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REPUTATION CONCERNS AND AUTHORITY IN ORGANIZATIONS*

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Abstract

The paper studies the optimal allocation of authority in an organization where an agent, who has reputation concerns, strategically transmits his information to the principal. The optimal allocation of authority allows its holder to use more and better information in order to make efficient decisions. The paper identifies the mechanism through which the agent's reputation concerns affect his information transmission. It shows that under centralization the agent transmits his information truthfully to the principal only if his reputation concerns are low and therefore that the delegation of authority to the agent can be optimal if the agent's reputation concerns are high.

Keywords: authority, delegation, centralization, reputation concerns, information transmission
JEL Classification Codes: D23, D82, D86

I. *Introduction*

In an organization consisting of several layers of members with diverse interests, a member or a group of members has the rights to decide actions that affect the part or the whole of the organization. Simon (1951) defines these decision-making rights in organizations as *authority*. While authority can arise from the ownership of assets (Grossman and Hart, 1986), it must be distinguished from ownership as it can be delegated from the owner to the members of the organization (Bolton and Dewatripont, 2013). For instance, shareholders delegate their decision rights to the board of directors, who then delegate management decisions to a CEO, and so forth. Besides the allocation of ownership, the allocation of authority is an important issue in organizational economics, and an essential question is when superiors delegate authority to their subordinates.

In this paper, we study this question in an organization that potentially faces new changes. The organization consists of a principal and an agent. There is a new project whose outcome is uncertain. As it is new, the agent's ability for this project is unknown, and he acquires unverifiable information about its quality. Alternatively, there is a status-quo project whose

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outcome is certain and known. Between these two projects, a party with authority chooses one of them for the organization. If the agent has authority (i.e., delegation), he makes this decision based on his information about the new project without consulting with the principal. If the principal has authority (i.e., centralization), she first asks the agent to report his information. Given that the agent may not report truthfully, the principal herself acquires information about the new project. The principal then makes her decision based on the agent's report and her own information.

Agents may care about their reputation in the labor market. In the context of the delegation of authority, relevant agents may be high-ranked officers such as CEOs, government officials, and others. As Fama (1980) and Dewatripont et al. (1999) suggest, and Gibbons and Murphy (1992) confirm empirically, their motivation are largely affected by their reputation in the labor market. The agent's reputation concerns would create incongruence between the principal and the agent (Holmstrom, 1982). We model the agent's reputation as the labor market's perception of his ability that determines the outcome of a new project.

Who should have authority among agents with different degrees of reputation concerns? Given that the agent's reputation concerns are the only source of incongruence, the ally principle that delegation is optimal for a less biased agent may suggest that it can be delegated to an agent whose reputation concerns are low. However, we find the opposite.

The optimal allocation of authority allows its holder to make an efficient choice of projects, which requires more and better information. Centralization is optimal for an agent whose reputation concerns are low because he transmits his information truthfully to the principal who then uses both the agent's information and her own information. In contrast, delegation can be optimal for an agent whose reputation concerns are high because under centralization this agent does not transmit his information truthfully to the principal who then uses only her own information, which may not be better than the agent's information. Even if the agent's preference is incongruent to the principal's, he uses all his information to make an efficient choice of projects under delegation. Thus, the agent's bias from reputation concerns matters for information transmission, whereas it does not matter for project selection, which in turn allows delegation to be optimal.

To understand the mechanism through which the agent's reputation concerns affect his information transmission, consider for instance an agent who has information that the new project has a bad prospect (call this agent as the low type). Given that the outcome of the new project is determined by the agent's ability, the low type ends up damaging his reputation if he transmits his information truthfully because then the principal makes more informed decisions through which the market can assess his ability more precisely. The low type can avoid this reputation damage by misreporting because it then allows him to be pooled with the high type in the reputation formation by the market. Of course misreporting lowers the expected value of selected projects because it makes the principal use less information in her decision-making. If the agent's reputation concerns are high, the reputation gain for him can outweigh the value loss from misreporting. Thus the agent transmits his information truthfully only if his reputation concerns are low.[1]

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[1] In a generic sender-receive setting, Ottaviani and Sorensen (2006) also show that the sender's reputation concerns make truth-telling incompatible with equilibrium. However, their setting is different than ours in that the sender's reputation is formed by the inside receiver, not by the outside market. Furthermore, they do not study the allocation of

In the context of delegation with strategic information transmission, the standard tradeoff is the loss of information vs. the loss of control [see Dessein (2002)]. Without her own information, the principal has to rely on the agent's information for her decision-making. Delegation allows the principal to better utilize the information at the expense of the loss of control. Note that the tradeoff in our model is different because the principal has her own information. It is the loss of the agent's information (under centralization) vs. the loss of the principal's information and the loss of control (under delegation). Since it has more losses than centralization, delegation is difficult to be optimal. Nevertheless, it is shown to be optimal if the agent's bias is large.

Another interesting result we find in our model is that the optimal allocation of authority is discontinuous in the dimension of the principal's information. When the principal does not have her own information at all, the agent under centralization always transmits his information truthfully regardless of the degree of reputation concerns. As the decision is made using the same information set in this case, centralization and delegation are completely equivalent. But when the principal has her own information with small but positive probability, one allocation can dominate the other depending on the degree of the agent's reputation concerns.

Finally, we extend the model to the case where the agent costly develops a new project. The optimal allocation then not only allows its holder to use more and better information but also motivates the agent properly. We show that the introduction of the agent's moral hazard does not alter the results because the agent's motivation is also higher if a party with authority uses more and better information in its decision-making.

We study the allocation of authority by developing a model with several notable features: incomplete contracting, strategic information transmission, reputation concerns, and an informed principal. Our paper belongs to the literature on authority that uses incomplete contracting frameworks spawn by Aghion and Tirole (1997),[2] who identify the tradeoff between the provision of ex-ante incentives and the loss of control when delegating authority to the agent. They show that delegation is optimal if the agent's incentive to acquire information is important for the organization.[3] Our paper differs from Aghion and Tirole as there is strategic cheap-talk communication between the principal and the agent.

Dessein (2002) is among the first to investigate the optimal allocation of authority in a situation where the agent strategically transmits his information to the principal in a cheap-talk framework. In his model, the principal faces a tradeoff between noisy-but-unbiased decisions (the loss of information) and informed-but-biased decisions (the loss of control). With this tradeoff, he shows that the delegation of authority is optimal if the agent is less biased. There has been several papers that extend Dessein, including Alonzo and Matouschek (2007) who introduce the principal's commitment to decision rules, Alonzo and Matouschek (2008) who assume that the agent's bias varies with states, and Agastya et al. (2014) who consider a situation where the agent is partially informed. Our paper differs from these papers as it

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authority, which is the main topic of our paper.

[2] There is a literature on the delegation of authority that uses complete contracting frameworks. However, due to the revelation principle under complete contracts, it is hard to show that delegation is optimal unless the model introduces frictions such as communication and information processing costs that can break down the revelation principle. See Mookherjee (2006) for details.

[3] See Bester and Krahmer (2008) for the effect of delegation on the agent's work incentives. They show that the consideration of the agent's work incentives make delegation less likely to be optimal.

specifies the source of the agent's bias as his reputation concerns and the principal has his own information. Due to these differences, in contrast to the ally principle that Dessein and others show in their models, we show that delegation is optimal for a more biased agent (i.e., an agent with higher reputation concerns).

A few papers consider the agent's reputation concerns in the context of delegation. Englmaier et al. (2010) show that the agent's reputation concerns make the standard tradeoff (the loss of information vs. the loss of control) tilted in favor of delegation as they lower the agent's incentive to take biased actions. In Hirata (2014), the agent's reputation concerns induce him to take biased actions under delegation, but it provides him with an incentive to exert effort. Thus the agent's reputation concerns generate a tradeoff between the provision of ex-post incentives and the loss of control. While these papers consider the agent's reputation concerns, they do not have strategic information transmission.

For an informed principal in the context of delegation, Zábojník (2002) show that to implement her idea, the principal under centralization has to provide the agent with explicit incentives, which are costly as the agent's liquidity is constrained. Delegation can be optimal even if the principal has better information or idea. Harris and Raviv (2005) show that delegation is optimal when the agent's information is more important than the principal's and therefore that the principal delegates authority even to more biased agents for some types of projects. Unlike our paper, these papers do not consider the agent's reputation concerns.

The rest of the paper is organized as follows. Section II introduces the model. Section III looks at the benchmark case where the principal also observes the agent's information. Section IV analyzes the optimal allocation of authority when the principal does not observes the agent's information. Section V extends the model. Section VI concludes the paper.

II. *Model*

The model consists of a risk-neutral principal (she) and a risk-neutral agent (he) in an organization, and an outside labor market for the agent. Inside the organization, a party with authority chooses a project to implement. Following the literature on the allocation of authority, we employ an incomplete contracting framework in that nothing is contractible except the allocation of authority [see Bolton and Dewatripont (2013)].

There is a new project, called project N.[4] The quality of project N is unknown, and it is either high (H) with probability $\alpha \in (0, 1)$ or low (L) with $1-\alpha$. It will generate a net (ex-post) value of v_H if its quality is high and v_L otherwise, where $v_H > v_L$. The probability α measures the agent's ability, so the project is more likely to be of high quality if the agent has high ability. As project N is new, neither the agent nor the principal knows the agent's ability for this project.[5] Instead, all parties (including the labor market) just share a common belief about its distribution, where the (unconditional) mean and variance are denoted as $\bar{\alpha}$ and σ^2, respectively.

[4] Project N is just given in the base model. In Section V, we discuss the case where project N is endogenously developed by the agent with his costly effort.

[5] This symmetric incomplete information about the agent's ability is a standard assumption in the literature on reputation concerns begun by Holmstrom (1982).

The agent obtains an unverifiable signal $j\in\{h, l\}$ about the quality of project N. The probability of obtaining signal j conditional on the quality of project N is given by $p\equiv\Pr(j=h|H)=\Pr(j=l|L)\in(\frac{1}{2}, 1)$. The agent is likely to receive a high signal (h) if the quality of project N is high and a low signal (l) if it is low. Thus the signal is indicative of the quality of project N. It is private information to the agent, so hereafter the agent is called the high type (the low type) if he obtains a high signal (a low signal).

Alternative to project N, there is a status-quo project, called project S, that will generate a net value of v_0. As project S is an existing one, its quality is known and it generates a certain value. A priori, projects N and S generate the same expected value: $\bar{\alpha}v_H+(1-\bar{\alpha})v_L=v_0$, implying that $v_H>v_0>v_L$.

A party with authority decides which project, between projects N and S, to implement. If the agent has authority (delegation), he makes his decision based on the signal he received without consulting with the principal. If the principal has authority (centralization), she first asks the agent to report his signal about project N. As the agent's signal is unverifiable, his report, defined by $j'\in\{h, l\}$, does not have to be true. Given that the agent's report may not be truthful, the principal herself acquires information about project N. In particular, the principal obtains a signal $k\in\{h_P, l_P\}$ with probability $q_j\in(0, 1)$ and no signal, $k=\emptyset$, with $1-q_j$.

The principal's information acquisition deserves some explanations. First, in contrast to the agent, the principal may obtain no signal. It makes the agent's signal useful for the principal, and therefore the principal asks the agent to report his signal. Second, in general the principal's information may or may not be related with the agent's information. We model this relation such that the probability that the principal obtains signal k may depend on the agent's signal j. We begin with the case where it depends on the agent's signal, $q_h\neq q_l$. We then later discuss the other case, $q_h=q_l$. For $q_h\neq q_l$, we analyze the case of $q_h>q_l$, and it can be easily checked that the case of $q_h<q_l$ generates the qualitatively same results. For analytical simplicity, we let $q_h=q>0$ and $q_l=0$. Third, given that the principal obtains an informative signal, her signal k is more precise than the agent's signal j such that $\Pr(k=h_P|H)=\Pr(k=l_P|L)>p$. Without this assumption, the principal's information is useless in the truth-telling equilibrium because the agent "always" obtains more "precise" signal and the principal can use it. Again for analytical simplicity, we let the principal's signal be perfectly informative: $\Pr(k=h_P|H)=\Pr(k=l_P|L)=1$. Given the perfectness of the principal's signal, we simplify the notation by letting $h_P=H$ and $l_P=L$, so $k\in\{H, L, \emptyset\}$.

To summarize, given that $j=h$, the principal obtains a perfect signal $k\in\{H, L\}$ with probability $q\in(0, 1)$ and no signal $k=\emptyset$ with $1-q$. Given that $j=l$, the principal obtains no signal. Note that the principal's information is not necessarily more precise overall than the agent's information as it contains no signal. We can say that the principal's information is less precise overall if q is low.

Under delegation, the agent chooses a project based on his signal $j\in\{h, l\}$. The probability of selecting project N is denoted by $x_j\in[0, 1]$ and the set of the probabilities by $x=(x_h, x_l)$. Under centralization, the principal's project selection can be made based on the agent's report and her own signal. In particular, if $k\in\{H, L\}$, the principal uses only her own signal as it is perfectly informative. If $k=\emptyset$, the principal uses the agent's report $j'\in\{h, l\}$. Thus the principal's project selection can be represented by $x=(x_H, x_L, x_{h\emptyset}, x_{l\emptyset})$.

At the end, either project N or project S is implemented to generate v_i, where $i \in \{H, L, 0\}$. This value is publicly observable. The labor market believes a priori that the agent's ability is $\bar{\alpha} \equiv E[\alpha]$. Once v_i is realized, the market updates its perception of the agent's ability to $\bar{\alpha}_i \equiv E[\alpha | v_i]$, which measures the agent's posterior reputation. The market does not observe project-choice decisions, x, made inside the organization.

The principal's (ex-post) utility is v_i as she cares about the value generated by a selected project. The agent also cares about this value as he is the one who implements the project. In addition, the agent cares about the market perception of his ability. It is because, for instance, the agent's future pay and job career will depend on his reputation measured by the market's perception of his ability. Following Milbourn et al. (2001), Bourjade and Jullien (2011), and others, the agent's (ex-post) utility is modelled as $v_i + \beta\bar{\alpha}_i$.[6] Here $\beta \geq 0$ is a parameter gauging how much the agent cares about his reputation relative to the value of a project. Note that incongruence between the principal's and the agent's preferences stems only from the agent's concerns for his reputation that is determined by the labor market.

The interaction among the principal, the agent, and the market can be summarized along the following timeline: (i) The principal decides the allocation of authority. (ii) The agent receives signal j. (iii) Under delegation, the agent chooses a project to implement. Under centralization, the agent reports his signal and the principal obtains signal k. The principal selects a project. (iv) Either project N or project S is implemented to generate v_i with which the outside market updates its perception of the agent's ability.

III. *Benchmark*

The analysis begins with the benchmark case where the principal also observes the agent's signal j. As the principal has the information the agent has, she has no reason to delegate authority to the agent. The centralized decision yields the first-best outcome, which will be characterized below.

If $k \in \{H, L\}$, the principal selects a project based on her signal k. If $k = \emptyset$, she uses the agent's signal $j \in \{h, l\}$. Accordingly, the principal's project selection can be represented by $x = (x_H, x_L, x_{h\emptyset}, x_{l\emptyset})$. Before solving the principal's project selection, we first look at how the market updates its perception of the agent's ability.

After observing v_i, the market updates its perception of the agent's ability using the Bayes' rule as follows:

$$\bar{\alpha}_i = \int \alpha f(\alpha | v_i) d\alpha = \int \alpha \frac{\pi(v_i | \alpha)}{\pi(v_i)} f(\alpha) d\alpha,$$

where $\pi(\cdot)$ is the probability that the selected project generates v_i and $f(\cdot)$ is the density for α. It is then straightforward that

$$\bar{\alpha}_H = \bar{\alpha} + \frac{\sigma^2}{\bar{\alpha}} \tag{1}$$

[6] We abstract away the agent's wage in the principal's and the agent's utilities. As nothing is contractible except the allocation of authority in our model, the principal at most would give a fixed wage for the agent's participation. However, the agent's participation is guaranteed even without a wage as he cares about the value of projects.

$$\bar{\alpha}_L = \bar{\alpha} - \frac{\sigma^2}{1-\bar{\alpha}} \tag{2}$$

$$\bar{\alpha}_0 = \bar{\alpha} + \frac{\{pq(1-\tilde{x}_H)-(1-p)q(1-\tilde{x}_L)+[p-(1-p)](1-q)(1-\tilde{x}_{h\varnothing})-[p-(1-p)](1-\tilde{x}_{l\varnothing})\}\sigma^2}{\bar{\alpha}pq(1-\tilde{x}_H)+(1-\bar{\alpha})(1-p)q(1-\tilde{x}_L)+[\bar{\alpha}p+(1-\bar{\alpha})(1-p)](1-q)(1-\tilde{x}_{h\varnothing})+[\bar{\alpha}(1-p)+(1-\bar{\alpha})p](1-\tilde{x}_{l\varnothing})}, \tag{3}$$

where $\tilde{x}$ is the market's estimate of the principal's decisions on x. The market cannot observe the decisions made inside the organization. Accordingly, the market updates its perception based on its estimate of the principal's decisions.

Since project N is more likely to generate a high value (v_H) if the agent's ability is high, the market updates its perception of the agent's ability upward when the selected project generates a high value ($\bar{\alpha}_H > \bar{\alpha}$) and downward when it generates a low value ($\bar{\alpha}_L < \bar{\alpha}$). If project S is implemented to generate v_0, the market does not have direct information with which it can update its perception because the value of project S is independent of the agent's ability. However, the fact that the principal selects project S conveys some information about the agent's ability. Thus the market revises its perception of the agent's ability depending on how it estimates the principal's decisions on x as shown in (3).

The principal selects a project to maximize her payoff:

$$V(x) \equiv \sum_i \pi_i(x) v_i,$$

where $\pi_i(x) \equiv \pi(v_i | x)$ is the probability that the selected project generates v_i under $x = (x_H, x_L, x_{h\varnothing}, x_{l\varnothing})$.[7] The marginal effects of x on V are

$$\frac{\partial V}{\partial x_H} = \bar{\alpha}pq[v_H - v_0] > 0 \tag{4}$$

$$\frac{\partial V}{\partial x_L} = (1-\bar{\alpha})(1-p)q[v_L - v_0] < 0 \tag{5}$$

$$\frac{\partial V}{\partial x_{h\varnothing}} = \bar{\alpha}p(1-q)[v_H - v_0] + (1-\bar{\alpha})(1-p)(1-q)[v_L - v_0] > 0 \tag{6}$$

$$\frac{\partial V}{\partial x_{l\varnothing}} = \bar{\alpha}(1-p)[v_H - v_0] + (1-\bar{\alpha})p[v_L - v_0] < 0. \tag{7}$$

The conditions (4) ~ (7) imply that $x^*_H = 1$, $x^*_L = 0$, $x^*_{h\varnothing} = 1$, and $x^*_{l\varnothing} = 0$, where superscript * represents the solution under the benchmark case.

LEMMA 1: *When the principal observes the agent's signal, the principal makes the first-best project selection such that* $x^*_H = 1$, $x^*_L = 0$, $x^*_{h\varnothing} = 1$, *and* $x^*_{l\varnothing} = 0$.

When selecting a project, the principal cares only about its expected value. Thus the principal selects project N if she finds that it will generate a high value ($x^*_H = 1$) and project S

[7] In particular, $\pi_H(x) = \bar{\alpha}pqx_H + \bar{\alpha}p(1-q)x_{h\varnothing} + \bar{\alpha}(1-p)x_{l\varnothing}$, $\pi_L(x) = (1-\bar{\alpha})(1-p)qx_L + (1-\bar{\alpha})(1-p)(1-q)x_{h\varnothing} + (1-\bar{\alpha})px_{l\varnothing}$, $\pi_0(x) = \bar{\alpha}pq(1-x_H) + (1-\bar{\alpha})(1-p)q(1-x_L) + [\bar{\alpha}p + (1-\bar{\alpha})(1-p)](1-q)(1-x_{h\varnothing}) + [\bar{\alpha}(1-p) + (1-\bar{\theta})p](1-x_{l\varnothing})$.

if it will generate a low value ($x_L^*=0$). If the principal finds nothing, she relies on the agent's signal. The principal selects project N if the signal indicates that it will be likely to generate a high value ($x_{h\varnothing}^*=1$) and project S otherwise ($x_{l\varnothing}^*=0$). This choice is the first-best as it uses all information and generates the highest value.

In equilibrium with rational expectations, the market's estimate of the principal's decision is correct [see for instance Holmstrom (1982) and Gibbons and Murphy (1992)]. That is, $\tilde{x}=x^*$. With this, the market perception of the agent's ability stated in (1) ~ (3) can be established in equilibrium, defined by $\bar{\alpha}_i^*$. Here $\bar{\alpha}_H^*$ and $\bar{\alpha}_L^*$ are the same as in (1) and (2), respectively, since they are independent of the principal's project selection, and

$$\bar{\alpha}_0^*=\bar{\alpha}-\frac{[p-(1-p)+(1-p)q]\sigma^2}{\bar{\alpha}(1-p)+(1-\bar{\alpha})[p+(1-p)q]}. \tag{8}$$

The market updates its perception of the agent's ability downward from the prior level ($\bar{\alpha}_0^*<\bar{\alpha}$) when the selected project generates v_0. The market can infer the fact that the principal chooses project S because the quality of project N is low ($x_L^*=0$) or it is likely to be low ($x_{l\varnothing}^*=0$), both of which are detrimental to the agent's reputation as the quality of project N depends on the agent's ability. The implementation of project S gives the market a signal that the agent may have low ability.

IV. *Optimal Allocation of Authority*

This section studies the case where the principal does not observe the agent's signal j so that the agent's strategic information transmission is an issue. It begins with the case of centralization where the principal holds decision-making authority. It then introduces the case where the principal delegates authority to the agent. Finally, it studies the optimal allocation of authority by comparing centralization and delegation.

1. Centralization

Under centralization, there is a game in which the agent reports his signal and then the principal selects a project based on the signal reported. The solution concept of this game is the perfect Bayesian equilibrium: the principal's selection of a project is optimal for her (i.e., payoff maximizing) given her belief about the agent's type, the report made by each type of the agent is optimal for him given the principal's selection, and the belief is updated according to the Bayes' rule. In what below, we seek the pure strategy equilibrium of the game.

Given that the principal succeeds in obtaining her own signal, the principal simply ignores the agent's report as her signal gives perfect information about the quality of project N. However, if the principal obtains no signal, she relies on the agent's report. Knowing this, the agent may or may not report his signal truthfully as the principal's project selection affects his utility. While the truthfulness of the agent's report does not matter if the principal makes report-independent selections ($x_{h\varnothing}=x_{l\varnothing}$), it does matter for report-dependent selections ($x_{h\varnothing}\neq x_{l\varnothing}$). As is standard in this cheap-talk game, for report-dependent selections, it is no loss of generality to restrict the analysis to the game where the agent reports his signal truthfully in equilibrium.

Thus, there can be two types of equilibrium: an equilibrium where the agent reports his signal truthfully and the principal makes report-dependent selections ($x_{h\varnothing} \neq x_{l\varnothing}$), and an equilibrium where the principal makes report-independent selections ($x_{h\varnothing} = x_{l\varnothing}$).

Consider first the equilibrium with report-dependent selections. Given that the agent reports his signal truthfully, the principal makes the first-best project selection x^* as in the benchmark case, and the market updates the agent's ability to $\bar{\alpha}_i^*$ in equilibrium. However, this report-dependent selection can be an equilibrium only if the agent reports his signal truthfully. To check this, let $U_{jj'}(x)$ denote the (interim) utility of the agent with signal $j \in \{h,l\}$ when he reports his signal as $j' \in \{h,l\}$ under project selection x.

The high type has no incentive to misreport his signal because

$$
\begin{aligned}
&U_{hl}(x^*) - U_{hh}(x^*) \\
&= \left[\frac{\bar{\alpha}pq(v_H+\beta\bar{\alpha}_H^*)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)} + \frac{[\bar{\alpha}p(1-q)+(1-\bar{\alpha})(1-p)](v_0+\beta\bar{\alpha}_0^*)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}\right] \\
&\quad - \left[\frac{\bar{\alpha}p(v_H+\beta\bar{\alpha}_H^*)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)} + \frac{(1-\bar{\alpha})(1-p)(1-q)(v_L+\beta\bar{\alpha}_L^*)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)} + \frac{(1-\bar{\alpha})(1-p)q(v_0+\beta\bar{\alpha}_0^*)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}\right] \\
&= -\frac{(1-q)[\bar{\alpha}p(v_H-v_0)+(1-\bar{\alpha})(1-p)(v_L-v_0)]}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)} - \frac{\beta(1-q)[(2p-1)+p(1-p)q]\sigma^2}{[\bar{\alpha}p+(1-\bar{\alpha})(1-p)][\bar{\alpha}(1-p)+(1-\bar{\alpha})(p+(1-p)q)]} < 0.
\end{aligned} \tag{9}
$$

By understating his signal, the high type leads the principal to choose project S more often (as $x_{l\varnothing}^* = 0$). However, it makes the high type strictly worse-off. As the principal would select a project efficiently under truthful reporting, any deviation due to misreporting decreases the expected value of selected projects (the first term of (9)). Furthermore, pretending to be a low type obviously deteriorates the high type's reputation (the second term) as he is now pooled with the low type in the market's perception.

Unlike the high type, the low type may misreport his signal because

$$
\begin{aligned}
&U_{lh}(x^*) - U_{ll}(x^*) \\
&= \left[\frac{\bar{\alpha}(1-p)(v_H+\beta\bar{\alpha}_H^*)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p} + \frac{(1-\bar{\alpha})p(v_L+\beta\bar{\alpha}_L^*)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}\right] - [v_0+\beta\bar{\alpha}_0^*] \\
&= \frac{\bar{\alpha}(1-p)[v_H-v_0]+(1-\bar{\alpha})p[v_L-v_0]}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p} + \frac{\beta(1-p)^2 q\sigma^2}{[\bar{\alpha}(1-p)+(1-\bar{\alpha})p][\bar{\alpha}(1-p)+(1-\bar{\alpha})(p+(1-p)q)]} \gtrless 0.
\end{aligned} \tag{10}
$$

Again, as the principal would select a project efficiently under truthful reporting, any deviation due to misreporting decreases the expected value of selected projects, so the first term of (10) is negative. However, the low type can improve the market perception of his ability by overstating his signal, so the second term is positive. Note that in the first-best project selection, the low type is pooled with the agent whose new project is found by the principal to be of low quality (as $x_{l\varnothing}^* = x_L^*$). That is, the low type is pooled with the lowest type. It makes his reputation lower than what he deserves (as the low type's new project can still be of high quality). The low type can avoid this reputation damage by misreporting his signal as he can separate from the lowest type (as $x^*_{h\emptyset} \neq x^*_L$), so the second term of (10) is positive. Thus the low type faces a tradeoff (value loss vs. reputation gain) when misreporting his signal. With this tradeoff, the low type will report his signal truthfully only if his reputation concerns (β) are low.

Let us define $\bar{\beta}$ such that (10) holds equality:

$$\frac{\bar{\alpha}(1-p)[v_H-v_0]+(1-\bar{\alpha})p[v_L-v_0]}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}+\bar{\beta}\frac{(1-p)^2q\sigma^2}{[\bar{\alpha}(1-p)+(1-\bar{\alpha})p][\bar{\alpha}(1-p)+(1-\bar{\alpha})(p+(1-p)q)]}\equiv 0.$$

For $\beta \leq \bar{\beta}$, there exists an equilibrium in which both types report their signals truthfully and the principal selects the same project as in the benchmark case. Of course, in addition to this fully revealing equilibrium, there exists a babbling equilibrium in which both types are pooled and the principal selects a project based on her prior belief. Here we focus on the fully revealing equilibrium.

For $\beta > \bar{\beta}$, the equilibrium with report-dependent selections does not exist as the low type misreports his signal.[8] The principal makes report-independent selections such that $x_{h\emptyset}=x_{l\emptyset}$. Then the principal's selection depends only on her own signal and therefore it can be represented by x_k, where $k \in \{H, L, \emptyset\}$. To characterize the equilibrium with report-independent selections, in what below we proceed with the same analytical steps as shown in the benchmark case.

After observing the value generated by a selected project, the market updates its perception of the agent ability to $\bar{\alpha}_i$. As before, $\bar{\alpha}_H$ and $\bar{\alpha}_L$ are the same as in (1) and (2), respectively, and

$$\bar{\alpha}_0=\bar{\alpha}+\frac{\{pq(1-\tilde{x}_H)-(1-p)q(1-\tilde{x}_L)-[p-(1-p)]q(1-\tilde{x}_\emptyset)\}\sigma^2}{\bar{\alpha}pq(1-\tilde{x}_H)+(1-\bar{\alpha})(1-p)q(1-\tilde{x}_L)+[(\bar{\alpha}p+(1-\bar{\alpha})(1-p))(1-q)+\bar{\alpha}(1-p)+(1-\bar{\alpha})p](1-\tilde{x}_\emptyset)}. \tag{11}$$

The principal selects a project to maximize her payoff $V(x)=\sum_i \pi_i(x)v_i$, where $\pi_i(x)$ is the probability that the selected project generates v_i under the principal's report-independent project selection $x=(x_H, x_L, x_\emptyset)$.[9] The marginal effects of x_H and x_L on V are the same as (4) and (5), respectively, and

$$\frac{\partial V}{\partial x_\emptyset}=\bar{\alpha}[p(1-q)+(1-p)](v_H-v_0)+(1-\bar{\alpha})[(1-p)(1-q)+p](v_L-v_0)<0. \tag{12}$$

The conditions (4), (5), (12) imply that $x^C_H=1$, $x^C_L=0$, and $x^C_\emptyset=0$, where superscript C represents the report-independent selections under centralization.[10] If the principal obtains an

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[8] The dichotomous result that the agent transmits his information truthfully only if $\beta \leq \bar{\beta}$ is due to the model that the agent's information set is discrete. If the agent's information is continuous as in Crawford and Sobel (1982), the agent would transmit his information with finer partitions as β decreases. Nevertheless, the result is qualitatively the same in that an agent with lower β transmits more precise information to the principal.

[9] In particular, $\pi_H(x)=\bar{\alpha}pqx_H+\bar{\alpha}[p(1-q)+(1-p)]x_\emptyset$, $\pi_L(x)=(1-\bar{\alpha})(1-p)qx_L+(1-\bar{\alpha})[(1-p)(1-q)+p]x_\emptyset$, $\pi_0(x)=\bar{\alpha}pq(1-x_H)+(1-\bar{\alpha})(1-p)q(1-x_L)+\{\bar{\alpha}[p(1-q)+(1-p)]+(1-\bar{\alpha})[(1-p)(1-q)+p]\}(1-x_\emptyset)$.

[10] $\frac{\partial V}{\partial x_\emptyset}<0$ for $q \in (0, 1)$ because $\frac{\partial V}{\partial x_\emptyset}<0$ for $q=1$, $\frac{\partial V}{\partial x_\emptyset}=0$ for $q=0$, and $\frac{\partial^2 V}{\partial x_\emptyset \partial q}<0$.

informative signal $k \in \{H, L\}$, she makes the first-best selection as in the benchmark case. If the principal obtains no signal, she selects project S because it happens more likely when the agent is a low type (as $q_h > q_l = 0$). In sum, the principal selects project S unless she has evidence that the quality of project N is high.

For $\beta > \bar{\beta}$, the ex-ante value of selected projects is lower compared to the benchmark case because the principal uses less information in her project selection:

$$V(x^C) - V(x^*) = (1-q)[\bar{\alpha}p(v_0 - v_H) + (1-\bar{\alpha})(1-p)(v_0 - v_L)] < 0. \tag{13}$$

For the agent's posterior reputation in equilibrium with report-independent selections, $\bar{\alpha}_H^C$ is the same as in (1), $\bar{\alpha}_L^C$ is irrelevant because, under project selection x^C, project N will be implemented only if it will generate a high value, and

$$\bar{\alpha}_0^C = \bar{\alpha} - \frac{pq\sigma^2}{1 - \bar{\alpha}pq}. \tag{14}$$

The market updates its perception of the agent's ability downward when the selected project generates v_0 because project S is chosen only if the principal finds no evidence that the quality of project N is high.

We can summarize the results under centralization in the following proposition.

PROPOSITION 1: *Under centralization, for $\beta \leq \bar{\beta}$, the agent reports his signal truthfully in equilibrium. The principal's project selection is the same as the first-best, x^*. For $\beta > \bar{\beta}$, the agent does not report his signal truthfully in equilibrium. The principal's project selection is distorted from the first-best such that $x_H^C = 1$, $x_L^C = 0$, $x_\varnothing^C = 0$, and it generates a lower expected value than the first-best.*

The result that the expected value of projects under centralization is lower than the benchmark case opens a door for the possibility that the delegation of authority to the agent is rather optimal. In what follows, we analyze this possibility.

2. Delegation

Under delegation, the agent selects a project based on his signal, so his selection can be stated as x_j, where $j \in \{h, l\}$. As in the case of centralization analyzed above, the market updates its perception of the agent's ability after observing the final value generated by the project chosen by the agent. $\bar{\alpha}_H$ and $\bar{\alpha}_L$ are the same as those in (1) and (2), respectively, and

$$\bar{\alpha}_0 = \bar{\alpha} + \frac{[p-(1-p)](\tilde{x}_l - \tilde{x}_h)\sigma^2}{[\bar{\alpha}p + (1-\bar{\alpha})(1-p)](1-\tilde{x}_h) + [\bar{\alpha}(1-p) + (1-\bar{\alpha})p](1-\tilde{x}_l)}. \tag{15}$$

Anticipating such an update, each type of the agent selects a project to maximize his payoff:

$$U_j(x) = \sum_i \pi_i(x, j)[v_i + \beta\bar{\alpha}_i],$$

where $\pi_i(x, j)$ is the probability that the selected project generates v_i under project selection $x = (x_h, x_l)$ and signal j.[11]

For the high type's selection,

$$\frac{\partial U_h}{\partial x_h}=\left[\frac{\bar{\alpha}p(v_H-v_0)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}+\frac{(1-\bar{\alpha})(1-p)(v_L-v_0)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}\right]+\beta\left[\frac{\bar{\alpha}p(\bar{\alpha}_H-\bar{\alpha}_0)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}+\frac{(1-\bar{\alpha})(1-p)(\bar{\alpha}_L-\bar{\alpha}_0)}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}\right]>0. \tag{16}$$

The first term of (16) is the value gain from selecting project N over project S, which is positive. The second term is the reputation gain, which is non-negative.[12] The condition (16) implies that $x_h^D=1$, where superscript D represents the solution under delegation.

For the low type's selection,

$$\frac{\partial U_l}{\partial x_l}=\left[\frac{\bar{\alpha}(1-p)(v_H-v_0)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}+\frac{(1-\bar{\alpha})p(v_L-v_0)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}\right]+\beta\left[\frac{\bar{\alpha}(1-p)(\bar{\alpha}_H-\bar{\alpha}_0)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}+\frac{(1-\bar{\alpha})p(\bar{\alpha}_L-\bar{\alpha}_0)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}\right]<0. \tag{17}$$

Again, the first term of (17) represents the value gain and the second term does the reputation gain from selecting project N over project S. The first term is negative and the second term is non-positive.[13] The condition (17) implies that $x_l^D=0$.

Note that regardless of the agent's type, the reputation gain (the second terms of (16) and (17)) has the same direction as the value gain (the first terms of (16) and (17)). The project selection that maximizes the value of projects is also better for the agent's reputation. Thus the agent's reputation concerns do not interfere with the efficient choice of projects. As will be shown below, it allows delegation to be optimal if it uses more precise information than centralization.

For the agent's posterior reputation in equilibrium, $\bar{\alpha}_H^D$ and $\bar{\alpha}_L^D$ are the same as those in (1) and (2), respectively, since they are independent of the agent's project selection x^D, and

$$\bar{\alpha}_0^D=\bar{\alpha}-\frac{[p-(1-p)]\sigma^2}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}. \tag{18}$$

Finally, it is easy to check that delegation generates a lower value than the first-best

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[11] In particular, $\pi_H(x,h)=\frac{\bar{\alpha}px_h}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}$, $\pi_L(x,h)=\frac{(1-\bar{\alpha})(1-p)x_h}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}$, $\pi_0(x,h)=1-x_h$; $\pi_H(x,l)=\frac{\bar{\alpha}(1-p)x_l}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}$, $\pi_L(x,l)=\frac{(1-\bar{\alpha})px_l}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}$, $\pi_0(x,l)=1-x_l$.

[12] To prove this, we can restate the second term using (1) and (2) as $\beta[\bar{\alpha}+\frac{[p-(1-p)]\sigma^2}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}-\bar{\alpha}_0]$. Note from (15) that $\bar{\alpha}_0$ decreases with $\tilde{x}_h$ and increases with $\tilde{x}_l$. It implies that $\bar{\alpha}_0$ has its maximum value of $\bar{\alpha}+\frac{[p-(1-p)]\sigma^2}{\bar{\alpha}p+(1-\bar{\alpha})(1-p)}$ when $\tilde{x}_h=0$ and $\tilde{x}_l=1$. The second term becomes zero with this maximum value. Thus it must be non-negative for any $\tilde{x}_j$.

[13] To prove this, we can restate the second term using (1) and (2) as $\beta[\bar{\alpha}-\frac{[p-(1-p)]\sigma^2}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}-\bar{\alpha}_0]$. Since $\bar{\alpha}_0$ decreases with $\tilde{x}_h$ and increases with $\tilde{x}_l$, $\bar{\alpha}_0$ has its minimum value of $\bar{\alpha}-\frac{[p-(1-p)]\sigma^2}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p}$ when $\tilde{x}_h=1$ and $\tilde{x}_l=0$. The second term becomes zero with this minimum value. Thus it is non-positive for any $\tilde{x}_j$.

because it uses less information in the decision-making:

$$V(x^D) - V(x^*) = (1-\bar{\alpha})(1-p)q(v_L - v_0) < 0. \tag{19}$$

We summarize the results under delegation in the following proposition.

PROPOSITION 2: *Under delegation, the agent's project selection is* $x_h^D = 1$ *and* $x_l^D = 0$, *and it generates a lower expected value than the first-best.*

3. Centralization vs. Delegation

At the beginning, the principal decides whether to keep authority or delegates it to the agent. For this, she compares the expected value of projects under centralization with that under delegation. As shown earlier, this value varies with β. For $\beta \leq \bar{\beta}$, we have shown that centralization results in the first-best outcome, whereas delegation gives rise to inefficient outcome. Thus it is optimal for the principal to keep authority. However, for $\beta > \bar{\beta}$, we have shown that the expected value of projects under centralization is lower than the first-best. We now show that delegation can generate a higher value for $\beta > \bar{\beta}$:

$$V(x^D) - V(x^C) = \bar{\alpha}p(1-q)(v_H - v_0) + (1-\bar{\alpha})(1-p)(v_L - v_0) \lesseqgtr 0. \tag{20}$$

From (20), we can see that delegation generates a higher value than centralization does if and only if $q < \bar{q} \equiv 1 - \dfrac{(1-\bar{\alpha})(1-p)(v_0 - v_L)}{\bar{\alpha}p(v_H - v_0)} \in (0,1)$.[14] As the agent does not reveal his information truthfully, the centralized project selection does not necessarily utilize more information than the decentralized one. Thus it is less efficient if the principal's information is less precise overall (i.e., $q < \bar{q}$).

PROPOSITION 3: *Delegation generates a higher expected value than centralization if the agent's reputation concerns are high* ($\beta > \bar{\beta}$) *and the principal's information is less precise overall* ($q < \bar{q}$).

Regarding centralization - delegation decision, the principal faces a tradeoff between the loss of the agent's information vs. the losses of the principal's information and control. Under centralization, the principal may lose the agent's information. Under delegation, the principal loses her control. In addition, the principal does not acquire information. As it has more losses, delegation would be difficult to be optimal. Nevertheless, delegation is shown to be optimal if the agent's reputation concerns are high.

Finally, note that we have restricted our analysis to the case where $q > 0$ Consider now the case where $q = 0$. That is, the principal does not have her own information at all. Under centralization, the agent transmits his information truthfully regardless of β. It can be seen from (10) that misreporting always lowers the low type's payoff if $q = 0$. As explained above, if $q > 0$ the low type is pooled with the lowest type in the market perception. To avoid this reputation damage, the low type will misreport if β is high. However, if the principal cannot distinguish the lowest type because she does not have information at all, the low type does not have such an incentive and therefore reports his type truthfully. Accordingly, project selection under

[14] $\bar{q} \in (0, 1)$ because $\bar{\alpha}p(v_H - v_0) > (1-\bar{\alpha})(1-p)(v_0 - v_L)$.

centralization yields the first-best outcome. This is also the case under delegation. It can be seen from (19) that delegation does not incur an efficiency loss if $q=0$. Since only the agent's information is available and the agent uses this information efficiently in his project choice, delegation also yields the first-best outcome. Thus, in sum, centralization and delegation are completely equivalent if $q=0$. Combining this result with the one in Proposition 3, we can say that the optimal allocation of authority is discontinuous at $q=0$ in the sense that one allocation strictly dominates the other depending on β when q is small but positive.

V. *Extensions*

In this section, we introduce a few extensions of the base model and show that the results are robust to these extensions.

1. Costly Development of a New Project

The base model assumed that projects are just given even if they are new. Thus the optimal allocation of authority takes into account only the efficient choice of projects that requires more and better information. However, a new project may not be just given. The agent may exert costly effort to develop it. Given that the agent's effort is a private action, moral hazard then becomes an issue in addition to strategic information transmission in the presence of the agent's reputation concerns. If these two involve a tradeoff, the results regarding the optimality of delegation in the base model may not be valid. However, we show below that the introduction of the agent's moral hazard does not alter the results.

Suppose that the agent can develop project N at a private cost $z>0$. Unless this cost of development is large, it is optimal for the organization to induce the agent to incur this cost because then a party with authority has an option to select a better project. This real option can improve the expected value of selected projects. Thus the optimal allocation of authority now not only uses more and better information when selecting a project but also motivates the agent to develop project N in the first place. That is, the optimal allocation of authority must expand the set of projects and then select a better project among them.

Regardless of who has authority, the agent develops project N in equilibrium if

$$\sum_i \pi_i(x^A)[v_i+\beta\bar{\alpha}_i^A]-z\geq v_0+\beta\bar{\alpha}_0^A, \tag{21}$$

where superscript $A\in\{C, D\}$ represents either centralization or delegation, and x^A and $\bar{\alpha}_i^A$ were characterized in the previous section. If the agent develops project N, a party with authority chooses either project N or project S, which will generate v_i. The agent can anticipate that he receives the expected payoff as in LHS of (21). If the agent does not develop project N, a party with authority has no choice but to implement project S, which will generate v_0. The agent will receive a certain payoff as in RHS of (21).

Note that the agent's expected payoff when developing project N is determined by the expected level of posterior reputation, $\sum_i \pi_i(x^A)\bar{\alpha}_i^A$. With $\pi_i(x^A)$ and $\bar{\alpha}_i^A$ characterized in the previous section, we can see that regardless of who has authority, the agent's expected level of posterior reputation is the same as his prior reputation:

$$\sum_i \pi_i(x^A)\bar{\alpha}_i^A = \bar{\alpha}. \tag{22}$$

As the market correctly anticipates the project-choice decisions in equilibrium (i.e., $\tilde{x} = x^A$), it adjusts its perception correctly such that the agent's posterior reputation is on average the same as his prior reputation.

Using (22), we can rewrite (21) as

$$\left[\sum_i \pi_i(x^A)v_i - v_0\right] + \beta[\bar{\alpha} - \alpha_0^A] \geq z. \tag{23}$$

From this, we can see that the agent's gain from project development comes from two sources: a value gain (the first term in the LHS of (23)) and a reputation gain (the second term). The value gain from project development is positive (i.e., $\sum_i \pi_i(x^A)v_i > v_0$). It is because, given that project N is available (as the agent developed it), a party with authority has some information to make a better choice. Thus this value gain is larger if a party with authority has more and better information. From the analysis in the previous section, we can see that for $\beta \leq \bar{\beta}$, the value gain is larger under centralization because it uses more information (i.e., uses both the principal's and the agent's information). For $\beta > \bar{\beta}$, as shown in (20), the value gain is larger under delegation if and only if $q < \bar{q}$ because it then uses better information (i.e., the agent's information is more precise overall that the principal's as the principal's information acquisition is likely to fail).

As we can see from (8), (14), and (18) that $\alpha_0^A < \bar{\alpha}$, the reputation gain from project development is also positive regardless of the allocation of authority. It is because the fact that the agent implements project S, instead of project N, gives the market a signal that the agent has low ability. This reputation gain is larger if a party with authority chooses a project based on more and better information because then project selection gives the market more precise information about the agent's ability, so that α_0^A becomes much smaller than $\bar{\alpha}$. Accordingly, for $\beta \leq \bar{\beta}$, the reputation gain is larger under centralization (i.e., $\bar{\alpha}_i^C = \bar{\alpha}_i^* < \bar{\alpha}_i^D$ from (8) and (18)) because it uses more information. For $\beta > \bar{\beta}$, the reputation gain is larger under delegation if and only if $q < \hat{q} \equiv \frac{p-(1-p)}{p^2} \in (0,1)$ (i.e., $\bar{\alpha}_i^D < \bar{\alpha}_i^C$ if and only if $q < \hat{q}$ from (14) and (18)) because it then uses better information.[15]

In sum, the allocation of authority can efficiently motivate the agent to develop project N if it allows project selection to be made based on more and better information. Delegation is better to motivate the agent if $\beta > \bar{\beta}$ and q is low. Note that this is exactly the condition under which delegation is optimal in the base model. Thus even with the agent's moral hazard in developing project N, delegation is optimal for qualitatively the same condition.

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[15] $\hat{q} < 1$ because $\hat{q}$ increases with p and $\lim_{p \to 1} \hat{q} = 1$.

2. Alternative Information Acquisition Technology

The base model assumed that the principal's information acquisition depends on the agent's signal j such that $q_h \neq q_l$. Here we study the alternative case where the principal's information acquisition is independent of the agent's signal such that $q_h = q_l = q$. In what follows, we show that the optimal allocation of authority is largely robust to this alternative information acquisition technology.

When the principal observes the agent's signal, she makes the first-best project selection as in the base model. With this selection, the market, in equilibrium, updates its perception of the agent's ability to

$$\bar{\alpha}_0^* = \bar{\alpha} - \frac{[p+(1-p)q-(1-p)(1-q)]\sigma^2}{\bar{\alpha}(1-p)(1-q)+(1-\bar{\alpha})[p+(1-p)q]}. \tag{24}$$

Of course, $\bar{\alpha}_H^*$ and $\bar{\alpha}_L^*$ are the same as (1) and (2), respectively.

With this reputation in equilibrium, the essential question under the case where the principal does not observe the agent's signal is whether the low type would misreport his signal if he anticipates that the principal selects the first-best projects, x^*. He indeed may misreport his signal because

$$\begin{aligned} & U_{lh}(x^*) - U_{ll}(x^*) \\ &= \frac{\bar{\alpha}(1-p)(v_H+\beta\bar{\alpha}_H^*)+(1-\bar{\alpha})p(v_L+\beta\bar{\alpha}_L^*)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p} - \frac{\bar{\alpha}(1-p)q(v_H+\beta\bar{\alpha}_H^*)+[\bar{\alpha}(1-p)(1-q)+(1-\bar{\alpha})p](v_0+\beta\bar{\alpha}_0^*)}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p} \\ &= \frac{\bar{\alpha}(1-p)(1-q)[v_H-v_0]+(1-\bar{\alpha})p[v_L-v_0]}{\bar{\alpha}(1-p)+(1-\bar{\alpha})p} + \frac{\beta(1-p)^2 q(1-q)\sigma^2}{[\bar{\alpha}(1-p)+(1-\bar{\alpha})p][\bar{\alpha}(1-p)(1-q)+(1-\bar{\alpha})(p+(1-p)q)]} \gtrless 0. \end{aligned} \tag{25}$$

As in the base model, the value gain from misreporting (the first term of (25)) is negative and the reputation gain (the second term) is positive because the low type can be pooled with the high type by overstating his signal. Accordingly, there exists $\bar{\beta} > 0$ above which the low type misreports his signal. Thus, for $\beta > \bar{\beta}$, the principal makes report-independent selections in equilibrium as the agent does not transmit his signal truthfully. Of course, if the principal succeeds in obtaining an informative signal, it is obvious that $x_H^C = 1$ and $x_L^C = 0$ as in the base model. However, if the principal fails, she is indifferent between project N and project S because the principal's information acquisition is independent of the agent's signal. To see it more clearly, we look at the marginal effect of $x_\varnothing$ on the principal's payoff:

$$\frac{\partial V}{\partial x_\varnothing} = \bar{\alpha}(1-q_h)(v_H - v_0) + (1-\bar{\alpha})(1-q_l)(v_L - v_0) = 0. \tag{26}$$

This condition holds equality because $q_h = q_l = q$. Since the principal's information acquisition is equally successful across the agent's signal, she cannot infer any information when her information acquisition fails. It makes her indifferent between project N and project S, so $x_\varnothing^C \in \{0, 1\}$. This indeterminacy is the only difference from the base model.

The final question is whether the delegation of authority can be optimal when $\beta > \bar{\beta}$. Note that project selection under centralization only uses the principal's information as it is report-independent. Accordingly, as in the base model, it is straightforward to show that delegation can be optimal if the principal's information is less precise overall.

VI. *Conclusion*

There are several decisions that are essential for the success of an organization. For instance, a firm makes decisions about financing, capital allocation, product development, investment, spin-off, merge and acquisition, and so on. One of the central questions is then who make such important decisions. Although decision-making authority usually resides in the hand of the owner or the principal of the organization, it is often delegated down to the hierarchy. Upon this observation, we studied the allocation of authority between the principal and the agent to see under what circumstances delegation can be optimal. In particular, we explored a situation where the agent has reputation concerns, which create incongruence between him and the principal.

The optimal allocation of authority should make its holder use more and better information in order to make an efficient choice of projects. Under centralization, given that the agent has private information about a new project, he would not transmit this information truthfully to the principal if it damages his reputation. In particular, a low-type agent whose new project has a bad prospect misreports his information in order to be pooled with a high-type agent in the market's formation of his reputation. Accordingly, the agent does not transmit his information truthfully if his reputation concerns are high. The principal then chooses a project based only on her information, which may not be precise than the agent's information. Thus the delegation of authority to agent can be optimal if the agent's reputation concerns are high and his information is more precise overall than the principal's information.

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