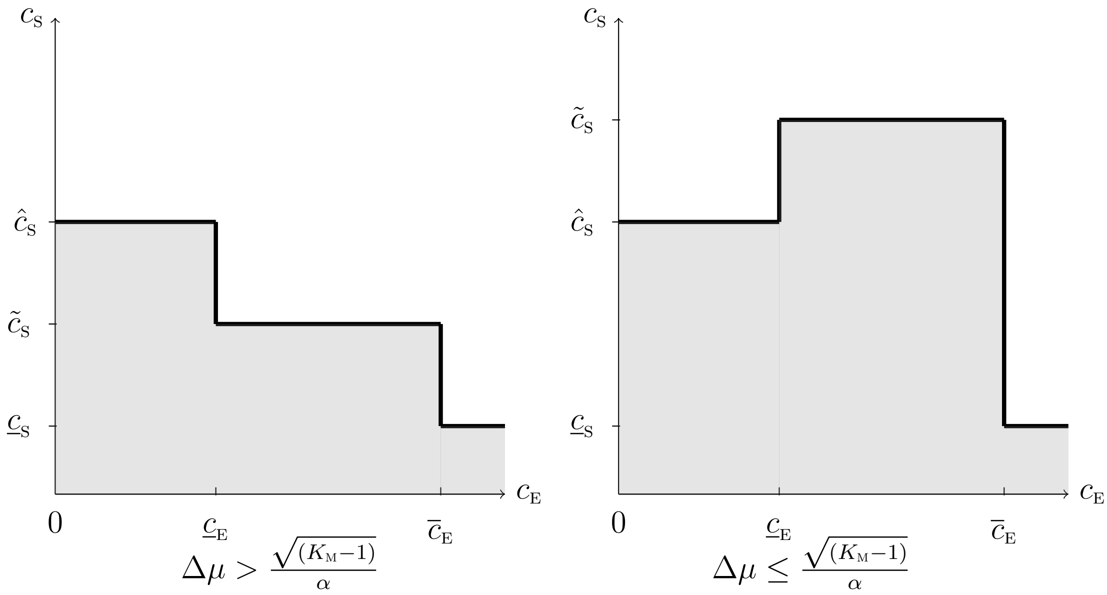
Proposition 1 (Complementarity of decisions)**.** *If $c_{\text{S}} \in (\underline{c}_{\text{S}}, \tilde{c}_{\text{S}})$ and $c_{\text{E}} \in (\underline{c}_{\text{E}}, \overline{c}_{\text{E}})$, then $\hat{x} = \text{A}$ if and only if $\hat{y}(\text{A}, \tilde{s}) = \text{E}$.*

Note that $c_{\text{E}} \in (\underline{c}_{\text{E}}, \overline{c}_{\text{E}})$ directly implies one direction. The interesting direction is the manager's decision as a function of the worker's effort. Thus, both actions are complementary. Figure 1 summarizes the equilibrium behavior. Let $\overline{c}_{\text{S}}(c_{\text{E}})$ be the acquisition cost where the manager is indifferent between acquiring information or not in equilibrium.[21] Interestingly, if $\hat{c}_{\text{S}} < \tilde{c}_{\text{S}}$ (as shown in the right panel of Figure 1) the manager's equilibrium acquisition decision is not monotonic in c_{E} because of the complementarity.

[20]We assume that $\left[K_{\text{M}} - \frac{1}{(1+\tau)} + \left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right] > 0$.

[21]Formally, if $\Delta\mu > \frac{\sqrt{(K_{\text{M}}-1)}}{\alpha}$, $\overline{c}_{\text{S}}(c_{\text{E}})$ is $\hat{c}_{\text{S}}$ when $c_{\text{E}} < \underline{c}_{\text{E}}$; $\tilde{c}_{\text{S}}$ when $\underline{c}_{\text{E}} \leq c_{\text{E}} \leq \overline{c}_{\text{E}}$; $\underline{c}_{\text{S}}$ when $\overline{c}_{\text{E}} < c_{\text{E}}$. If $\Delta\mu < \frac{\sqrt{(K_{\text{M}}-1)}}{\alpha}$, $\overline{c}_{\text{S}}(c_{\text{E}})$ is $\tilde{c}_{\text{S}}$ when $c_{\text{E}} < \underline{c}_{\text{E}}$; $\hat{c}_{\text{S}}$ when $\underline{c}_{\text{E}} \leq c_{\text{E}} \leq \overline{c}_{\text{E}}$; $\underline{c}_{\text{S}}$ when $\overline{c}_{\text{E}} < c_{\text{E}}$.

Figure 1: Equilibria where the manager acquires information



Note: *The* ***gray areas*** *reflect the parameters for which the manager acquires information under diversity* $\Delta\mu$.

As a general intuition, when a player's cost of taking action is sufficiently low [high, resp.], he will [not] take that action irrespective of what the other player decides. Figure 1 illustrates such scenarios for the manager and the worker. For intermediate costs, however, a player's decision depends on what the other player does on the equilibrium path. In the case where the costs for both players are intermediate, their decisions become mutually interdependent such that they influence each other in equilibrium. In other words, the worker reacts to the manager's decision to acquire information by exerting more effort, and such decision by the worker motivates the manager to acquire information in the first place. Such reaction by the worker introduces a *motivational* return when the manager invests in information, which creates a non-monotonicity in her decision to acquire information as a function of the worker's cost of effort.

3.3 Diversity as a motivator

We now analyze the effects of diversity on decision-making by comparing the equilibrium outcome when diversity increases from $\Delta\mu$ to $\Delta\mu'$. We focus on the case where higher diversity improves organizational performance by inducing the manager to acquire information and the worker to exert effort. Recall from Lemma 1 that the worker's incentives for effort are strictly decreasing in diversity. Therefore, any potential benefit relates to the manager's incentives to acquire information. When players' prior beliefs are close to each other, the project that would be chosen based on those beliefs is relatively close to the manager's (ex-ante) ideal; as a consequence, her *alignment incentives* for information are relatively weak. Increasing diversity strengthens such incentives by making the no-information project worse from her ex-ante perspective, which may lead to better overall performance if it also motivates the worker to exert effort. Proposition 2 characterizes the cases where increases in diversity motivate both players.

Proposition 2 (Motivating through diversity)**.** *Suppose that* $c_{\text{S}} > \tilde{c}_{\text{S}}$ *and* $c_{\text{E}} \in (\underline{c}_{\text{E}}, \overline{c}_{\text{E}})$*, so the equilibrium outcome is* $\hat{x} = \text{NA}$ *and* $\hat{y}(\text{NA}, \tilde{s}) = \text{NE}$*. In addition, suppose that* $\tau \geq \hat{\tau} > 0$*. The following statements are equivalent:*

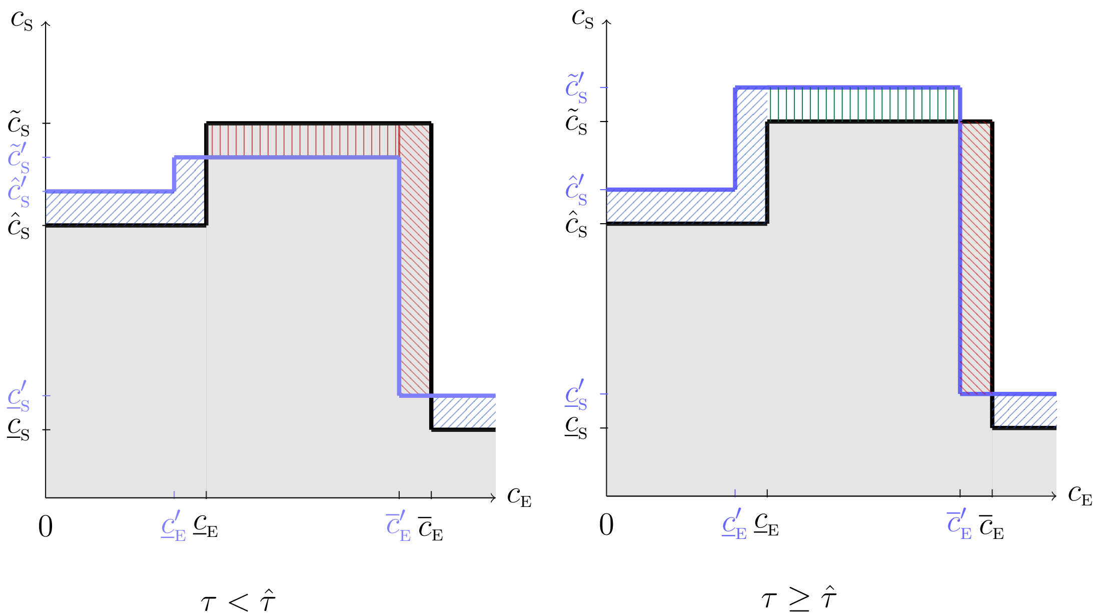
i). The worker's bargaining power relative to the manager's is sufficiently high $\alpha > \hat{\alpha}$*.*

ii). There are cutoffs $\underline{\Omega} < \overline{\Omega}$ *such that an increase in diversity from* $\Delta\mu$ *to* $\Delta\mu' \in [\underline{\Omega}, \overline{\Omega}]$ *changes the outcome to* $\hat{x} = \text{A}$ *and* $\hat{y}(\text{A}, \tilde{s}) = \text{E}$*.*[22]

Increasing diversity from low to moderate levels can induce the manager to invest in information because it worsens her expected payoff from the no-information scenario. This, per se, results in enhanced organizational performance because it leads to a project that, in expectation, matches the state of the world better. Instead, Proposition 2 focuses on the more interesting case where the manager's willingness to invest in information due to higher diversity also induces the worker to exert effort. In other words, the reactive worker does not exert effort under the initial level of diversity but the manager's acquisition decision encourages him to do so under the new, higher level. This is illustrated by the green area in the right panel of Figure 2. Note that the left panel features the opposite case where more diversity disincentivizes the manager to acquisition and, thus, a reactive worker to high effort (see the area in red with vertical stripes). In addition, the figure illustrates the case where only the manager's acquisition incentives improve (in blue) as analyzed by Che and Kartik (2009); Van den Steen (2010a), and the case where more diversity only results in lower effort from the worker (red inclined stripes) as analyzed by Landier et al. (2009); Van den Steen (2010a). Figure A1 in the appendix shows the same intuitions hold for moderate levels of diversity.

[22]Note that $\hat{\tau} := \left(\frac{\overline{p}}{\underline{p}}\right)^{1/2} - 1$, and $\hat{\alpha}$ is the unique value that satisfies the following equation: $\frac{-c_{\text{S}}(1+\tau)+\overline{p}(K_{\text{M}}(1+\tau)-1)-\underline{p}(K_{\text{M}}-1)(1+\tau)}{\left(-\frac{c_{\text{E}}(1+\tau)}{\Delta p}+K_{\text{W}}(1+\tau)-1\right)\left(\overline{p}-\underline{p}(1+\tau)^2\right)} = \left(\frac{\alpha}{1-\alpha}\right)^2.$

Figure 2: Increasing diversity on organizational performance for $\Delta\mu \leq \frac{\sqrt{(K_{\text{M}}-1)}}{\alpha}$



Note: *In the areas in* ***red with inclined stripes****, higher diversity discourages the worker to high effort (Landier et al., 2009; Van den Steen, 2010a); In* ***blue****, the manager acquires information, but the worker does not change his equilibrium effort decision as a result of increased diversity (Che and Kartik, 2009; Van den Steen, 2010a). The areas with* ***vertical lines*** *in both panels represent the result in Proposition 2: in red, higher diversity discourages information acquisition and, thus, worker's effort (left panel), whereas in green it encourages acquisition and, thus, effort from a reactive worker (right panel).*

We finally analyze the role of the worker's participation in project choice on the benefits of higher diversity. Interestingly, under the set of parameters for which Proposition 2 holds, higher worker participation in project choice enlarges the set of prior beliefs under which diversity improves performance.

Corollary 1 (Role of worker participation)**.** *Suppose that* $\tau \geq \hat{\tau}$ *and* $\alpha \geq \hat{\alpha}$*. Then,* $\underline{\Omega}$ *decreases and* $\overline{\Omega}$ *increases in* α*.*

4 Organizational Complexity

4.1 Covert information acquisition

We now drop the assumption that the worker observes the manager's decision to acquire information. In this way, the worker can not react to the manager's action and must form beliefs about it. Let $\beta \in [0, 1]$ be the probability the worker assigns to $a = \text{A}$. In equilibrium, the worker's beliefs must be consistent with the manager's decision. However, the manager anticipates that different actions will not change the worker's on-path decision because her deviations will not be detected. Note that the worker's beliefs will affect the project to be selected for implementation. Therefore, after a public signal realization $\tilde{s}$, the his posterior beliefs about θ given β, are given by:

$$\mathbb{E}_{\text{W}}\left[\theta \mid \beta, \tilde{s}\right] := \frac{1}{1+\beta\,\tau}\,\mu_{\text{W}} + \frac{\beta\,\tau}{1+\beta\,\tau}\,\tilde{s}.$$

Effectively, the weight the worker puts in the observed signal depends on how much he thinks it comes from information acquired by the manager. In other words, $\beta = 0$ means he believes the signal is pure noise and, thus, his interim and prior beliefs coincide; $\beta = 1$ means he believes the manager has actually acquired information and, thus, his interim beliefs are the weighted average between the prior and the signal.

The project chosen will also depend on the manager's beliefs, which are based on the information she observes. Knowing the project to be implemented, the worker updates his beliefs before deciding on effort. Such beliefs will then coincide with the manager's actual decision. In other words, any deviation from the equilibrium acquisition decision will only affect project selection.[23] In this context, the worker's strategy is simply a mapping $y : \mathbb{R} \to \{\text{E}, \text{NE}\}$. Therefore, given β, the worker exerts effort $\hat{y}(\tilde{s}) = \text{E}$ if and only if:

$$\left[K_{\text{W}} - \frac{1}{(1+\beta\,\tau)} - \left(\frac{(1-\alpha)\,\Delta\mu}{1+\beta\,\tau}\right)^2\right]\Delta p \geq c_{\text{E}}. \tag{6}$$

In equilibrium, if the manager's action is $a = \text{NA}$, then $\beta = 0$ and condition (6) becomes (3); if the manager's action is $a = \text{A}$, then $\beta = 1$ and (6) becomes (4). Thus, conditional to the manager's action, the worker's equilibrium effort decision is the same as in the baseline model.

An equilibrium acquisition decision for the manager must be immune to two types of deviations. First, the decision has to be payoff superior (in expectation) to the alternative *given the worker's on-path beliefs* associated with each of them; that is, considering each possible decision, $a \in \{\text{A}, \text{NA}\}$, as a tentative equilibrium. In

[23] We find this assumption practically relevant: the worker's effort decision is based on a concrete project to be implemented. Besides, the assumption pushes the manager's benefit from deviations at the acquisition stage to the minimum. Higher benefits would make the conditions for equilibria with acquisition more stringent and, given Proposition 2, further limit the potential benefits of increased diversity.

the appendix we show that the associated incentive compatibility (IC) constraint is the same as in the baseline model—i.e., condition (5).

Secondly, the manager's decision has to be immune to deviations that will not be detected at the project selection stage. This means that the worker's on-path beliefs, β, will not change upon the deviation and, therefore, the manager cannot use this decision to signal her intention to reduce disagreement. As shown below, this very fact weakens the manager's incentives for information acquisition in a way such that increasing diversity will always be detrimental to her incentives.

Before characterizing the manager's incentives, let $p_a := \overline{p}\mathbb{1}_{\hat{y}(\tilde{s})=\text{E}} + \underline{p}\mathbb{1}_{\hat{y}(\tilde{s})=\text{NE}}$ be the induced probability of success given $\hat{y}(\tilde{s})$, and considering that $\beta = 1$ if $a = \text{A}$ and $\beta = 0$ if $a = \text{NA}$. Note that the definition coincides with that of the main model.

Lemma 3 (Manager's equilibrium decision in the covert game)**.** *The manager acquires the signal in equilibrium, $\hat{x} = \text{A}$, if and only if*

$$\underbrace{p_{\text{NA}}\left(\frac{\tau}{1+\tau}\right)}_{\textit{alignment incentives}} + \underbrace{(p_{\text{A}} - p_{\text{NA}})\left[K_{\text{M}} - \frac{1}{(1+\tau)} - \left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right]}_{\textit{motivational incentives}} \geq c_{\text{S}}. \tag{7}$$

It is straightforward to note that the LHS in (7) is strictly smaller than in (5). In particular, the difference lies in the first term corresponding to the *alignment incentives* for acquisition. In the baseline model, the manager had incentives to invest in information on the prospect of reducing the ex-ante conflict of interest with the worker. When her decision is not observed and the worker believes she did acquire information, $\beta = 1$, deviating to not acquiring will not alter the project chosen in equilibrium. By doing so, she can save on information costs in the expectation of an uninformative signal close to her prior, at the expense of a higher expected residual variance and a weakly lower effort at the implementation stage.[24] In other words, the manager's inability to credibly signal her acquisition decision kills incentives associated with reducing the conflict of interest with the worker.

Similar to the baseline model, condition (7) define three cutoffs, $\underline{c}_{\text{S}}^{cov}$, $\hat{c}_{\text{S}}^{cov}$ and $\tilde{c}_{\text{S}}^{cov}$, which depend on the effort decision. We provide explicit expressions in the proof of Lemma 3 in the appendix. From the previous discussion, it is straightforward to see that $\underline{c}_{\text{S}} > \underline{c}_{\text{S}}^{cov}$, $\hat{c}_{\text{S}} > \hat{c}_{\text{S}}^{cov}$, and $\tilde{c}_{\text{S}} > \tilde{c}_{\text{S}}^{cov}$. Further, $\tilde{c}_{\text{S}} - \underline{c}_{\text{S}} = \tilde{c}_{\text{S}}^{cov} - \underline{c}_{\text{S}}^{cov}$. As a result, the set of parameters for which the manager acquires information in

[24]These incentives are represented in the first and second terms of (7), respectively.

the equilibrium of the covert case is a strict subset of the corresponding set for the overt case (baseline). Figure A2 in the Appendix compares both cases.

Despite the manager's incentives being hampered by covert information acquisition, there is still a non-empty set of parameters where the equilibrium decisions of both players are complementary. The result below is the equivalent of Proposition 1 for the covert game.

Proposition 3 (Complementarity of decisions)**.** *When the manager's acquisition information is not observed, if* $c_{\text{S}} \in \left(\underline{c}_{\text{S}}^{cov}, \tilde{c}_{\text{S}}^{cov}\right)$ *and* $c_{\text{E}} \in \left(\underline{c}_{\text{E}}, \overline{c}_{\text{E}}\right)$*, then,* $\hat{x} = \text{A}$ *if and only if* $\hat{y}(\tilde{s}) = \text{E}$*.*

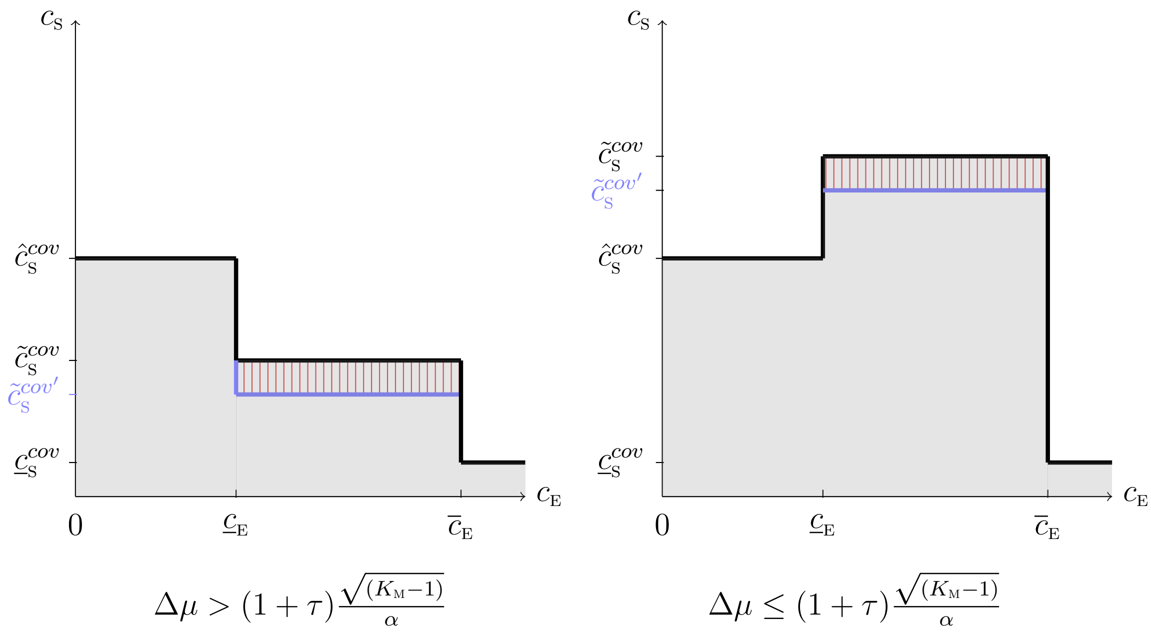
The fact that part of the alignment effect has disappeared due to covert acquisition leads to increasing diversity being detrimental to organizational performance. A more diverse environment now unequivocally reduces the set of parameters, resulting in equilibria where players' decisions are complementary.

Proposition 4 (No benefits from diversity in the covert game)**.** *Suppose that in equilibrium* $\hat{x} = \text{NA}$ *and* $\hat{y}(\tilde{s}) = \text{NE}$*. There is no increase in diversity from* $\Delta\mu$ *to* $\Delta\mu'$ *that changes the outcome to* $\hat{x} = \text{A}$ *and* $\hat{y}(\tilde{s}) = \text{E}$*.*

In the overt game, the possibility of reducing the conflict of interest with the worker was an important driver of the manager's incentives to acquire information. Higher diversity in such contexts increased the return associated with a lower ex-post conflict, leading to better quality decisions and a higher probability of successful implementation in some cases. When the manager's ability to signal her acquisition decision disappears, her incentives associated with reducing ex-ante conflict follow and, thus, the potentially beneficial effects of higher diversity on organizational performance. Figure 3 illustrates the effects for low and moderate levels of initial diversity.

The previous result presents a qualification for the traditional mechanism through which increasing the difference in opinions between players results in enhanced incentives for information acquisition (Che and Kartik, 2009; Van den Steen, 2010a), and speaks to a critical unintended consequence of DEI initiatives. People in charge of implementing organizational decisions—both strategic and operational—are key stakeholders whose trust and motivation play a critical role in organizational success. Therefore, the ability to navigate complex data and master the technical aspects of compiling it to develop reliable information is necessary for an organization that aims to harness the potential benefits of a more diverse workplace. It is then crucial that DEI initiatives are implemented with complementary organizational processes improving such informational transparency (Schnackenberg and Tomlinson, 2016).

Figure 3: Effects of increasing diversity on organizational performance under covert information acquisition ($\tau > \hat{\tau}$)



Note: *The light blue lines correspond to the effect of diversity on the manager's acquisition IC constraint. The* ***red areas*** *represent the harmful effect of increased diversity on organizational performance due to reduced incentives for information acquisition in the covert game. When the acquisition decision is private information of the manager, increasing diversity always harms communication as opposed to Che and Kartik (2009); Van den Steen (2010a).*

We next analyze the incentive effects of the manager's ability to commit to information transmission.

4.2 Strategic Information Transmission

In this section, we consider the possibility that only the manager observes the signal information, but he can communicate with the worker through costless and non-verifiable messages.

Now, prior to project selection, there is a communication stage where the manager can send a message $m \in \mathcal{S}$ to the worker. The manager's *communication strategy* is a function $\hat{m} : \mathcal{S} \to \mathcal{M}$; while an *influential* communication strategy satisfies that at least two signal $s, s' \in \mathcal{S}$, generate two different messages $\hat{m}(s) \neq$

$\hat{m}(s')$. A communication strategy $\hat{m}$ and message m induces a decision

$$z_m := (1-\alpha)\,\mathbb{E}_{\text{M}}\big[\theta \mid a, m\big] + \alpha\,\mathbb{E}_{\text{W}}\big[\theta \mid a, m\big].$$

We assume the decision is consistent with the manager's message in the sense that project choice considers her 'public beliefs'. In other words, the manager only influences the decision through communication with the worker, and it will determine the beliefs used to select the project to be implemented. Anticipating this, her message strategy must be incentive-compatible.[25] In our environment, both the manager's and worker's beliefs are considered for project selection, such that when choosing her communication strategy, the manager anticipates its effects on beliefs and project choice. A communication strategy $\hat{m}$ is *incentive compatible* if and only if for action $a = \text{A}$, signal s, message $m = \hat{m}(s)$ and alternative message $m' \neq \hat{m}(s)$, the manager expected payoff of sending message m is higher than sending message m'.

From now on, we assume that $\Delta\mu = \mu_{\text{M}} - \mu_{\text{W}} > 0$. We first show that there is no *fully revealing* communication strategy that is incentive-compatible; i.e., there is no incentive-compatible communication strategy where the manager sends a different message for every signal $\hat{m}(s) \neq \hat{m}(s')$, with $s \neq s'$. Thus, influential equilibria—if any exists—must involve signals pooling into intervals (Crawford and Sobel, 1982; Moscarini, 2007). In a fully revealing equilibrium, the worker perfectly learns the signal after observing the message. We know from Lemma 1 that when both manager and worker observe the signal, the worker's effort decision does not depend on the signal realization but only on whether the manager acquired information.

Suppose the set of parameters is such that the worker induces with his effort a probability p^* of project success implementation. In a fully revealing equilibrium, an incentive-compatible communication strategy satisfies for any signal s and message m':

$$-p^*\,\mathbb{E}_{\text{M}}\big[(\theta - z_{\hat{m}(s)})^2 \mid \text{A}, s\big] - (1-p^*)K_{\text{M}} \geq -p^*\,\mathbb{E}_{\text{M}}\big[(\theta - z_{m'})^2 \mid \text{A}, s\big] - (1-p^*)K_{\text{M}},$$

[25] Alternatively, we could pose that the manager's actual beliefs are used for project choice together with the worker's communication beliefs—i.e., $\mathbb{E}_{\text{M}}[\theta \mid s]$ and $\mathbb{E}_{\text{W}}[\theta \mid m]$, respectively. In such a case, the worker would be able to reverse-engineer the manager's information at the implementation stage and, thus, communication would not affect his effort decision on-path (similar to the covert information acquisition case). We consider our current approach more relevant and theoretically interesting.

which is equivalent to

$$\left(z_{\hat{m}(s)} - z_{m'}\right)\left(2\,\mathbb{E}_{\mathrm{M}}\left[\theta \mid \mathrm{A}, s\right] - z_{\hat{m}(s)} - z_{m'}\right) \geq 0.$$

In the last inequality, the sign of the LHS depends on the type of deviation. Suppose $z_{m'} > z_{\hat{m}(s)}$ and denote $s' = \hat{m}^{-1}(m')$. After some algebra, the term $\left(2\,\mathbb{E}_{\mathrm{M}}[\theta \mid \mathrm{A}, s] - z_{\hat{m}(s)} - z_{m'}\right)$ becomes

$$(s' - s) - \frac{2\,\alpha\,\Delta\mu}{\tau}.$$

If the pair of signals s, s' is sufficiently far from each other, the previous term is positive, and then the incentive-compatible requirement is violated. Since $\mathcal{S} = \mathbb{R}$, for any s there is a s' for which the above condition fails to hold. Analogously, the manager does not have the incentive to send a signal s' that induces $z_{m'} < z_{\hat{m}(s)}$. The term $\left(\frac{\alpha\,\Delta\mu}{\tau}\right)$ can be interpreted as a measure of the *conflict of interest* associated with strategic communication, which prevents full information transmission. The conflict of interest vanishes as diversity tends to zero $\Delta\mu \to 0$ or the signal becomes perfectly informative, $\tau \to \infty$. We summarize the previous arguments in the following Lemma with no proof.

Lemma 4. *There is no fully revealing incentive-compatible communication strategy.*

Any incentive-compatible communication strategy can thus be characterized by a partition $\{P_k\}_{k\in\mathbb{N}}$ of the set $\mathcal{S}$ (Crawford and Sobel, 1982; Moscarini, 2007). Assume without loss of generality that if $s \in P_k$ and $s' \in P_{k+1}$, then $s \leq s'$ for every $k \in \mathbb{N}$. In this communication strategy, the manager that observes a signal $\tilde{s} \in P_k$, sends a message P_k (or any message $s \in P_k$) and prefers doing so to announcing any alternative interval. Denote for simplicity $\mathbb{E}_i\left[\cdot \mid P_k\right] := \mathbb{E}_i\left[\cdot \mid \mathrm{A}, s \in P_k\right]$. When the manager sends a message P_k on-path, the project to implement is:

$$z_k := (1-\alpha)\,\mathbb{E}_{\mathrm{M}}\left[\theta \mid P_k\right] + \alpha\,\mathbb{E}_{\mathrm{W}}\left[\theta \mid P_k\right].$$

We now characterize the worker's effort incentives to, then, resume the analysis of communication strategies. First, we derive some useful statistics:

$$\mathbb{E}_i\left[\theta \mid P_k\right] = \frac{1}{(1+\tau)}\mu_i + \frac{\tau}{(1+\tau)}\mathbb{E}_i\left[s \mid P_k\right],$$

$$\mathrm{Var}_i\left[\theta \mid P_k\right] = \frac{1}{(1+\tau)} + \left(\frac{\tau}{1+\tau}\right)^2 \mathrm{Var}_i[s \mid P_k].$$

Worker's effort decision. The worker's strategy is a function between a message and effort that depends on whether the manager acquires information or not, $y : \{\text{A}, \text{NA}\} \times \mathcal{M} \to \{\text{E}, \text{NE}\}$. For simplicity, we associate the equilibrium messages of a given communication strategy when the manager acquires information with the corresponding intervals P_k of the equilibrium partition of the state space. Because information acquisition is overt, communication when the manager does not have information is payoff irrelevant. Let $s_k := \sup P_k$. We have the following:

Lemma 5 (Worker's optimal effort decision under strategic communication)**.** *In the strategic communication game:*

i) $\hat{y}(\text{NA}, \tilde{s}) = \text{E}$ *if and only if* (3) *holds.*

ii) $\hat{y}(\text{A}, P_k) = \text{E}$ *if and only if*

$$\left[K_{\text{W}} - Var_{\text{W}}\left[\theta \mid P_k\right] - (1-\alpha)^2 \left(\mathbb{E}_{\text{M}}\left[\theta \mid P_k\right] - \mathbb{E}_{\text{W}}\left[\theta \mid P_k\right]\right)^2\right] \Delta p \geq c_{\text{E}}. \quad (8)$$

For $\hat{x} = \text{A}$ *and fixed* $\tilde{s} \in P_k$*, if* $s_{k-1} \nearrow \tilde{s} \wedge s_k \searrow \tilde{s}$*, then the LHS of* (8) *converges to* $\bar{c}_{\text{E}}$*; and if* $s_{k-1} \to -\infty \wedge s_k \to +\infty$*, then the LHS of* (8) *converges to* $\underline{c}_{\text{E}}$*.*

Interestingly, the worker's effort now depends on the message announced by the manager when she acquires information. His incentives for effort increase the lower the residual variance the message induces. Furthermore, the worker's incentives increase as his expected posterior beliefs get closer to the manager's.

Strategic communication with constant worker's effort. To study the manager's communication strategy, we restrict attention to the case where the worker's effort decision is independent of the particular message announced, P_k, within a partition $\{P_k\}_{k\in\mathbb{N}}$. The restriction allows us to compare the analysis with the baseline model and understand the relative consequences of strategic communication. Lemma B4 in the Appendix shows that this is the case when the signal's precision adopt extreme values: either $\tau < \underline{\tau}$ or $\tau > \overline{\tau}$. We assume that $\tau \in \mathcal{T} := [0, \underline{\tau}) \bigcup (\overline{\tau}, \infty)$. When $\tau \notin \mathcal{T}$, a communication strategy may induce different effort levels from different messages, which complicates the present analysis without substantial gains in intuitions.[26]

Suppose the worker's effort induces a probability p^* of project success. In an incentive-compatible communication strategy, the following must be satisfied for

[26] In a separate project, we are analyzing such equilibria as an extension of the canonical cheap talk model of Crawford and Sobel (1982).

any $s \in P_k$ and $P_{k'} \neq P_k$:

$$-p^* \mathbb{E}_{\text{M}}\big[(\theta - z_k)^2 \mid \text{A}, s\big] - (1-p^*)K_{\text{M}} \geq -p^* \mathbb{E}_{\text{M}}\big[(\theta - z_{k'})^2 \mid \text{A}, s\big] - (1-p^*)K_{\text{M}}$$
$$\iff \quad (z_k - z_{k'})\big(2\,\mathbb{E}_{\text{M}}[\theta \mid \text{A}, s] - z_k - z_{k'}\big) \geq 0$$

From the previous discussion, the manager has incentives to deviate to induce, through the message, larger projects. Let $\hat{s}_k := (1-\alpha)\,\mathbb{E}_{\text{M}}\big[s \mid P_k\big] + \alpha\,\mathbb{E}_{\text{W}}\big[s \mid P_k\big]$. Following Crawford and Sobel (1982), it is sufficient to study the message incentives for the boundary type s_k between intervals P_k and P_{k+1}. Thus

$$2\,\mathbb{E}_{\text{M}}[\theta \mid \text{A}, s_k] - z_k - z_{k+1} = 0$$
$$\Leftrightarrow \; (\hat{s}_{k+1} - s_k) - (s_k - \hat{s}_k) = 2\,\frac{\alpha\,\Delta\mu}{\tau} \tag{9}$$

Condition (9) is analogous with Crawford and Sobel (1982) arbitrage condition, where the conflict of interest b is equal to

$$b := \frac{\alpha\,\Delta\mu}{\tau}. \tag{10}$$

The main difference with Crawford and Sobel (1982) is that the state space is unbounded in our environment. Based on Moscarini (2007), we can show that any incentive-compatible communication strategy features a finite number of partitions (Lemma B3 in the Appendix). In such an environment, however, the equilibrium cannot be analytically characterized. Moscarini (2007) overcomes this limitation by rescaling the message space in a way that collapses the parameters determining the conflict of interest between sender and receiver. This maintains the set of equilibria of the original model up to the rescaling, but the normalization allows for a complete numerical characterization. Our framework admits an equivalent standardization when $\alpha = 1$. In doing so, we effectively collapse the belief space relevant for project choice into the worker's belief distribution.

Lemma 6 (Moscarini, 2007)**.** *Let $\alpha = 1$. Any incentive-compatible communication strategy is a finite partition of the real line into K intervals $\mathcal{P}^K := \big\{P_1, P_2, ..., P_K\big\} = \big\{(-\infty, s_1), [s_1, s_2), ..., [s_{K-1}, +\infty)\big\}$, where $\{s_k\}_{k=1}^{K-1}$ is a strictly increasing and finite sequence satisfying (9). For every $b \in (0,\infty)$ defined in (10), there exists an integer $N(b) \geq 2$ such that each $K \in \{1, ..., N(b)\}$ defines a communication equilibrium in which, after* M *privately observes the signal realization $s \in P_k \subset \mathcal{P}^K$, she announces P_k. $N(b)$ is non-increasing in b, and $\lim_{b\to 0} N(b) = \infty$. Comparing across $K \in \{1, 2, ..., N(b)\}$, the minimum (ex-ante) expected residual* *variance* $\mathbb{E}_{\text{M}}[Var_{\text{W}}[s \mid P_k]]$ *is achieved by the equilibrium with the finest partitions* $K = N(b)$*. Moreover, these minimized values are increasing in* b*.*

Moscarini (2007) gives an algorithm to construct the entire set of equilibria. An important implication of Lemma 6 is that increasing diversity ($\Delta\mu$) results in less information transmitted by the manager, measured by the number of intervals in equilibrium. On the contrary, improving the quality of information the manager has access to (τ) reduces the conflict of interest and, thus, enhances information transmission.

Note that the assumption that $\alpha = 1$ in Lemma 6 allows us to guarantee existence of equilibria. However, we do not restrict the analysis on the manager's incentives to the same assumption.

Manager's information acquisition decision. The manager's expected payoff from acquiring information depends on the communication strategy such information induces on-path. Because the worker's effort decision may depend on the exact message announced by the manager, the probability of success could be a function of the structure of partitions in the equilibrium message strategy. To simplify the analysis, we focus on equilibria where the worker's effort decision is constant across all possible messages. The main difference with section 3 relates to the effects of credibility on the expected payoffs from acquiring information.

As in the baseline model, there will be two types of incentives shaping the manager's acquisition decision. On the one hand, the *alignment effect* involves the reduction in the residual variance plus the reduction in the posterior disagreement with the worker. The latter is critical for the beneficial effects of diversity on performance (cf. Propositions 2 and 4). Under strategic communication, the reduction in posterior beliefs depends on how much information is effectively transmitted to the worker on the equilibrium path. In addition, the fact that project choice is based on the manager's public beliefs generates a loss of information for her, which reduces the expected gains from acquisition.

On the other hand, the *motivation effect* involves the expected marginal return from the successful implementation of the chosen project when the manager's decision to acquire information induces the worker to exert effort. It is straightforward to note that the distortion in information transmission increases both the expected variance and the posterior disagreement compared to the baseline. The following result formalizes these intuitions.

Proposition 5. *Suppose that $\tau \in \mathcal{T}$. Under strategic communication, there exist a function $\Psi := \frac{\tau}{\alpha}\big[s - \hat{s}_k\big]$ with $\mathbb{E}_{\mathrm{M}}[\Psi(\cdot)] > 0$, such that the manager acquires the signal in equilibrium, $\hat{x} = \mathrm{A}$, if and only if*

$$\overbrace{p_{\mathrm{NA}} \frac{\tau}{(1+\tau)} \left[1 + \frac{(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)}\right]}^{\text{alignment incentives}} + \overbrace{(p_{\mathrm{A}} - p_{\mathrm{NA}}) \left[K_{\mathrm{M}} - \frac{1}{(1+\tau)}\right]}^{\text{motivational incentives}} \\ \underbrace{- \, p_{\mathrm{A}} \left(\frac{\alpha}{1+\tau}\right)^2 \left[2\tau\Delta\mu^2 + \mathbb{E}_{\mathrm{M}}[\Psi(\cdot)^2]\right]}_{\text{expected credibility loss}} \geq c_{\mathrm{S}}. \tag{11}$$

Moreover, the LHS of (11) is strictly smaller than the LHS of (5), it converges to zero for $b \to \infty$ and converges to the LHS of (5) for $b \to 0$.

The manager's incentives to acquire information are weaker than in baseline because she anticipates that some information will be lost in communication. This is similar to the trade-off between information acquisition and communication identified in Che and Kartik (2009), but here featuring with *cheap talk* communication of imperfect information and effort at the implementation stage. The manager expects that information will be less useful in improving the expected (posterior) quality of the decision in terms of matching her posterior beliefs and, at the same time, will be less effective in reducing the posterior disagreement with the worker and lead to a decision farther away to her expected posterior belief.

When the conflict of interest at the communication stage is maximal, all the information the manager could acquire will be lost to credibility, so she will have no incentives to incur costs to observe the signal. When the conflict of interest is minimal, however, the manager will be able to convey all of it to the worker such that her acquisition incentives will be maximal —as in the baseline scenario. We now analyze how increasing diversity affects the manager's acquisition incentives.

Proposition 6. *Relative to the baseline model, increasing diversity under strategic communication has two additional effects on the manager's acquisition incentives:*

i). A direct effect, given by

$$-\mathcal{H}\,\tau\,\Delta\mu < 0;$$

ii). An indirect effect, given by

$$-\mathcal{H}\,\tau\Big[\Delta\mu\,(2+\tau)\Big] < 0;$$

where $\mathcal{H} := 2\,p_{\mathrm{A}}\,\left(\frac{\alpha}{1+\tau}\right)^2 > 0$.

The credibility loss due to strategic communication dilutes the potentially beneficial effects of increasing diversity on performance, as compared to the baseline model. The direct effect described in *i*) captures that the increased expected return from acquiring information is lower than in baseline because less of that information will be transmitted to the worker at the communication stage. The indirect effect in *ii*) captures the idea that increasing diversity worsens the conflict of interest between players, such that even less information can be credibly transmitted. Note also that more diversity worsens the already adverse effects on her *motivational incentives* for information acquisition. The presence of an implementation stage thus exacerbates the trade-off found in Che and Kartik (2009): the harmful effects of diversity on communication incentives are now more dominant.

All in all, increasing diversity in organizations where information is soft and communication is costless strengthens the conflict of interest at the communication stage. Managers with access to information will have fewer incentives to obtain it because less will be effectively transmitted to workers. To compensate for such unintended consequences, the organization can facilitate managers' access to higher-quality information. To see this, recall that $b = \frac{\alpha \Delta\mu}{\tau}$; hence, for any given level of diversity (and worker participation in decision-making), there exists a τ that keeps the conflict of interest constant.

Corollary 2. *Suppose an increase in diversity from $\Delta\mu$ to $\Delta\mu'$. There exists a signal precision $\tau' > \tau$ such that for any value higher than τ', the expected credibility loss is lower than the original expected credibility loss at $\Delta\mu$ and τ.*

Minimizing the unintended consequences due to strategic communication requires organizations to complement DEI initiatives with investments to improve the quality of information their members can access. Such complementary organizational processes have the potential to neutralize the indirect effects impairing the acquisition of information, and reduce the negative impact of the direct effect—associated with the level of conflict of interest at the communication stage.

5 Concluding remarks

This paper studied how diversity and participatory decision-making influence organizational performance, integrating informational transparency and trust into the analysis. We identified a novel mechanism through which diversity improves performance. Our model involves a manager with access to costly information that guides project selection and a worker responsible for implementing the project. Organization members have heterogeneous priors, and their interim beliefs determine the project to be implemented—worker empowerment relates to how much his perspective influences project choice. We showed that information acquisition reduces disagreement and motivates effort. In this context, more diversity decreases the manager's opportunity cost of acquiring information, enhances her incentives, and motivates the worker to put in more effort in some cases. Notably, the relationship between diversity and performance is non-monotonic, with an optimal range beyond which additional diversity can lead to unintended consequences.

The extensions underlined the fragility of diversity's benefits, which rely on members of the organization knowing the quality of the manager's information and trusting the means she employs to communicate it. When information acquisition is covert, the manager loses her ability to signal commitment to reducing disagreement, eliminating all beneficial effects of diversity. Similarly, strategic communication introduces credibility concerns that dilute the manager's gains from information, reducing the instances where diversity enhances performance.

Our results have significant implications for organizational design and the implementation of diversity, equity, and inclusion (DEI) initiatives. Transparency and trust-building processes must accompany diversity efforts to prevent unintended consequences undermining performance. Future research could explore the interplay of these factors in more complex organizational settings and extend our findings to dynamic environments.

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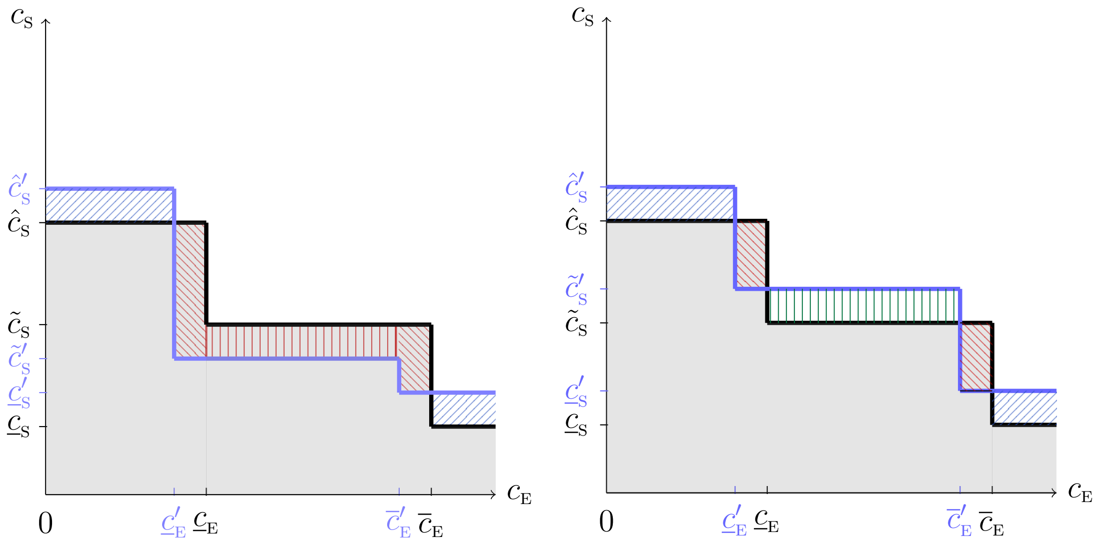
Appendix A Additional figures

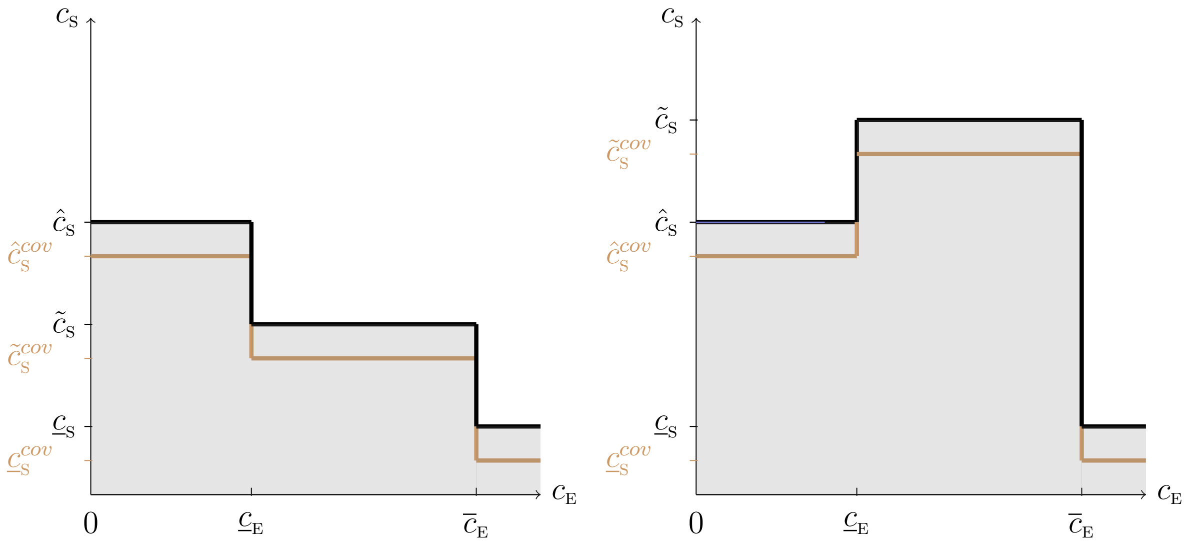
Figure A1: The Benefits of Diversity in Organizations for $\Delta\mu > \frac{\sqrt{(K_{\text{M}}-1)}}{\alpha}$



$\tau < \hat{\tau}$ $\tau \geq \hat{\tau}$

Note: *In the areas in* ***red with inclined stripes****, higher diversity discourages the worker to high effort (Landier et al., 2009; Van den Steen, 2010a); In* ***blue****, the manager acquires information, but the worker does not change his equilibrium effort decision as a result of increased diversity (Che and Kartik, 2009; Van den Steen, 2010a). The areas with* ***vertical lines*** *in both panels represent the result in Proposition 2: in red, higher diversity discourages information acquisition and, thus, worker's effort (left panel), whereas in green it encourages acquisition and, thus, effort from a reactive worker (right panel).*

Figure A2: Manager's equilibrium acquisition in the overt and covert game



$\Delta\mu > (1+\tau)\frac{\sqrt{(K_{\mathrm{M}}-1)}}{\alpha}$ $\qquad\qquad$ $\Delta\mu \leq \frac{\sqrt{(K_{\mathrm{M}}-1)}}{\alpha}$

***Note**: The brown lines represent the set of costs parameters in which the manager acquires information in the equilibrium of the covert game..*

Appendix B Proofs

Proof of Lemma 1. Let $\tilde{s}$ denote the signal observed by the players, whereas $a \in \{\text{NA}, \text{A}\}$ denotes the manager's acquisition decision. The worker exerts effort if and only if:

$$-\overline{p}\,\mathbb{E}_{\mathrm{W}}\left[(\theta-z)^2 \mid a,\tilde{s}\right] - (1-\overline{p})\,K_{\mathrm{W}} - c_{\mathrm{E}} \geq -\underline{p}\,\mathbb{E}_{\mathrm{W}}\left[(\theta-z)^2 \mid a,\tilde{s}\right] - (1-\underline{p})\,K_{\mathrm{W}}.$$

By re-arranging terms we obtain the following:

$$\left[K_{\mathrm{W}} - \mathbb{E}_{\mathrm{W}}\left[(\theta-z)^2 \mid a,\tilde{s}\right]\right]\Delta p \geq c_{\mathrm{E}}.$$

After some algebra we obtain

$$\begin{aligned}
\mathbb{E}_{\mathrm{W}}\left[(\theta-z)^2 \mid a,\tilde{s}\right] &= \mathbb{E}_{\mathrm{W}}\left[(\theta^2-2\theta z+z^2) \mid a,\tilde{s}\right] \\
&= \mathbb{E}_{\mathrm{W}}[\theta^2 \mid a,\tilde{s}] - 2\,z\,\mathbb{E}_{\mathrm{W}}[\theta \mid a,\tilde{s}] + z^2 \\
&= \mathbb{E}_{\mathrm{W}}[\theta^2 \mid a,\tilde{s}] - 2z\,\mathbb{E}_{\mathrm{W}}[\theta \mid a,\tilde{s}] + z^2 - \mathbb{E}_{\mathrm{W}}[\theta \mid a,\tilde{s}]^2 + \mathbb{E}_{\mathrm{W}}[\theta \mid a,\tilde{s}]^2 \\
&= \mathrm{Var}_{\mathrm{W}}[\theta \mid a,\tilde{s}] + [z - \mathbb{E}_{\mathrm{W}}[\theta \mid a,\tilde{s}]]^2 \\
&= \mathrm{Var}_{\mathrm{W}}[\theta \mid a,\tilde{s}] + \left((1-\alpha)\left(\mathbb{E}_{\mathrm{M}}[\theta \mid a,\tilde{s}] - \mathbb{E}_{\mathrm{W}}[\theta \mid a,\tilde{s}]\right)\right)^2.
\end{aligned}$$

Note that $\mathbb{E}_i[\theta \mid \text{A}, \tilde{s}] = \frac{1}{1+\tau}\mu_i + \frac{\tau}{1+\tau}\tilde{s}$, $\mathbb{E}_i[\theta \mid \text{NA}, \tilde{s}] = \mu_i$, $\text{Var}_{\text{W}}[\theta \mid \text{A}, \tilde{s}] = \frac{1}{1+\tau}$ and $\text{Var}_{\text{W}}[\theta \mid \text{NA}, \tilde{s}] = 1$. After replacing and some algebra, the results follow. □

Proof of Lemma 2. The manager acquires information if and only if the following is satisfied:

$$\begin{aligned}
&-p_{\text{A}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{A}, \tilde{s}\right] \mid \text{A}\right] - (1 - p_{\text{A}})\, K_{\text{M}} - c_{\text{S}} \\
&\qquad \geq -p_{\text{NA}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{NA}, \tilde{s}\right] \mid \text{NA}\right] - (1 - p_{\text{NA}})\, K_{\text{M}} \\
&\ \Leftrightarrow \\
&p_{\text{NA}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{NA}, \tilde{s}\right] \mid \text{NA}\right] - p_{\text{A}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{A}, \tilde{s}\right] \mid \text{A}\right] + \big(p_{\text{A}} - p_{\text{NA}}\big)K_{\text{M}} \geq c_{\text{S}}.
\end{aligned}$$

Adding and subtracting $p_{\text{NA}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{A}, \tilde{s}\right] \mid \text{A}\right]$ to the LHS and re-arranging terms we obtain:

$$\begin{aligned}
&p_{\text{NA}}\left[\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{NA}, \tilde{s}\right] \mid \text{NA}\right] - \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{A}, \tilde{s}\right] \mid \text{A}\right]\right] + \\
&+ (p_{\text{A}} - p_{\text{NA}})\,\left[K_{\text{M}} - \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{A}, \tilde{s}\right] \mid \text{A}\right]\right] \geq c_{\text{S}},
\end{aligned}$$

where

$$\begin{aligned}
\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{NA}, \tilde{s}\right] \mid \text{NA}\right] &= \mathbb{E}_{\text{M}}\left[\text{Var}_{\text{M}}[\theta \mid \text{NA}, \tilde{s}] \mid \text{NA}\right] + \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[\theta - z \mid \text{NA}, \tilde{s}\right]^2 \mid \text{NA}\right] \\
&= \text{Var}_{\text{M}}[\theta \mid \text{NA}, \tilde{s}] + (\alpha\, \Delta\mu)^2
\end{aligned}$$

and, similarly,

$$\begin{aligned}
\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{A}, \tilde{s}\right] \mid \text{A}\right] &= \mathbb{E}_{\text{M}}\Big[\text{Var}_{\text{M}}[\theta \mid \text{A}, s]\Big] + \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[\theta - z \mid \text{A}, \tilde{s}\right]^2 \mid \text{A}\right] \\
&= \text{Var}_{\text{M}}[\theta \mid \text{A}, \tilde{s}] + \left(\frac{\alpha\, \Delta\mu}{1+\tau}\right)^2.
\end{aligned}$$

Using that $\text{Var}_{\text{W}}[\theta \mid \text{A}, \tilde{s}] = \frac{1}{1+\tau}$ and $\text{Var}_{\text{W}}[\theta \mid \text{NA}, \tilde{s}] = 1$, after replacing and some algebra, the result follows. □

Proof of Proposition 1. First, note that if $c_{\text{E}} \leq \underline{c}_{\text{E}}$, the worker chooses E independently of the manager's information acquisition decision; similarly, if $c_{\text{E}} \geq \bar{c}_{\text{E}}$, the worker always chooses NE. We focus the analysis on $c_{\text{E}} \in (\underline{c}_{\text{E}}, \bar{c}_{\text{E}})$, where the worker's equilibrium decision does depend on the manager's decision—i.e., $\hat{y}(\text{A}, \tilde{s}) = \text{E}$ and $\hat{y}(\text{NA}, \tilde{s}) = \text{NE}$. We now study the manager's information acquisition decision.

Using Lemma 2, the expressions below define cost cutoffs for the manager's acquisition decision depending on the possible values of p_{A} and p_{NA} in equilibrium:

$$\underline{c}_{\text{S}} := \underline{p}\frac{\tau}{(1+\tau)}\left[1+\frac{(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)}\right],$$
$$\hat{c}_{\text{S}} := \overline{p}\frac{\tau}{(1+\tau)}\left[1+\frac{(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)}\right],$$
$$\tilde{c}_{\text{S}} := \underline{p}\frac{\tau}{(1+\tau)}\left[1+\frac{(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)}\right]+\Delta p\left[K_{\text{M}}-\frac{1}{(1+\tau)}-\left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right].$$

We analyze the manager's acquisition decision as a function of the expected reaction of the worker at the implementation stage (if any). First, when $c_{\text{E}} > \overline{c}_{\text{E}}$; the manager acquires information, $x = \text{A}$, if and only if $c_{\text{S}} < \underline{c}_{\text{S}}$. Secondly, when $c_{\text{E}} \leq \underline{c}_{\text{E}}$, she acquires information if and only $c_{\text{S}} < \hat{c}_{\text{S}}$. Finally, when $c_{\text{E}} \in (\underline{c}_{\text{E}}, \overline{c}_{\text{E}})$, she acquires information if and only if $c_{\text{S}} < \tilde{c}_{\text{S}}$.

Note that both $\underline{c}_{\text{S}} < \hat{c}_{\text{S}}$ and $\underline{c}_{\text{S}} < \tilde{c}_{\text{S}}$; however, the relationship between the two upper cutoffs $\hat{c}_{\text{S}}$ and $\tilde{c}_{\text{S}}$ depends on the parameters. Specifically, $\hat{c}_{\text{S}} \geq \tilde{c}_{\text{S}}$ if and only if $\Delta\mu \geq \frac{\sqrt{(K_{\text{M}}-1)}}{\alpha}$.

□

Proof of Proposition 2. From the definitions of the cost cut-offs for the worker in Lemma 1, and for the manager in the proof of Proposition 1, it is direct to see that $\underline{c}_{\text{E}}$ and $\overline{c}_{\text{E}}$ are strictly decreasing in $\Delta\mu$. Also, $\underline{c}_{\text{S}}$ is strictly increasing in $\Delta\mu$. Moreover, $\tilde{c}_{\text{S}}$ is increasing in $\Delta\mu$ if and only if $\frac{\overline{p}}{\underline{p}} \leq (1+\tau)^2$, which is equivalent to $\tau \geq \hat{\tau}$. Denote $\underline{\Omega}$ as the unique value of diversity $\Delta\mu'$ that satisfies $\tilde{c}_{\text{S}} = c_{\text{S}}$ and $\overline{\Omega}$ as the unique value of diversity $\Delta\mu'$ that satisfies $\overline{c}_{\text{E}} = c_{\text{E}}$. Then

$$\underline{\Omega} := \frac{\sqrt{1+\tau}}{\alpha}\frac{\sqrt{c_{\text{S}}(1+\tau)-\overline{p}(K_{\text{M}}(1+\tau)-1)+\underline{p}(K_{\text{M}}-1)(1+\tau))}}{\sqrt{\underline{p}(1+\tau)^2-\overline{p}}}$$
$$\overline{\Omega} := \frac{\sqrt{1+\tau}}{(1-\alpha)}\frac{\sqrt{-c_{\text{E}}(1+\tau)+(K_{\text{W}}(1+\tau)-1)\Delta p}}{\sqrt{\Delta p}}$$

After some algebra, we obtain that $\underline{\Omega} < \overline{\Omega}$ if and only if

$$\frac{-c_{\text{S}}(1+\tau)+\overline{p}(K_{\text{M}}(1+\tau)-1)-\underline{p}(K_{\text{M}}-1)(1+\tau)}{\left(-\frac{c_{\text{E}}(1+\tau)}{\Delta p}+K_{\text{W}}(1+\tau)-1\right)\left(\overline{p}-\underline{p}(1+\tau)^2\right)} < \left(\frac{\alpha}{1-\alpha}\right)^2 \tag{12}$$

Define

$$\hat{\alpha} := \left\{ \alpha : \frac{-c_{\text{S}}(1+\tau) + \overline{p}(K_{\text{M}}(1+\tau)-1) - \underline{p}(K_{\text{M}}-1)(1+\tau)}{\left(-\frac{c_{\text{E}}(1+\tau)}{\Delta p} + K_{\text{W}}(1+\tau) - 1\right)\left(\overline{p} - \underline{p}(1+\tau)^2\right)} = \left(\frac{\alpha}{1-\alpha}\right)^2 \right\}$$

Condition (12) is equivalent to $\alpha > \hat{\alpha}$. From Proposition 1, it is direct to see that at $\Delta\mu$, $\hat{x} = \text{NA}$ and $\hat{y}(\text{NA}, \tilde{s}) = \text{NE}$. Also, if $\underline{\Omega} < \overline{\Omega}$ and $\Delta\mu' \in (\underline{\Omega}, \overline{\Omega})$, in equilibrium we have that $\hat{x} = \text{A}$ and $\hat{y}(\text{A}, \tilde{s}) = \text{E}$.

□

Proof of Corollary 1. From the proof of Proposition 2, we have that

$$\underline{\Omega} = \frac{\sqrt{1+\tau}}{\alpha} \frac{\sqrt{c_{\text{S}}(1+\tau) - \overline{p}(K_{\text{M}}(1+\tau)-1) + \underline{p}(K_{\text{M}}-1)(1+\tau))}}{\sqrt{\underline{p}(1+\tau)^2 - \overline{p}}},$$

$$\overline{\Omega} = \frac{\sqrt{1+\tau}}{(1-\alpha)} \frac{\sqrt{-c_{\text{E}}(1+\tau) + (K_{\text{W}}(1+\tau)-1)\Delta p}}{\sqrt{\Delta p}}.$$

It is direct to check that $\underline{\Omega}$ is decreasing in α and $\overline{\Omega}$ is increasing in α, which proves the result. □

Proof of Lemma 3. Let $z(\beta) := (1-\alpha)\,\mathbb{E}_{\text{M}}\big[\theta \mid a, \tilde{s}\big] + \alpha\,\mathbb{E}_{\text{W}}\big[\theta \mid \beta, \tilde{s}\big]$ denote the project corresponding to a given belief β for the worker at the implementation stage, with $\mathbb{E}_{\text{W}}[\theta \mid \beta, \tilde{s}] = \frac{1}{1+\beta\tau}\,\mu_{\text{W}} + \frac{\beta\tau}{1+\beta\tau}\,\tilde{s}$. Also, define $p_a := \overline{p}\mathbb{1}_{\hat{y}(\tilde{s})=\text{E}} + \underline{p}\mathbb{1}_{\hat{y}(\tilde{s})=\text{NE}}$ as the induced probability of success given $\hat{y}(\tilde{s})$, and considering that $\beta = 1$ if $a = \text{A}$ and $\beta = 0$ if $a = \text{NA}$. The latter is equivalent to say that the worker's belief at the implementation stage is consistent with the manager's action.

The manager's decision to acquire information must survive two types of deviations to be an equilibrium. First, acquiring information must yield a higher expected payoff than the alternative when the worker's beliefs at the project selection and implementation stages are consistent with that decision, that is

$$-p_{\text{A}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z(1))^2 \,|\, \text{A}, \tilde{s}\right] \,|\, \text{A}\right] - (1-p_{\text{A}})\,K_{\text{M}} - c_{\text{S}} \geq$$
$$\geq -p_{\text{NA}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z(0))^2 \,|\, \text{NA}, \tilde{s}\right] \,|\, \text{NA}\right] - (1-p_{\text{NA}})\,K_{\text{M}}$$
$$\iff$$
$$p_{\text{NA}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z(0))^2 \,|\, \text{NA}, \tilde{s}\right] \,|\, \text{NA}\right] - p_{\text{A}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z(1))^2 \,|\, \text{A}, \tilde{s}\right] \,|\, \text{A}\right] + \left(p_{\text{A}} - p_{\text{NA}}\right)K_{\text{M}} \geq c_{\text{S}}.$$

Note that the definition of p_a is the same as the main model; thus the above condition becomes

$$p_{\text{NA}}\left(\frac{\tau}{1+\tau}\right)\left[1+\frac{(2+\tau)(\alpha\Delta\mu)^2}{(1+\tau)}\right]+(p_{\text{A}}-p_{\text{NA}})\left[K_{\text{M}}-\frac{1}{(1+\tau)}-\left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right]\geq c_{\text{S}},$$

which is the same as the case for overt acquisition, (5).

Secondly, the manager's decision to acquire information must be immune to deviating to not acquiring, given the worker's interim beliefs β do not change. In other words, acquiring information must yield a higher expected payoff than not acquiring when, at the project selection stage, the worker believes the manager did acquire information. At the implementation stage, however, the worker's beliefs must be consistent with the manager's acquisition decision.[27]

$$\begin{aligned}-p_{\text{A}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta-z(1))^2\,|\,\text{A},\tilde{s}\right]|\,\text{A}\right]-(1-p_{\text{A}})\,K_{\text{M}}-c_{\text{S}}\geq&\\ \geq -p_{\text{NA}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta-z(1))^2\,|\,\text{NA},\tilde{s}\right]|\,\text{NA}\right]-(1-p_{\text{NA}})\,K_{\text{M}}&\\ \iff&\\ p_{\text{NA}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta-z(1))^2\,|\,\text{NA},\tilde{s}\right]|\,\text{NA}\right]-p_{\text{A}}\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta-z(1))^2\,|\,\text{A},\tilde{s}\right]|\,\text{A}\right]+\big(p_{\text{A}}-p_{\text{NA}}\big)K_{\text{M}}\geq c_{\text{S}}.&\end{aligned}$$

The above condition becomes

$$\left[p_{\text{NA}}-\frac{p_{\text{A}}}{(1+\tau)}\right]+(p_{\text{A}}-p_{\text{NA}})\left[K_{\text{M}}-\left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right]\geq c_{\text{S}}.$$

Adding and subtracting $\left(\frac{p_{\text{NA}}}{1+\tau}\right)$ to the LHS, we obtain (7) which is easy to show to imply (5). Using Lemma 2, we can define the cost cutoffs depending on the possible values of p_{A} and p_{NA} on the equilibrium path as follows:

$$\begin{aligned}\underline{c}_{\text{S}}^{cov}&:=\underline{p}\frac{\tau}{(1+\tau)},\\ \hat{c}_{\text{S}}^{cov}&:=\overline{p}\frac{\tau}{(1+\tau)},\\ \tilde{c}_{\text{S}}^{cov}&:=\underline{p}\frac{\tau}{(1+\tau)}+\Delta p\left[K_{\text{M}}-\frac{1}{(1+\tau)}+\left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right].\end{aligned}$$

□

Proof of Proposition 3. We first analyze the worker's incentives for effort. In

[27] Note that priors and the signal's precision are common knowledge. Therefore, having observed the project selected, the worker can infer the manager's beliefs and, thus, update β to her actual decision. Such an update must not arise in equilibrium.

equilibrium, his beliefs at the implementation stage must be consistent with the manager's acquisition decision. Thus, if on the equilibrium path the manager decides $a = \text{NA}$, then $\beta = 0$ and condition (6) becomes (3); if her on-path decision is $a = \text{A}$, then $\beta = 1$ and (6) becomes (4). Therefore, conditional to the manager's action on-path, the worker's equilibrium effort decision is the same as in the baseline model. Indeed, recall that his decision may be independent of the manager's action. Hence, if $c_{\text{E}} \leq \underline{c}_{\text{E}}$ the worker always chooses E, whereas if $c_{\text{E}} \geq \bar{c}_{\text{E}}$, the worker always chooses NE. Finally, if $\underline{c}_{\text{E}} < c_{\text{E}} < \bar{c}_{\text{E}}$, the worker chooses E if and only the manager chooses A in equilibrium.

We now turn to the manager's information acquisition decision. Recall the cost cutoffs defined at the end of the proof of Lemma 3. Similar to the baseline model, we analyze the manager's incentives depending on the expected on-path reaction of the worker at the implementation stage (if any). First, suppose $c_{\text{E}} > \bar{c}_{\text{E}}$, the manager acquires information $x = \text{A}$ if and only if $c_{\text{S}} < \underline{c}_{\text{S}}^{cov}$. Secondly, suppose $c_{\text{E}} \leq \underline{c}_{\text{E}}$, then $x = \text{A}$ if and only $c_{\text{S}} < \hat{c}_{\text{S}}^{cov}$. Finally, suppose $c_{\text{E}} \in (\underline{c}_{\text{E}}, \bar{c}_{\text{E}})$, then $x = \text{A}$ if and only if $c_{\text{S}} < \tilde{c}_{\text{S}}^{cov}$. Note that $\underline{c}_{\text{S}}^{cov} < \hat{c}_{\text{S}}^{cov}$ and $\underline{c}_{\text{S}}^{cov} < \tilde{c}_{\text{S}}^{cov}$, but the relation between $\hat{c}_{\text{S}}^{cov}$ and $\tilde{c}_{\text{S}}^{cov}$ depend on the parameters. Specifically, $\hat{c}_{\text{S}}^{cov} \geq \tilde{c}_{\text{S}}^{cov}$ if and only if $\Delta\mu \geq (1+\tau)\frac{\sqrt{(K_{\text{M}}-1)}}{\alpha}$.

Thus, suppose $c_{\text{S}} \in (\underline{c}_{\text{S}}^{cov}, \tilde{c}_{\text{S}}^{cov})$ and $c_{\text{E}} \in (\underline{c}_{\text{E}}, \bar{c}_{\text{E}})$. If $\hat{x} = \text{A}$, then in equilibrium $\hat{y}(\tilde{s}) = \text{E}$ since $c_{\text{E}} \in (\underline{c}_{\text{E}}, \bar{c}_{\text{E}})$. Now, suppose that $\hat{y}(\tilde{s}) = \text{E}$. Since $c_{\text{S}} < \tilde{c}_{\text{S}}^{cov}$, $\hat{x} = \text{A}$. Also, if $\hat{y}(\tilde{s}) = \text{NE}$, and since $c_{\text{S}} > \underline{c}_{\text{S}}^{cov}$, $\hat{x} = \text{NA}$. □

Proof of Proposition 4. The proof is direct from the fact that for the worker $\frac{\partial \underline{c}_{\text{E}}}{\partial \Delta\mu} < 0$, $\frac{\partial \bar{c}_{\text{E}}}{\partial \Delta\mu} < 0$, and for the manager $\frac{\partial \underline{c}_{\text{S}}^{cov}}{\partial \Delta\mu} = \frac{\partial \hat{c}_{\text{S}}^{cov}}{\partial \Delta\mu} = 0$, $\frac{\partial \tilde{c}_{\text{S}}^{cov}}{\partial \Delta\mu} < 0$. □

Proof of Lemma 5. Statement i) follows directly from Lemma 1. For statement ii), if the manager acquires information and sends message P_k, the worker exerts effort if and only if:

$$\left[K_{\text{W}} - \mathbb{E}_{\text{W}}\left[(\theta - z)^2 \mid P_k\right]\right]\Delta p \geq c_{\text{E}}.$$

Similar than in the proof of Lemma 1, we have that

$$\mathbb{E}_{\text{W}}\left[(\theta - z)^2 \mid P_k\right] = \text{Var}_{\text{W}}[\theta \mid P_k] + \left((1-\alpha)\left(\mathbb{E}_{\text{M}}[\theta \mid P_k] - \mathbb{E}_{\text{W}}[\theta \mid P_k]\right)\right)^2,$$

which implies condition

$$\left[K_{\mathrm{W}} - \mathrm{Var}_{\mathrm{W}}\left[\theta \mid P_k\right] - (1-\alpha)^2 \left(\mathbb{E}_{\mathrm{M}}\left[\theta \mid P_k\right] - \mathbb{E}_{\mathrm{W}}\left[\theta \mid P_k\right]\right)^2\right] \Delta p \geq c_{\mathrm{E}}.$$

For the convergence arguments, we derive the expressions of useful statistics.

$$\begin{aligned}
\mathbb{E}_i\big[\theta \mid P_k\big] &= \frac{1}{(1+\tau)}\mu_i + \frac{\tau}{(1+\tau)}\mathbb{E}_i\big[s \mid P_k\big] \\
\mathrm{Var}_i\big[\theta \mid P_k\big] &= \mathbb{E}_i\big[\mathrm{Var}_i[\theta \mid s] \mid P_k\big] + \mathrm{Var}_i\big[\mathbb{E}_i[\theta \mid s] \mid P_k\big] \\
&= \frac{1}{(1+\tau)} + \mathrm{Var}_i\left[\frac{1}{(1+\tau)}\mu_i + \frac{\tau}{(1+\tau)} s \mid P_k\right] \\
&= \frac{1}{(1+\tau)} + \left(\frac{\tau}{1+\tau}\right)^2 \mathrm{Var}_i[s \mid P_k].
\end{aligned}$$

We can also obtain expressions for $\mathbb{E}_i\big[s \mid P_k\big]$ and $\mathrm{Var}_i[s \mid P_k]$. From an uninformed party's perspective, when the manager acquires information, the signal is distributed $s \sim \mathcal{N}\left(\mu_i, \frac{(1+\tau)}{\tau}\right)$. Let $s_k := \sup P_k$ and $\sigma_s := \sqrt{\frac{(1+\tau)}{\tau}}$. Then:

$$\mathbb{E}_i\big[s \mid P_k\big] = \mu_i - \sigma_s \frac{\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right) - \phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right)}{\Phi\left(\frac{s_k-\mu_i}{\sigma_s}\right) - \Phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right)}; \tag{13}$$

$$\mathrm{Var}_i[s \mid P_k] = \sigma_s^2 \left(1 + \frac{\frac{s_k-\mu_i}{\sigma_s}\,\phi\big(\frac{s_k-\mu_i}{\sigma_s}\big) - \frac{s_{k-1}-\mu_i}{\sigma_s}\,\phi\big(\frac{s_{k-1}-\mu_i}{\sigma_s}\big)}{\Phi\big(\frac{s_k-\mu_i}{\sigma_s}\big) - \Phi\big(\frac{s_{k-1}-\mu_i}{\sigma_s}\big)} - \left(\frac{\phi\big(\frac{s_k-\mu_i}{\sigma_s}\big) - \phi\big(\frac{s_{k-1}-\mu_i}{\sigma_s}\big)}{\Phi\big(\frac{s_k-\mu_i}{\sigma_s}\big) - \Phi\big(\frac{s_{k-1}-\mu_i}{\sigma_s}\big)}\right)^2\right)$$

where $\phi(\cdot)$ and $\Phi(\cdot)$ are the PDF and CDF of the standard normal distribution. We now derives some useful properties.

Lemma B1. *Consider an interval P_k and the boundaries s_{k-1}, s_k. Suppose $\tilde{s} \in P_k$. Then,*

$$\lim_{s_{k-1}\to-\infty,\, s_k\to\infty} \mathbb{E}_i\big[s \mid P_k\big] = \mu_i \qquad \textit{and,} \qquad \lim_{s_{k-1}\nearrow\tilde{s},\, s_k\searrow\tilde{s}} \mathbb{E}_i\big[s \mid P_k\big] = \tilde{s}.$$

Proof. When $s_{k-1} \to -\infty$ and $s_k \to \infty$, $\Phi\left(\frac{s_k-\mu_i}{\sigma_s}\right) - \Phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right) \to 1$. Also, since $\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)$ and $\phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right)$ approach to 0 at the extreme values, it implies that $\phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right) - \phi\left(\frac{s_k-\mu_i}{\sigma_s}\right) \to 0$. Thus

$$\lim_{s_{k-1}\to-\infty,\, s_k\to\infty} \mathbb{E}_i\big[s \mid P_k\big] = \mu_i.$$

When $s_{k-1} \to \tilde{s}$ and $s_k \to \tilde{s}$, the CDFs $\Phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right)$ and $\Phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)$ approach $\Phi\left(\frac{\tilde{s}-\mu_i}{\sigma_s}\right)$, which means that $\Phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)-\Phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right) \to 0$. This is intuitive because the probability that s lies in that infinitesimally small interval becomes zero, as the interval collapses to a single point. Secondly, both PDFs $\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)$ and $\phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right)$ approach $\phi\left(\frac{\tilde{s}-\mu_i}{\sigma_s}\right)$, which implies that the difference $\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)-\phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right) \to 0$. Given that numerator and denominator converge to 0, we use L'Hôpital's Rule to differentiate both terms with respect to s_k (or s_{k-1}):

1. The derivative of $\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)$ with respect to s_k is:

$$\frac{d}{ds_k}\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right) = \frac{d}{dz}\phi(z)\cdot\frac{d}{ds_k}\left(\frac{b-\mu_i}{\sigma_s}\right) = -z\phi(z)\cdot\frac{1}{\sigma_s} = -\frac{s_k-\mu_i}{\sigma_s^2}\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)$$

2. The derivative of $\Phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)$ with respect to s_k is:

$$\frac{d}{ds_k}\Phi\left(\frac{s_k-\mu_i}{\sigma_s}\right) = \frac{1}{\sigma_s}\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)$$

Thus, applying L'Hôpital's Rule yields:

$$\lim_{s_{k-1}\nearrow\tilde{s}, s_k\searrow\tilde{s}} \frac{\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)-\phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right)}{\Phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)-\Phi\left(\frac{s_{k-1}-\mu_i}{\sigma_s}\right)} = \lim_{s_k\searrow\tilde{s}} \frac{-\frac{s_k-\mu_i}{\sigma_s^2}\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)}{\frac{1}{\sigma_s}\phi\left(\frac{s_k-\mu_i}{\sigma_s}\right)} = -\frac{\tilde{s}-\mu_i}{\sigma_s}.$$

Substituting the previous result into the expression (13), we obtain:

$$\lim_{s_{k-1}\nearrow\tilde{s},\, s_k\searrow\tilde{s}} \mathbb{E}_i\left[s \mid P_k\right] = \tilde{s}.$$

□

An analogous proof shows the convergence values for the variance of the signal:

$$\lim_{s_{k-1}\nearrow\tilde{s},\, s_k\searrow\tilde{s}} \mathrm{Var}_i[s \mid P_k] = 0 \quad \text{and} \quad \lim_{s_{k-1}\to-\infty,\, s_k\to+\infty} \mathrm{Var}_i[s \mid P_k] = \frac{(1+\tau)}{\tau},$$

which results in the following:

$$\lim_{s_{k-1}\nearrow\tilde{s},\, s_k\searrow\tilde{s}} \mathrm{Var}_i\left[\theta \mid P_k\right] = \frac{1}{(1+\tau)} \quad \text{and} \quad \lim_{s_{k-1}\to-\infty,\, s_k\to\infty} \mathrm{Var}_i\left[\theta \mid P_k\right] = 1.$$

Using these limits and after some algebra, the results of the convergences of the LHS follow. □

Proof of Lemma 6. We follow Moscarini (2007) closely to prove that any incentive-compatible communication strategy is a finite partition of K intervals of the real line. First, we define some auxiliary functions representing the expected value of the signal conditional on lying on either the leftmost interval or the rightmost interval, given the boundary signal $\tilde{s} \in \mathbb{R}$:

$$g_i(\tilde{s}) := \mathbb{E}_i\big[s \mid s < \tilde{s}\big] = \mu_i - \sigma_s \frac{\phi(\frac{\tilde{s}-\mu_i}{\sigma_s})}{\Phi(\frac{\tilde{s}-\mu_i}{\sigma_s})},$$

$$h_i(\tilde{s}) := \mathbb{E}_i\big[s \mid s > \tilde{s}\big] = \mu_i + \sigma_s \frac{\phi(\frac{\tilde{s}-\mu_i}{\sigma_s})}{1-\Phi(\frac{\tilde{s}-\mu_i}{\sigma_s})}.$$

The function $g_i(\cdot)$ represents the expected value of the leftmost interval, which will be necessary to characterize the initial condition in the communication equilibrium. Similarly, the function $h_i(\cdot)$ represents the expected value of the rightmost interval, which will be necessary to characterize the final condition in the communication equilibrium. We now characterize some properties.

Lemma B2 (Lemma 3 in Moscarini (2007))**.** *For all $\tilde{s} \in \mathbb{R}$*

i) $(\tilde{s} - g_i(\tilde{s}))$ *is increasing in* $\tilde{s}$*, with* $\lim_{\tilde{s}\to-\infty}[\tilde{s} - g_i(\tilde{s})] = 0$ *and* $\lim_{\tilde{s}\to+\infty}[\tilde{s} - g_i(\tilde{s})] = \infty$*;*

ii) $(h_i(\tilde{s}) - \tilde{s})$ *is decreasing in* $\tilde{s}$*, with* $\lim_{\tilde{s}\to-\infty}[h_i(\tilde{s}) - \tilde{s}] = \infty$ *and* $\lim_{\tilde{s}\to+\infty}[h_i(\tilde{s}) - \tilde{s}] = 0$*.*

The proof is direct from Lemma 3 in Moscarini (2007). We can now characterize equilibrium communication.

Lemma B3 (Lemma 4 in Moscarini (2007))**.** *Any incentive-compatible communication strategy is a finite partition of the real line into K intervals* $\mathcal{P}^K := \big\{P_1, P_2, P_3, ..., P_K\big\} = \big\{(-\infty, s_1), [s_1, s_2), [s_2, s_3), ..., [s_{K-1}, +\infty)\big\}$*, where* $\{s_k\}_{k=1}^{K-1}$ *is a strictly increasing and finite sequence satisfying (9).*

Proof. We first obtain a lower bound on the difference between the right boundary of an interval s_k and the expected value conditional on the interval $\hat{s}_{k-1}$. Using that $\hat{s}_k > s_k$ and the indifference condition (9), we obtain the following

$$\hat{s}_k > s_k = \frac{2\,\frac{\alpha\,\Delta\mu}{\tau} + \hat{s}_k + \hat{s}_{k-1}}{2}$$
$$\Leftrightarrow \hat{s}_k - \hat{s}_{k-1} > 2\frac{\alpha\,\Delta\mu}{\tau}$$

Further, using (9) again for $\hat{s}_{k-1}$ we obtain

$$\begin{aligned} 2s_k - \hat{s}_{k-1} - 2\frac{\alpha\,\Delta\mu}{\tau} &= \hat{s}_k \\ \Leftrightarrow 2(s_k - \hat{s}_{k-1}) - 2\frac{\alpha\,\Delta\mu}{\tau} &= \hat{s}_k - \hat{s}_{k-1} > 2\frac{\alpha\,\Delta\mu}{\tau} \\ \Leftrightarrow 2(s_k - \hat{s}_{k-1}) &> 4\frac{\alpha\,\Delta\mu}{\tau} \\ \Leftrightarrow s_k - \hat{s}_{k-1} &> 2\frac{\alpha\,\Delta\mu}{\tau} \end{aligned}$$

The last expression characterizes a lower bound for the sequence $\{s_k\}_{k=1}^{\infty}$— the value $\underline{s}$ that satisfies $\underline{s} - g_{\mathrm{W}}(\underline{s}) = 2\frac{\alpha\Delta\mu}{\tau}$. Lemma B2.$i$) guarantees existence.

Now, rearranging condition (9), we also obtain

$$\begin{aligned} \hat{s}_k &= 2s_k - \hat{s}_{k-1} - 2\frac{\alpha\,\Delta\mu}{\tau} \\ \Leftrightarrow \hat{s}_k - s_k &= (s_k - \hat{s}_{k-1}) - 2\frac{\alpha\,\Delta\mu}{\tau} > 0. \end{aligned}$$

Similarly, an upper bound for the sequence $\{s_k\}_{k=1}^{\infty}$ is the value $\overline{s}$ that satisfies $\overline{s} = h_{\mathrm{W}}(\overline{s})$. Existence is guaranteed by statement ii) in Lemma B2. □

Since the length of any interval is bounded below $s_k - s_{k-1} = s_k - \hat{s}_{k-1} + \hat{s}_{k-1} - s_{k-1} > s_k - \hat{s}_{k-1} + \hat{s}_{k-1} - s_{k-1} > 2\frac{\alpha\Delta\mu}{\tau}$, and the sequence $\{s_k\}_{k=1}^{\infty}$ is bounded, any incentive-compatible communication strategy involves finite partitions of the state space, characterized by (9), using the properties of Lemma B2 to define the first and last intervals.

We use the equilibrium characterization from Moscarini (2007). To do that, we first collapse the parameter space that characterizes incentive-compatible communication strategy. For that, we change the space of the manager's messages and instead of announcing directly the message the manager observes s, we assume suppose the manager announces a message about the magnitude

$$\sqrt{\frac{\tau}{1+\tau}}\,(s - \mu_{\mathrm{W}}) \sim \mathcal{N}(0, 1).$$

Under this change, the 'composite' normalized conflict of interest between manager and worker is

$$\tilde{b} := \sqrt{\frac{\tau}{1+\tau}}\,b = \frac{\alpha\,\Delta\mu}{\sqrt{\tau(1+\tau)}}$$

Lemma 6 follows from the direct application of Propositions 3 and 4 in Moscarini (2007). □

Lemma B4. *Suppose that (3) does not hold, and there exists a $\hat{\tau} > 0$ such that (4) holds strictly. Then, there are two thresholds $0 < \underline{\tau} < \overline{\tau}$, such that:*

- *If $\tau < \underline{\tau}$, in any incentive-compatible communication strategy, for any message P_k, the worker chooses no effort $\hat{y}(\text{A}, P_k) = \text{NE}$,*

- *If $\tau > \overline{\tau}$, in any incentive-compatible communication strategy, for any message P_k, the worker chooses effort $\hat{y}(\text{A}, P_k) = \text{E}$.*

Proof. Condition (3) does not hold and that there exists a $\hat{\tau}$ such that (4) holds with strictly is equivalent to, respectively

$$\left[K_{\text{W}} - 1 - \left((1-\alpha)\,\Delta\mu\right)^2\right]\Delta p < c_{\text{E}};$$
$$\left[K_{\text{W}} - \frac{1}{(1+\hat{\tau})} - \left(\frac{(1-\alpha)\,\Delta\mu}{1+\hat{\tau}}\right)^2\right]\Delta p > c_{\text{E}}.$$

First, note that condition (9) implies that for a sufficiently high value of b (sufficiently low value of τ), the most informative incentive compatible communication strategy features a two intervals partition (Moscarini, 2007), characterized by one cut-off value. Still, when $\lim_{\tau\to 0} b = \infty$, by Lemma 6, the cut-off value $\hat{s}$, characterized by $2\hat{s} - h_{\text{W}}(\hat{s}) - g_{\text{W}}(\hat{s}) = b$, tends to infinity, so the communication strategy converges to the uninformative one. In that case, the worker does not exert effort for any message since our first assumption. By continuity, there exist a $\underline{\tau} > 0$ such that for all $\tau < \underline{\tau}$ the worker still does not exert effort.

Similarly, note that $\lim_{\tau\to\infty} b = 0$ and (9) implies that the most informative incentive compatible communication strategy is fully revealing. Our second assumption implies that for sufficiently low value of b (sufficiently high value of τ), the worker exert effort for any message. By continuity, there exist a $\overline{\tau} > \underline{\tau}$ such that for all $\tau > \overline{\tau}$ the worker still exerts effort upon acquisition by the manager.

□

Proof of Proposition 5. From Lemma B4, if $\tau \leq \underline{\tau}$ or $\tau \geq \overline{\tau}$, implies that worker's effort decision is independent of the particular message announced, P_k, within a partition $\{P_k\}_{k\in\mathbb{N}}$. In this case, the manager acquires information if and only if the following is satisfied:

$$p_{\text{NA}}\left[\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \text{NA}, \tilde{s}\right] \mid \text{NA}\right] - \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \tilde{s}, P_k\right] \mid \text{A}\right]\right] +$$
$$+ (p_{\text{A}} - p_{\text{NA}})\left[K_{\text{M}} - \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta - z)^2 \mid \tilde{s}, P_k\right] \mid \text{A}\right]\right] \geq c_{\text{S}}, \tag{14}$$

where

$$\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta-z)^2 \mid \text{NA}, \tilde{s}\right] \mid \text{NA}\right] = \mathbb{E}_{\text{M}}\left[\text{Var}_{\text{M}}[\theta \mid \text{NA}, \tilde{s}] \mid \text{NA}\right] + \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[\theta - z \mid \text{NA}, \tilde{s}\right]^2 \mid \text{NA}\right]$$

and, similarly,

$$\mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[(\theta-z)^2 \mid \tilde{s}, P_k\right] \mid \text{A}\right] = \mathbb{E}_{\text{M}}\left[\text{Var}_{\text{M}}[\theta \mid \tilde{s}, P_k]\right] + \mathbb{E}_{\text{M}}\left[\mathbb{E}_{\text{M}}\left[\theta - z \mid \tilde{s}, P_k\right]^2 \mid \text{A}\right]$$

The previous expression can be rewritten as follows:

$$\begin{aligned}
&\mathbb{E}_{\text{M}}\Big[\mathbb{E}_{\text{M}}\big[(\theta-z)^2 \mid \tilde{s}, P_k\big] \mid \text{A}\Big] \\
&= \frac{1}{(1+\tau)} + \left(\frac{\alpha}{1+\tau}\right)^2 \mathbb{E}_{\text{M}}\left[\Delta\mu + \tau\Big[\mathbb{E}_{\text{M}}[s \mid P_k] - \mathbb{E}_{\text{W}}[s \mid P_k]\Big] + \frac{\tau}{\alpha}\Big[\tilde{s} - \mathbb{E}_{\text{M}}[s \mid P_k]\Big] \mid \text{A}\right]^2
\end{aligned}$$

We first consider the manager's ***alignment incentives*** represented by the first term in the LHS of condition (14). We can rewrite this term as follows

$$\begin{aligned}
p_{\text{NA}}\Bigg[\frac{\tau}{(1+\tau)} + \frac{\alpha^2}{(1+\tau)^2}\Bigg[&\big[(1+\tau)\Delta\mu\big]^2 - (\Delta\mu)^2 - 2\,\Delta\mu\mathbb{E}_{\text{M}}\Big[\tau\left[\mathbb{E}_{\text{M}}[s \mid P_k] - \mathbb{E}_{\text{W}}[s \mid P_k]\right] \\
&+ \frac{\tau}{\alpha}\left[\tilde{s} - \mathbb{E}_{\text{M}}[s \mid P_k]\right] \mid \text{A}\Big] - \mathbb{E}_{\text{M}}\Big[\tau\left[\mathbb{E}_{\text{M}}[s \mid P_k] - \mathbb{E}_{\text{W}}[s \mid P_k]\right] + \frac{\tau}{\alpha}\left[\tilde{s} - \mathbb{E}_{\text{M}}[s \mid P_k]\right] \mid \text{A}\Big]^2\Bigg]\Bigg]
\end{aligned}$$

Define

$$\begin{aligned}
\Psi(\Delta\mu, \alpha, \tau) &:= \Big[\tau[\mathbb{E}_{\text{M}}[s \mid P_k] - \mathbb{E}_{\text{W}}[s \mid P_k]] + \frac{\tau}{\alpha}[\tilde{s} - \mathbb{E}_{\text{M}}[s \mid P_k]]\Big] \\
&= \frac{\tau}{\alpha}\Big[\tilde{s} - (1-\alpha)\mathbb{E}_{\text{M}}[s \mid P_k] - \alpha\mathbb{E}_{\text{W}}[s \mid P_k]\Big]
\end{aligned}$$

Note that $\mathbb{E}_{\text{M}}\big[\Psi(\cdot)^2 \mid \text{A}\big] > 0$. Also, since $\mathbb{E}_{\text{M}}[s \mid P_k] = \mathbb{E}_{\text{W}}[s \mid P_k] + \Delta\mu$ and $\mathbb{E}_{\text{M}}[\mathbb{E}_{\text{M}}[s \mid P_k]] = \mu_{\text{M}}$, $\mathbb{E}_{\text{M}}[\mathbb{E}_{\text{W}}[s \mid P_k]] = \mu_{\text{W}}$. Thus:

$$\begin{aligned}
\mathbb{E}_{\text{M}}\big[\Psi(\cdot) \mid \text{A}\big] &= \frac{\tau}{\alpha}\Big[\mu_{\text{M}} - (1-\alpha)\mathbb{E}_{\text{M}}\big[\mathbb{E}_{\text{M}}[s \mid P_k]\big] - \alpha\mathbb{E}_{\text{M}}\big[\mathbb{E}_{\text{W}}[s \mid P_k]\big]\Big] \\
&= \frac{\tau}{\alpha}\Big[\mu_{\text{M}} - (1-\alpha)\mu_{\text{M}} - \alpha\mu_{\text{W}}\Big] \\
&= \tau\Delta\mu.
\end{aligned}$$

Thus, the expression for the alignment incentives becomes:

$$p_{\text{NA}}\left[\frac{\tau}{(1+\tau)}\left[1 + \frac{(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)}\right] - \left(\frac{\alpha}{1+\tau}\right)^2\Big[2\,\tau\,\Delta\mu^2 \,+\, \mathbb{E}_{\text{M}}[\Psi(\cdot)^2 \mid \text{A}]\Big]\right].$$

Secondly, we derive the manager's ***motivational incentives*** for information acquisition represented by the second term in the LHS of condition (14). From the previous calculations, we have that

$$
\begin{aligned}
&(p_{\text{A}} - p_{\text{NA}}) \Big[K_{\text{M}} - \mathbb{E}_{\text{M}}\big[\text{Var}_{\text{M}}(\theta \mid s)\big] - \mathbb{E}_{\text{M}}\big[\big(\mathbb{E}_{\text{M}}(\theta \mid s) - z_k\big)^2 \mid \text{A}\big]\Big] \\
&= (p_{\text{A}} - p_{\text{NA}})\left[K_{\text{M}} - \frac{1}{(1+\tau)} - \left(\frac{\alpha}{1+\tau}\right)^2 \mathbb{E}_{\text{M}}\left[\left[\Delta\mu + \Psi(\cdot)\right]^2 \mid \text{A}\right]\right] \\
&= (p_{\text{A}} - p_{\text{NA}})\left[K_{\text{M}} - \frac{1}{(1+\tau)} - \left(\frac{\alpha\Delta\mu}{1+\tau}\right)^2 - \left(\frac{\alpha}{1+\tau}\right)^2 \left[2\,\tau\,\Delta\mu^2 + \mathbb{E}_{\text{M}}[\Psi(\cdot)^2 \mid \text{A}]\right]\right]
\end{aligned}
$$

Thus, the LHS of (14) is strictly smaller than the LHS of (5).

We now prove the convergence results. Recall that $\mathbb{E}_i[s \mid P_k] = \mu_i - \sigma_s\, f_i(P_k)$, where

$$
f_i(P_k) := \frac{\phi\left(\frac{s_k - \mu_i}{\sigma_s}\right) - \phi\left(\frac{s_{k-1} - \mu_i}{\sigma_s}\right)}{\Phi\left(\frac{s_k - \mu_i}{\sigma_s}\right) - \Phi\left(\frac{s_{k-1} - \mu_i}{\sigma_s}\right)}.
$$

So, we can express $\Psi(\cdot) = \frac{\tau}{\alpha}\Big[(\tilde{s} - \mu_{\text{M}}) + \alpha\Delta\mu + \sigma_s[(1-\alpha) f_{\text{M}}(P_k) + \alpha f_{\text{W}}(P_k)]\Big]$. When $b \to 0$, by Lemma 6, the communication equilibrium with the finite partition converges to fully revealing. Thus, for every signal $\tilde{s}$ and interval P_k that includes $\tilde{s}$:

$$
\lim_{P_k \to \tilde{s}} \mathbb{E}_i\big[f_i(P_k) \mid \text{A}\big] = -\frac{\tilde{s} - \mu_i}{\sigma_s}, \qquad \text{and} \qquad \lim_{P_k \to \tilde{s}} \mathbb{E}_i\big[s \mid P_k\big] = \tilde{s}.
$$

Thus, $\lim\limits_{P_k \to \tilde{s}} \Psi(\cdot) = \lim\limits_{P_k \to \tilde{s}} \Psi(\cdot)^2 = 0$, Therefore, the alignment and motivational incentives converge to the LHS from condition (5):

$$
p_{\text{NA}}\left(\frac{\tau}{1+\tau}\right)\left[1 + \frac{(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)}\right] + (p_{\text{A}} - p_{\text{NA}})\left[K_{\text{M}} - \frac{1}{(1+\tau)} - \left(\frac{\alpha\,\Delta\mu}{1+\tau}\right)^2\right]
$$

When $b \to \infty$, by Lemma 6, the communication equilibrium with the finite partition converges to an uninformative equilibrium. To see this, by Lemma 6 note that for a fixed b the most uninformative equilibrium has two messages. This equilibrium is characterized by $2\hat{s} - h_{\text{W}}(\hat{s}) - g_{\text{W}}(\hat{s}) = b$. From Lemma (B2), there is always a unique $\hat{s}$ satisfying the condition. Moreover, as $b \to \infty$, $\hat{s} \to \infty$, so the communication equilibrium converges to an uninformative equilibrium. Thus:

$$
\lim_{P_k \to \mathbb{R}} \mathbb{E}_i\big[f_i(P_k) \mid \text{A}\big] = 0, \qquad \text{and} \qquad \lim_{P_k \to \mathbb{R}} \mathbb{E}_i\big[s \mid P_k\big] = \mu_i.
$$

Hence, the alignment incentives converge to

$$
\begin{aligned}
&p_{\text{NA}}\left[\frac{\tau}{(1+\tau)}+\frac{\tau(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)^2}-\frac{\alpha^2}{(1+\tau)^2}\left[2\,\tau\,\Delta\mu^2+\frac{\tau^2}{\alpha^2}\sigma_s^2+(\tau\,\Delta\mu)^2\right]\right]\\
&=p_{\text{NA}}\left[\frac{\tau}{(1+\tau)}+\frac{\tau(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)^2}-\frac{\tau}{(1+\tau)^2}\left[2\,(\alpha\Delta\mu)^2+\tau\frac{(1+\tau)}{\tau}+\tau\,(\alpha\Delta\mu)^2\right]\right]\\
&=p_{\text{NA}}\left[\frac{\tau}{(1+\tau)}+\frac{\tau(2+\tau)(\alpha\,\Delta\mu)^2}{(1+\tau)^2}-\frac{\tau}{(1+\tau)^2}\left[(2+\tau)(\alpha\Delta\mu)^2+(1+\tau)\right]\right]=0
\end{aligned}
$$

About the motivational incentive, from Lemma 5 we have that $p_{\text{A}}-p_{\text{NA}}=0$, so the motivational incentives also converge to zero. □

Proof of Proposition 6. Denote LHS(11) and LHS(5) as the LHS in the manager's information acquisition condition in (11) and (5) respectively. We have that

$$
\begin{aligned}
\frac{\partial\,\text{LHS}(5)}{\partial\Delta\mu}-\frac{\partial\,\text{LHS}(11)}{\partial\Delta\mu}&=-2p_{\text{A}}\left(\frac{\alpha}{1+\tau}\right)^2\left[\mathbb{E}_{\text{M}}\big[\Psi(\cdot)\big]+\frac{\partial\mathbb{E}_{\text{M}}[\Psi(\cdot)]}{\partial\Delta\mu}\left[\Delta\mu+\mathbb{E}_{\text{M}}[\Psi(\cdot)]\right]\right]\\
&=-2p_{\text{A}}\left(\frac{\alpha}{1+\tau}\right)^2\left[\tau\Delta\mu+\tau\left[\Delta\mu+\tau\Delta\mu\right]\right]\\
&=-2p_{\text{A}}\left(\frac{\alpha}{1+\tau}\right)^2\tau\Delta\mu(2+\tau)
\end{aligned}
$$

Define $\mathcal{H}:=2p_{\text{A}}\left(\frac{\alpha}{1+\tau}\right)^2>0$. The direct effect is given by

$$
-\mathcal{H}\,\mathbb{E}_{\text{M}}\big[\Psi(\cdot)\big]=-\mathcal{H}\,\tau\,\Delta\mu<0,
$$

while the indirect effect is

$$
-\mathcal{H}\,\frac{\partial\mathbb{E}_{\text{M}}[\Psi(\cdot)]}{\partial\Delta\mu}\left[\Delta\mu+\mathbb{E}_{\text{M}}[\Psi(\cdot)]\right]=-\mathcal{H}\,\tau\Delta\mu(1+\tau)<0
$$

□

Proof of Corollary 2. In Proposition 5 we show that the LHS of (11) converges to the LHS of (5) for $b\to 0$, which is equivalent to $\tau\to\infty$ for a fixed $\Delta\mu$. This is equivalent to say that the expected credibility loss

$$-p_{\text{A}} \left(\frac{\alpha}{1+\tau}\right)^2 \left[2\tau\Delta\mu^2 + \mathbb{E}_{\text{M}}[\Psi(\cdot)^2]\right]$$

converges to zero when $\tau \to \infty$ for a fixed diversity. After an increase in diversity from $\Delta\mu$ to $\Delta\mu'$, the expected credibility loss increases by Proposition 6 for a fixed τ. Using the convergence result, for a sufficiently high value of τ, the expected credibility loss at $\Delta\mu'$ is strictly lower than the expected credibility loss at $\Delta\mu$ and the original value of τ. □