Disagreement And Autonomy: Incentive Contracting With Psychological Ownership And Objective Ownership

Fenghua Song* and Anjan V. Thakor†

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*PhD Student, Olin School of Business, Washington University in St. Louis. Campus Box 1133, One Brookings Drive, St. Louis, MO 63130. Email: songf@wustl.edu

†John E. Simon Professor of Finance, Olin School of Business, Washington University in St. Louis. Campus Box 1133, One Brookings Drive, St. Louis, MO 63130. Email: thakor@wustl.edu

Abstract

We examine the conditions under which agents value control ex ante without exogenous private benefits, and then analyze optimal incentive contracts in a principal-agent setting with private benefits and principal-agent disagreement induced by heterogenous prior beliefs. The optimal contract gives the agent a fixed wage, a monetary incentive in the form of a share of the project payoff, possible autonomy/control over project choice, and possible autonomy over the choice of strategy that affects project success. The optimal contract reveals a sharp difference between private benefits and heterogeneous priors. Monetary incentives and agent autonomy are *complementary* incentive devices with private benefits, but are *substitutes* with heterogenous priors. Moreover, private benefits and heterogenous priors interact interestingly in the optimal contract. Further, there is also an interesting interaction between the agent's autonomy and career concerns. Greater autonomy makes perceptions of the agent's ability *more sensitive* to project success, so autonomy works through the agent's career concerns to generate positive incentive effects. We use the result of the analysis to provide economic content to the notion of "psychological ownership," which is related to the agent's psychic gratification from a sense of control over outcomes, and is distinct from "objective ownership," which is linked to the agent's monetary incentives.

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"A man's Self is the sum total of all that he CAN call his, not only his body and his psychic powers, but his cloths and his house, his wife and children, his ancestors and friends, his reputation and works, his land, and yacht and bank account. All these things give the same emotions. If they wax and prosper, he feels triumphant; if they dwindle and die, he feels cast down."

– William James, *The Principles of Psychology*, New York: Henry Holt & Co., 1890

1 Introduction

The fact that control matters in economic interactions is an empirical ubiquity, and the issue of the allocation of control has been extensively studied in economics (e.g., Aghion and Tirole (1997), Dessein (2002), Hart and Moore (1999), and others). Moreover, it also appears that agents' choices among different ownership modes, organizational forms and contracts seem to be shaped by the differing degrees of control associated with these choices (see Boot, Gopalan and Thakor (2006), and Brau and Fawcett (2006), for example). Given the importance of control, the issue of how this control is allocated across transacting parties becomes an important decision variable (see, for example, Hart and Holmstrom (2002), and Van den Steen (2006)). This then brings up the fundamental question of *why* control matters to agents. The standard economic paradigm on this is that it is because of private control benefits (e.g., Aghion and Bolton (1992), and Baker, Gibbons and Murphy (2006)). If an agent derives private benefits from a particular project, he may wish to have control over its selection because in the absence of such control, those who care only about the financial value of the project may reject it. Given such a propensity on the agent's part to pursue financially-imprudent projects, the principal responds by using "high-powered" incentives that make the agent's compensation sufficiently sensitive to the project payoff to deter the agent from pursuing financially-imprudent projects that generate high private benefits for the agent. But such incentives are costly because they lead to risk-sharing inefficiencies due to the agent's risk aversion, so that riskier endeavors should use less payoff sensitivity in compensation contracts.[1]

[1]However, the empirical evidence with respect to the predictions emerging from this standard model of private-benefits-induced moral hazard is mixed. There is a puzzling lack of pay-for-performance sensitivity in executive

In contrast to this view, psychologists have developed what appears to be a more comprehensive – albeit less formal – view of why agents value control in organizations. Their notion is that agents value control over organizational decisions and outcomes because it gives them "psychological ownership." A distinction is made between "objective ownership" and "psychological ownership." Objective ownership refers to pecuniary compensation stemming from ownership of tangible assets; profit sharing, payoff-contingent bonuses and stock and option ownership are examples. The value attached to psychological ownership is presumed to arise from an innate desire to possess and control, something that may be hardwired into preferences (e.g., Pierce, Kostova and Dirks (2003)). Indeed, psychological ownership is often viewed as facilitating the agent's intrinsic motivation to do well, and to the extent that the extrinsic rewards associated with objective ownership may actually diminish intrinsic motivation (see, for example, Deci, Koestner and Ryan (1999), and Bénabou and Tirole (2003)), objective and psychological ownership may conflict in terms of their behavioral effects. This raises an interesting question about how psychological and objective ownership may be integrated in a contractual relationship between the principal and the agent.

Because psychological ownership is closely linked to the control given to the agent, an economic theory of both psychological and objective ownership seems within reach. We believe that the best way to approach this is to start with an environment in which agents value control for both the usual exogenous-private-benefits reason and for reasons that generate a desire for psychological ownership, and then to derive properties of optimal contracts between the principal and the agent in such an environment. One reason why the agent values control that is consonant with the desire for psychological ownership is that the agent knows that he and the principal may openly disagree on the right action to maximize a common objective function, i.e., they may have different prior beliefs. In this case, even an intrinsically-motivated agent who wishes to maximize the same objective function as the principal will wish to have the autonomy to make the decision he thinks is the best. How should the principal design optimal contracts in such a setting in which a risk-averse agent may care about control for reasons related both to exogenous private benefits and potential disagreement with the principal induced by heterogeneous prior beliefs? Can the properties of the optimal contracts provide economic content to psychological ownership and rationalize why real-world contracts may give agents both objective and psychological ownership? These are the questions we address in this paper. We show that optimal contracts designed in a private-benefits setting display strikingly different properties from those designed in a heterogeneous-

compensation (Jensen and Murphy (1990)) and empirically it does not appear that higher risk always lowers the payoff sensitivity of compensation contracts.

priors setting. Moreover, when both private benefits and heterogeneous priors are present, they interact in interesting ways in shaping optimal contracts, and the different aspects of psychological ownership discussed in the psychology literature have intuitively appealing analogs in familiar economic effects.

We derive our results in a principal-agent setting which has four key features: *moral hazard* associated with the agent shirking in providing an unobservable, private-costly input, which reduces the likelihood of project availability; an exogenous *private benefit* that makes the agent have a preference for a financially-inferior project; differences in prior beliefs across the principal and the agent that, conditional on project availability, may cause them to *disagree* on the right action/strategy for project success; and *career concerns* on the part of the agent that provide the agent with intrinsic motivation to see the project succeed. The principal takes these factors into account and designs an optimal incentive contract that includes: (1) the autonomy over project choice given to the agent; (2) the autonomy over the appropriate strategy/action choice for project success; (3) the share of the financial payoff on the project promised to the agent; and (4) the fixed wage to be paid to the agent. We use the term "autonomy" to represent the ex ante probability with which the agent will have the authority to make a decision, and "control" to represent the ex post realization of the state in which the agent has that authority, given his stipulated autonomy.

Our analysis produces numerous results, which are listed below.

- The agent values project-choice autonomy even without differences in prior beliefs, as long as private benefits of control exist.
- The agent values strategy-choice autonomy *ex ante* only when two conditions are simultaneously satisfied: he has career concerns and there are heterogeneous prior beliefs. Thus, the agent cares *ex ante* about this form of control only when he is intrinsically motivated through his career concerns to care about project success, and the potential for disagreement ensures that beliefs do *not* form a martingale. In this case, strategy-choice autonomy has positive incentive effects.
- In the pure private benefits case with no disagreement, the optimal contract for the agent has a fixed wage, a share of the project payoff, and complete strategy-choice autonomy. The agent's project-choice autonomy is decreasing in his (known) private benefit. Moreover, monetary incentives (the agent's share of the project payoff) and project-choice autonomy are *complements*.

- In the pure disagreement case with heterogeneous priors but no private benefits, the optimal contract for the agent has a fixed wage, a share of the project payoff, and complete project-choice autonomy. The agent's monetary incentives and his strategy-choice autonomy are *substitutes*. As the potential agreement between the principal and the agent increases, the agent's monetary incentives are diminished and his strategy-choice autonomy is increased.

- In the pure disagreement case with heterogeneous priors but no private benefits, the agent's strategy-choice autonomy increases monotonically as potential principal-agent agreement increases, as long as the project payoff in the successful state is unaffected by this disagreement. However, if the project payoff conditional on success increases as potential agreement decreases – reflecting possible gains from aggregating diverse viewpoints – then the agent's project-choice autonomy is *non-monotonic* in principal-agent agreement. Above a threshold agreement level, the agent's autonomy is increasing in agreement, but below the threshold, the agent's autonomy is *decreasing* in agreement. Thus, in circumstances where the principal is hiring an agent with a very different "view of the world" – perhaps due to the agent's expertise – the agent may actually be given more autonomy than he would be if the principal and the agent were more aligned.

- In the case in which both private benefits and heterogeneous priors exist, the optimal contract gives the agent a fixed wage, a share of the project payoff that is decreasing in principal-agent agreement, project-choice autonomy that complements the monetary incentives provided by the agent's share of project payoff, and a strategy-choice autonomy that substitutes for monetary incentives and is increasing in principal-agent agreement. A reduction in principal-agent agreement surprisingly makes it *more likely* that the agent will receive complete project-choice autonomy.

After deriving our main results, we use them to provide an economic interpretation of objective and psychological ownership. We interpret the agent's career concerns and project-choice autonomy and strategy-choice autonomy as part of psychological ownership, and his share of the project payoff as objective ownership. This allows us to provide economic content to the interaction between these two forms of ownership in the optimal contract.

This paper is related to the literature on control in principal-agent settings. This literature is huge, as it includes papers on delegation, centralization/decentralization, and hierarchies (e.g., Aghion, Dewatripont and Rey (2004), Aghion and Tirole (1997), Alonso and Matouschek (2004), Hart and Holmstrom (2002), and Zabojnik (2002)). While the common thread running through these papers and ours is that they deal with the allocation of control, their papers address issues that are very different from the optimal contracting issues with private benefits and disagreement that our paper focuses on. Prendergast (2002) studies the principal's tradeoff between risk and incentives and find that the principal either relinquishes *all* the control to the agent in project selection and relies on a financially high-powered incentive contract, or retains *all* the control over project choice without using an incentive contract to resolve the agent's private-benefits-induced moral hazard. Thus, in Prendergast (2002) the optimal contract relies entirely on either psychological ownership (if one interprets the agent's control over project choice in his paper as psychological ownership) or objective ownership but does not examine the interaction between the two. Baker, Gibbons and Murphy (2006) examine the issue of control allocation, but do so in a private-benefits setting. In two related papers, Van den Steen (2005, 2006) studies the differences between private benefits and disagreement in a principal-agent setting like we do. Van den Steen (2005) shows that private-benefits-induced moral hazard is best resolved with high-powered financial incentives, but using such a contract with disagreement due to heterogeneous priors can actually exacerbate the problem as the intrinsically-motivated agent may be induced even more to take an action the principal considers undesirable. That paper exposes the dark side of intrinsic motivation. Van den Steen (2006) derives numerous interesting results about how control should be allocated in settings in which the principal and the agent disagree due to different priors, including the complementarity between income rights and control rights, and shows that these results cannot be obtained with a private benefits model. While these papers touch on many themes that run through our work, neither is concerned with the design of optimal contracts with endogenously-determined degrees of autonomy for the agent in a setting in which private benefits and heterogeneous priors potentially interact.

There are also numerous papers on intrinsic motivation that are related to our work. Bénabou and Tirole (2003) develop a model in which extrinsic performance incentives (objective ownership) can adversely impact the agent's perception of the task or his own ability by communicating some private information the principal possesses, so that performance incentives can undermine the agent's intrinsic motivation. Besley and Ghatak (2005) show that in organizations in which the focus is on the mission rather than profits, it may be optimal to match the mission preferences of the principal and the agent, and that this could diminish the need for high-powered incentives. Murdock (2002) develops a model in which, under some conditions, intrinsic motivation and implicit contracts are complements. These papers show that intrinsic motivation can play an important role in incenting the agent and can affect how we view extrinsic performance-contingent monetary incentives. However, the issues they address differ from the question we focus on, in that they address the consequences of intrinsic motivation, as opposed to its genesis and its impact on the various forms of autonomy for the agent in an optimal contract.

Our intended incremental contribution is therefore threefold. First, we focus on the *economic reasons* why agents value control, beyond the standard assumption of private-benefits-induced self-serving behavior. Second, we characterize optimal contracts that expose an important distinction between private benefits and disagreement induced by heterogeneous priors. In particular, monetary incentives and incentives based on giving the agent decision-making autonomy are *complements* with private benefits and *substitutes* with disagreement. Third, we use our analysis to provide economic content for the somewhat nebulous concept of psychological ownership in the psychology literature.

The rest is organized as follows. Second 2 develops the model. Analysis of posterior beliefs and why the agent values control is in Section 3. In Section 4 we analyze optimal contracts. Section 5 examines how the results can be used to provide an economic interpretation of psychological and objective ownership. Section 6 concludes. All proofs are in the Appendix.

2 The Model

2.1 The Economic Environment

We consider a three-period economy with four dates ($t = 0, \ldots, 3$), zero riskless interest rate, and three players: a risk-neutral principal (she), a risk-averse agent (he) and a labor market (it). At $t = 0$, it is unknown whether the principal will have a project portfolio at $t = 1$; its availability depends on whether the agent invests some essential resources at $t = 0$. These resources could be thought of as the initial R&D, prototype development and market testing. If the agent invests these essential resources at $t = 0$, with a personal cost of $\Omega > 0$, the project portfolio will be available for sure at $t = 1$. If the agent shirks, there will be no project investment opportunity at $t = 1$. Whether the agent invested Ω or shirked is unobservable to the principal and hence noncontractible. At $t = 1$, it becomes known to all whether the project portfolio is available. If the project portfolio is available, it consists of two mutually-exclusive projects: project G and project B, from which one project must be chosen.[2] If project $i \in \{G, B\}$ is chosen, it needs to be implemented by a strategy $s \in \{s_P, s_A\}$ at $t = 2$. The outcome of the project, which is realized

[2]For example, the principal may not have enough resources to invest in both projects.

and observed by all at $t = 3$, can be either 1 (success) or 0 (failure) for project G, and either $\delta \in (0, 1)$ (success) or 0 (failure) for project B.

The project outcome depends on two things: whether the strategy undertaken is "proper" for the project, and the ability of the player who undertook the strategy. An "improper" strategy guarantees project failure with probability one, regardless of the ability of the player undertaking the strategy. If a proper strategy is undertaken by the principal, then with probability $\theta \in (0, 1)$ the project succeeds, and with probability $1-\theta$ the project fails. If a proper strategy is undertaken by the agent, then with probability $q \in (0, 1)$ the project succeeds, and with probability $1 - q$ the project fails. Here θ is a constant that represents the principal's commonly-known ability, and q is a random variable representing the agent's unknown ability; we will say more about this later when we introduce the agent's career concerns. Moreover, investing in project B yields a private benefit of $Z > 0$ to the agent that is not attainable from investing in project G.

The agent can distinguish noiselessly between project G and project B, whereas the principal and the labor market cannot. If the principal chooses a project from the portfolio at $t = 1$, then with probability $\tau \in (0, 1)$ the project is G, and with probability $1 - \tau$ the project is B. However, which project has been selected will become public knowledge at $t = 3$. The agent's superior ability to distinguish between type G and type B projects represents the agent's "local knowledge" about the project. The assumption of superior local knowledge is the standard justification for delegating tasks to the agent.

The agent is indispensable to the principal in the project-development stage ($t = 0$), because without the agent investing in project development, no project is available. In the subsequent project-selection stage ($t = 1$), however, the agent is *not* essential to the principal who can select a project from the portfolio and carry out that project herself by choosing a strategy $s \in \{s_P, s_A\}$ at $t = 2$. Of course, the agent's local-knowledge advantage in distinguishing between type G and type B projects could make it efficient for the principal to delegate project selection to the agent. *Figure 1* provides a schematic of project payoffs.

[*Figure 1* goes here]

The principal and the agent negotiate a contract at $t = 0$ and this contract, in addition to specifying a compensation rule for the agent, also allocates two types of control rights over project-related decisions. The first control right is over project choice. Conditional on project-portfolio availability, whether a project is chosen by the principal or the agent depends on *project-choice* autonomy given to the agent by the principal as part of the contract. That is, the contract stipulates the rule by which it will be determined who will choose the project at $t = 1$, and the agent's project-choice autonomy refers to the freedom the agent will have to make the project choice himself. The second control right is over strategy choice. The contract specifies the allocation of *strategy-choice* autonomy to determine who will choose the strategy for the selected project at $t = 2$. We will say more about these later when we talk about the principal's optimal contracting problem.

2.2 The Potential Disagreement between the Principal and the Agent Regarding the Proper Strategy

Conditional on project-portfolio availability, the principal always believes that the proper strategy to undertake for project $i \in \{G, B\}$ is s_P, whereas the agent draws his prior beliefs about the proper strategy at $t = 1$.[3] We allow for the possibility that the principal and the agent may have different prior beliefs regarding the proper strategy to carry out a project. More specifically, it is common prior knowledge at $t = 0$ that at $t = 1$ with probability $\rho \in [0, 1]$ the agent will agree with the principal that the proper strategy is s_P, whereas with probability $1 - \rho$ the agent will disagree with the principal and perceive the proper strategy to be s_A. Thus, the parameter ρ measures the degree of agreement between the principal and the agent, with a larger ρ representing a higher level of agreement between the two. Although the labor market observes the potential disagreement between the principal and the agent about the proper strategy, it does not know who is right and who is wrong: it simply believes that s_P and s_A are equally likely to be proper.[4]

The heterogeneity in priors we admit in our model can stem from a variety of sources, such as differences in experiences and innate attributes. Kurz (1994a, 1994b) has pointed out that when economic agents form beliefs based on their observations of past data rather than rational expectations, there can be multiple "rational beliefs," so that heterogeneity of beliefs is consistent with rationality. Morris (1995) argues that Bayesian rationality and heterogeneous priors are compatible. Kreps (1990) asserts that the assumption of common priors has no basis in philosophy or logic, so that a heterogeneous-prior-beliefs setup is more general than a common-priors setting.[5]

[3] We could have both the principal and the agent randomly draw prior beliefs at $t = 1$, with a specified correlation structure. Since this yields qualitatively the same results, we adopt the simpler specification of stipulating a constant belief for the principal.

[4] Assuming this fifty-fifty percentage probability distribution for the labor market simplifies our mathematical analysis (especially Lemma 1) without altering our main results qualitatively.

[5] A variety of papers have employed the assumption of heterogeneous priors, including Abel and Mailath (1994), Allen and Gale (1999), Boot, Gopalan and Thakor (2006), Coval and Thakor (2005), Song and Thakor (2006), and Van den Steen (2004, 2005, 2006); see Kandel and Pearson (1995) for empirical support.

2.3 The Agent's Career Concerns and Preferences

Let f be the probability density of the agent's ability q with support $[0, 1]$. Denote $\mathbf{E}(q) \equiv \bar{q}$ as the expected value and $\mathbf{Var}(q) \equiv \sigma^2$ as the variance of q. Although the probability distribution of q is common knowledge, the true value of q is unknown to everybody a priori,[6] and never directly observed ex post. Inferences about q can be made by the labor market, however, based on observed project outcomes. The labor market updates its prior belief about the agent's ability at $t = 3$ to $\mathbf{E}(q|\mathcal{F})$, where $\mathcal{F}$ is the information set of the labor market at $t = 3$. The set $\mathcal{F} = \{f(q), \{success, i\}, \{failure, i\}, \{no\}\}$, where $f(q)$ is the labor market's prior belief about the probability distribution of the agent's ability, $\{success, i\}$ means that project $i \in \{G, B\}$ succeeds (payoff of 1 for project G, and δ for project B) , $\{failure, i\}$ means that project $i \in \{G, B\}$ fails (payoff of 0 for either project G or project B), and $\{no\}$ denotes that no project outcome is realized at $t = 3$, i.e., the project portfolio was not available.

The agent's utility depends on the labor market's posterior assessment of his ability, as well as the financial payoff from the project based on the contract formed between him and the principal, and the private benefit if project B is selected. Suppose the agent's financial payoff from the project as stipulated in the contract is x, the agent's utility is assumed to be[7]

$$U_A = -e^{-r[x+Z\lambda+\alpha\mathbf{E}(q|\mathcal{F})]}, \tag{1}$$

where λ is an indicator function that takes the value 1 if project B is chosen, and 0 otherwise, $\alpha > 0$ is the weight the agent attaches to his reputational payoff, $\mathbf{E}(q|\mathcal{F})$, relative to his financial payoff, x, and $r > 0$ is the agent's absolute risk-aversion coefficient. We assume the agent's reservation utility to be $-e^{-r(\bar{u}+\alpha\bar{q})}$, where $\bar{u} > 0$ is a constant.

2.4 The Contract and the Agent Autonomies

The contract between the principal and the agent, which is written at $t = 0$, has four components: (1) a base salary, w, that is paid to the agent regardless of project outcome; (2) a share of project outcome, $\beta \in [0, 1]$; (3) the agent's project-choice autonomy, $\eta_T \in [0, 1]$, at $t = 1$; and (4) the agent's strategy-choice autonomy, $\eta_E \in [0, 1]$, at $t = 2$.

The agent's project-choice autonomy, η_T, and strategy-choice autonomy, η_E, can be understood as follows. Conditional on project-portfolio availability, with probability η_T the agent has

[6] We assume that the agent himself does not know q either to focus on the main issues and eliminate the concerns of information asymmetry over the agent's ability.

[7] The CARA utility function is assumed here solely for analytical tractability.

control over the project choice at $t = 1$, whereas with the remaining probability $1 - \eta_T$ the principal controls the project selection. At $t = 2$, with probability η_E the agent has the right to decide on the strategy for the selected project, whereas with the remaining probability $1 - \eta_E$ that decision rests with the principal. Although the labor market knows η_T and η_E as part of the contract, it does *not* know ex post who actually chose the project and who actually decided on the strategy. The first two components of the contract, namely the base salary, w, and the share of the project outcome, β, are standard in compensation contracts. The other two components, namely the possibility that the agent is able to choose a project that the principal dislikes and the possibility that the agent is able to undertake a strategy that the principal disagrees with, are special features of the contract in our model.

Since shirking by the agent at $t = 0$ leads to project unavailability, and the choice of project B at $t = 1$ is financially inferior, the principal's primary contract-design objectives are to incent the agent to not shirk and choose the financially-superior project G by utilizing a standard incentive mechanism, β, coupled with the determination of the agent's autonomies, η_T and η_E, taking into account the possibility of her disagreement with the agent. We assume that $w < 0$ is possible, so that the optimal contract is not constrained by limited liability.

2.5 Summary of Sequence of Events

To summarize the sequence of events described thus far, the time line is as follows. At $t = 0$, the principal is aware that: (1) the agent may shirk at $t = 0$ that leads to project-portfolio unavailability; (2) the agent, despite possessing the ability to distinguish between type G and type B projects, may choose the financially-inferior project B at $t = 1$ in order to enjoy private benefits; and (3) the agent may disagree with her at $t = 1$ regarding the proper strategy to implement the chosen project. The principal writes a contract for the agent. The contract specifies the agent's payment schedule (base salary, w, and project share, β), project-choice autonomy, η_T, and strategy-choice autonomy, η_E. Given the contract, the agent decides whether to develop the project portfolio. Suppose the project portfolio is available at $t = 1$. If the agent has project-choice autonomy, he selects his preferred project from the portfolio; otherwise the principal gets to choose the project. The agent forms his prior belief about the proper strategy to implement the project, which can be either the same as the principal's prior belief or different. At $t = 2$, the player who has strategy-choice control right decides on the strategy for the selected project. The project payoff is realized and observed by all at $t = 3$. The payoff is distributed between the principal and the agent according to the stipulated contract. The labor market updates its prior belief about the agent's ability. *Figure 2* pictorially summarizes the sequence of events.

[*Figure 2* goes here]

3 Analysis of the Labor Market's Posterior Beliefs and the Agent's Project and Autonomy Preferences

In this section, we study the labor market's posterior beliefs about the agent's ability. Several additional results that will be useful in analyzing the principal's optimal contract design are derived.

3.1 The Labor Market's Posterior Beliefs about the Agent's Ability

The first step of the analysis is to examine the labor market's posterior beliefs about the agent's ability at $t = 3$; these beliefs take into account that the principal designs the optimal contract, $\{w, \beta, \eta_T, \eta_E\}$, to incent the agent to develop the project portfolio and maximize her expected payoff. Suppose the agent develops the project portfolio at $t = 0$.[8] We have the following result:

Lemma 1. *Suppose the agent develops the project portfolio. Then, for each given contract,* $\{w, \beta, \eta_T, \eta_E\}$, *the labor market's posterior beliefs about the agent's ability corresponding to project success and failure for project* $i \in \{G, B\}$ *are*

$$\mathbf{E}(q|success, i) = \bar{q} + \frac{\sigma^2 \eta_E}{\bar{q}\eta_E + \theta(1-\eta_E)}, i \in \{G, B\}, \quad (2)$$

$$\mathbf{E}(q|failure, i) = \bar{q} - \frac{\sigma^2 \eta_E}{(2-\bar{q})\eta_E + (2-\theta)(1-\eta_E)}, i \in \{G, B\}, \quad (3)$$

respectively. Moreover, $\mathbf{E}(q|success, i)$ *is increasing in the agent's strategy-choice autonomy,* η_E, *whereas* $\mathbf{E}(q|failure, i)$ *is decreasing in* η_E, $\forall i \in \{G, B\}$.

The result is readily interpretable. Since project success or failure depends partially on the ability of the player who undertakes the strategy, and the agent undertakes the strategy with probability η_E for a given contract $\{w, \beta, \eta_T, \eta_E\}$, it is clear that the labor market's posterior belief about the agent's ability is revised upward when the project succeeds and downward when the project fails, i.e., $\mathbf{E}(q|success, i) > \bar{q} > \mathbf{E}(q|failure, i), i \in \{G, B\}$. Moreover, when the agent has

[8]This will be true in equilibrium because the agent's incentive compatibility constraint will be satisfied.

greater strategy-choice autonomy (higher η_E), the project outcome depends *more* on his ability. Thus, the labor market's posterior belief about the agent's ability is *more sensitive* to the project outcome when the agent has greater strategy-choice autonomy, i.e., $\partial \mathbf{E}(q|success, i)/\partial \eta_E > 0$, and $\partial \mathbf{E}(q|failure, i)/\partial \eta_E < 0, i \in \{G, B\}$.

The following intermediate result is useful.

Corollary 1. *The labor market's posterior assessment about the agent's ability forms a martingale using the labor market's belief about the proper strategy, i.e., the labor market's expected posterior belief about the agent's ability is equal to its prior belief about the agent's ability. However, the labor market's posterior ability assessment does not form a martingale using the agent's belief about the proper strategy: it is a submartingale if $\bar{q}$ and/or ρ is sufficiently high, whereas it is a supermartingale if $\bar{q}$ and/or ρ is sufficiently low.*

The intuition is as follows. There are two types of beliefs here. One type is prior beliefs about the agent's ability, which are homogenous across the agent, the principal and the labor market. The other type is prior beliefs about the proper strategy for the project, which are heterogeneous, with the agent's priors differing from those of the market. The labor market's posterior assessment about the agent's ability is based on its own beliefs about the proper strategy, i.e., s_P and s_A are equally likely to be proper. The result that the labor market's assessment about the agent's ability forms a martingale using the market's own beliefs about the proper strategy is a standard result in the career concerns literature (e.g., Holmstrom and Ricart i Costa (1986)). However, the agent's beliefs about the proper strategy, and hence the probability of project success, are different from the market's beliefs. If the agent's expected ability, $\bar{q}$, and/or the level of principal-agent agreement, ρ, is sufficiently high, then the agent's belief about the likelihood of project success is higher than the market's belief.[9] Thus, when the agent uses his own prior beliefs about the proper strategy and computes the expected value of the market's posterior assessment of his ability, this expectation is *not* equal to the market's prior belief about his ability. The agent's computation yields a higher expected value of the market's posterior assessment of his ability than the market's own computation (submartingale). In contrast, if the agent's expected ability and/or the level of principal-agent agreement is sufficiently low, then the agent's belief about the likelihood of project success is lower than the market's belief, and hence the agent's computation of the expected value

[9]To see this, note that if $\bar{q}$ is sufficiently high, then the agent believes that whenever he undertakes the strategy, the project is very likely to succeed; if ρ is sufficiently high, then the agent believes that s_P is very likely to be proper, and hence the project is perceived by the agent to be more likely to succeed than using the market's belief in which s_P is likely to be proper only with a 50% probability.

of the market's posterior assessment of his ability using the agent's own prior beliefs about the proper strategy yields a lower value than the market's computation (supermartingale).

3.2 The Agent's Project and Autonomy Preferences

The following lemma characterizes the agent's project-choice preference.

Lemma 2. *For each given contract $\{w, \beta, \eta_T, \eta_E\}$, there exists a cutoff value for the agent's project share, β^*, such that the agent prefers to select project B when $\beta < \beta^*$, and project G when $\beta \geq \beta^*$, whenever he has project-choice autonomy. Moreover, that cutoff value is increasing in the agent's private benefit from investing in project B, i.e., $\partial\beta^*/\partial Z > 0$.*

This lemma says that *ceteris paribus* the agent prefers project B even though it is financially inferior compared to project G. The reason is that investing in project B yields the agent a private benefit, Z, that is not available with project G. Consequently, the principal needs to rely on sufficiently high-powered incentives, as reflected in a sufficiently large β, to incent the agent to choose the financially-superior project G whenever the agent has project-choice autonomy. It is then transparent that the principal's reliance on the power of the incentive contract becomes stronger when the agent's private benefit from investing in project B becomes larger.

We now turn to the agent's preference for strategy-choice autonomy.

Lemma 3. *Strategy-choice autonomy, η_E, is ex ante valuable to the agent if the agent's expected ability is sufficiently high (sufficiently large $\bar{q}$) and the agent's career concern is sufficiently strong (sufficiently large α).*

This lemma relies on Corollary 1. If the agent has a high expectation of his own ability (high $\bar{q}$), strategy-choice autonomy, η_E, is ex ante valuable to him because the agent's ex ante expectation of the labor market's posterior assessment of his ability is higher than the prior, $\bar{q}$ (submartingale, see Corollary 1), and higher strategy-choice autonomy increases the precision with which the market revises its belief about the agent's ability. Recall that the labor market's favorable belief revision about the agent's ability is predicated on project success, which is more likely when the agent has higher ability and greater strategy-choice autonomy. When the agent has greater strategy-choice autonomy, the labor market gives the agent "more credit" for project success in its belief revision about the agent's ability. When the agent assigns a higher weight to his career concern (higher α), the benefit he attaches to the incremental reputational gain from having greater strategy-choice autonomy is amplified.

From now on, we will assume that the agent's expected ability is sufficiently high so that strategy-choice autonomy is ex ante valuable to the agent. Note that the agent's preference for strategy-choice autonomy hinges directly on two assumptions: disagreement over the strategy, and the agent's career concerns. With homogeneous prior beliefs and no disagreement, strategy-choice autonomy would be irrelevant to the agent's career concerns. And if the agent had no career concerns, he would not really care about project success, unless his compensation depends on project success. But this concern with project success can be eliminated if the principal pays the agent only a fixed wage. However, the agent's career concerns make him care about project success independent of his compensation contract, and the probability of this is higher when he is in control in an environment in which heterogeneous priors make it possible the principal will disagree with the agent over strategy choice. In other words, the agent cares *ex ante* about strategy-choice autonomy with disagreement because it is *only* with heterogeneous priors that the agent's calculation of the expected value of the labor market's posterior belief is *not* equal to the prior belief.

For the remaining analysis, we assume $\bar{q} = \theta$ to simplify and focus the analysis on the main issues. This assumption says that the agent on average has the same ability as the principal. If $\bar{q}$ is much larger than θ, then the principal may want to give the agent complete strategy-choice autonomy if their agreement is sufficiently high. If $\bar{q}$ is much smaller than θ, then the principal may not want to give the agent any strategy-choice autonomy even if their agreement is sufficiently high. That is, if $\bar{q}$ is too different from θ, then the ability difference between the principal and the agent will also impact the optimal contract design, and this effect may swamp the effects of disagreement, agent risk aversion and private benefits. By assuming $\bar{q} = \theta$, we eliminate this ability-difference effect on contract design. Thus, the labor market's posterior beliefs about the agent's ability corresponding to different outcomes at $t = 3$ are

$$\mathbf{E}(q|success, i) = \bar{q} + \frac{\sigma^2 \eta_E}{\bar{q}}, i \in \{G, B\}, \tag{4}$$

$$\mathbf{E}(q|failure, i) = \bar{q} - \frac{\sigma^2 \eta_E}{2 - \bar{q}}, i \in \{G, B\}. \tag{5}$$

4 Analysis of Optimal Contracts

We now characterize the optimal contracts in various cases, taking into account the results of the previous section.

4.1 Optimal Contract with Private Benefit But No Disagreement

We first analyze the case in which the agent derives private benefit from investing in project B but there is no principal-agent disagreement regarding the proper strategy. Without loss of generality, we assume that the agent agrees with the principal that the proper strategy is s_P.

The following intermediate result is useful in analyzing the principal's contracting problem.[10]

Lemma 4. *In the case with private benefit but no disagreement, the agent is given complete strategy-choice autonomy, i.e.,* $\eta_E^P = 1$. *Whenever the agent has project-choice autonomy, he chooses project* G *if his share of the project output,* β^P, *is greater than a cutoff value,* β^{*P}, *and project* B *if* β^P *is smaller than* β^{*P}, *where* β^{*P} *is defined as:*

$$e^{-r\left[\beta^{*P}\delta+Z+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} - e^{-r\left[\beta^{*P}+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} = (1-\bar{q})\left(1-e^{-rZ}\right). \tag{6}$$

We know from Lemma 3 that strategy-choice autonomy is ex ante valuable to the agent. Strategy-choice autonomy is irrelevant to the principal in this special case since there is no disagreement, so the agent is given complete strategy-choice autonomy. The result about the agent's project preference conditional on his incentive compensation, β^P, is reminiscent of Lemma 2.

The principal's optimal contracting problem can be analyzed as follows.

Case A: If the principal chooses $\beta \geq \beta^{*P}$ (where β^{*P} is given by (6)), then the agent always chooses project G whenever he has project-choice autonomy. In this case, the principal's optimal contracting problem solves:

$$\max_{\{w,\beta>\beta^{*P},\eta_T,\eta_E=1\}} \underbrace{[\eta_T+(1-\eta_T)\tau][\bar{q}(1-\beta)-w]}_{\text{project } G} + \underbrace{(1-\eta_T)(1-\tau)[\bar{q}(1-\beta)\delta-w]}_{\text{project } B}, \tag{7}$$

subject to the agent's participation constraint requiring that the agent gets at least his reservation utility from project development:

$$\begin{aligned}
&\underbrace{(1-\eta_T)(1-\tau)\left[\bar{q}\left[-e^{-r[w+\beta\delta+Z+\alpha\mathbf{E}(q|success,B)]}\right]+(1-\bar{q})\left[-e^{-r[w+Z+\alpha\mathbf{E}(q|failure,B)]}\right]\right]}_{\text{project } B} \\
&+\underbrace{[\eta_T+(1-\eta_T)\tau]\left[\bar{q}\left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right]+(1-\bar{q})\left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right]\right]}_{\text{project } G} \\
&\geq -e^{-r(\bar{u}+\alpha\bar{q})},
\end{aligned} \tag{8}$$

[10] We use the superscript "P" to denote the case with private benefit but no disagreement.

and the agent's incentive-compatibility constraint requiring that project development is no worse than shirking:

$$\underbrace{(1-\eta_T)(1-\tau)\left[\bar{q}\left[-e^{-r[w+\beta\delta+Z+\alpha\mathbf{E}(q|success,B)]}\right]+(1-\bar{q})\left[-e^{-r[w+Z+\alpha\mathbf{E}(q|failure,B)]}\right]\right]}_{\text{project } B}$$
$$+\underbrace{[\eta_T+(1-\eta_T)\tau]\left[\bar{q}\left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right]+(1-\bar{q})\left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right]\right]}_{\text{project } G}$$
$$\geq -e^{-r(w+\Omega+\alpha\bar{q})}, \tag{9}$$

where $\mathbf{E}(q|success, i)$ and $\mathbf{E}(q|failure, i)$, $i \in \{G, B\}$ are given by (4) and (5), respectively.

Case B: If the principal chooses $\beta < \beta^{*P}$ (where β^{*P} is given by (6)), then the agent always chooses project B whenever he has project-choice autonomy. In this case, the principal's optimal contracting problem solves:

$$\max_{\{w,\beta<\beta^{*P},\eta_T,\eta_E=1\}} \underbrace{(1-\eta_T)\tau[\bar{q}(1-\beta)-w]}_{\text{project } G}+\underbrace{[\eta_T+(1-\eta_T)(1-\tau)][\bar{q}(1-\beta)\delta-w]}_{\text{project } B}, \tag{10}$$

subject to the agent's participation constraint requiring that the agent gets at least his reservation utility from project development:

$$\underbrace{[\eta_T+(1-\eta_T)(1-\tau)]\left[\bar{q}\left[-e^{-r[w+\beta\delta+Z+\alpha\mathbf{E}(q|success,B)]}\right]+(1-\bar{q})\left[-e^{-r[w+Z+\alpha\mathbf{E}(q|failure,B)]}\right]\right]}_{\text{project } B}$$
$$+\underbrace{(1-\eta_T)\tau\left[\bar{q}\left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right]+(1-\bar{q})\left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right]\right]}_{\text{project } G}$$
$$\geq -e^{-r(\bar{u}+\alpha\bar{q})}, \tag{11}$$

and the agent's incentive-compatibility constraint requiring that project development is no worse than shirking:

$$\underbrace{[\eta_T+(1-\eta_T)(1-\tau)]\left[\bar{q}\left[-e^{-r[w+\beta\delta+Z+\alpha\mathbf{E}(q|success,B)]}\right]+(1-\bar{q})\left[-e^{-r[w+Z+\alpha\mathbf{E}(q|failure,B)]}\right]\right]}_{\text{project } B}$$
$$+\underbrace{(1-\eta_T)\tau\left[\bar{q}\left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right]+(1-\bar{q})\left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right]\right]}_{\text{project } G}$$
$$\geq -e^{-r(w+\Omega+\alpha\bar{q})}, \tag{12}$$

where $\mathbf{E}(q|success, i)$ and $\mathbf{E}(q|failure, i)$, $i \in \{G, B\}$ are given by (4) and (5), respectively.

The optimal contract is characterized in the following proposition:

Proposition 1. *In the case with private benefit but no disagreement, there exists two cutoff values for the agent's private benefit, Z_L^{*P} and Z_H^{*P}, such that the optimal contract, $\{w^P, \beta^P, \eta_T^P, \eta_E^P\}$, is as follows:*

1. *If* $Z \leq Z_L^{*P}$, *then the agent receives a fixed wage,* $w^P = \bar{u} - \Omega$, *a share of the project output,* β_M^P, *complete strategy-choice autonomy, and complete project-choice autonomy, i.e.,* $\eta_E^P = 1$ *and* $\eta_T^P = 1$. *The agent always chooses project* G. *Both the agent's participation and incentive-compatibility constraints are binding.*

2. *If* $Z \in \left(Z_L^{*P}, Z_H^{*P}\right]$, *then the agent receives a fixed wage,* $w^P < \bar{u} - \Omega$, *a share of the project output,* β_H^P, *which exceeds* β_M^P, *complete strategy-choice autonomy, and complete project-choice autonomy, i.e.,* $\eta_E^P = 1$ *and* $\eta_T^P = 1$. *The agent always chooses project* G. *The agent's participation constraint is binding, whereas his incentive-compatibility constraint is not binding.*

3. *If* $Z > Z_H^{*P}$, *then the agent receives a fixed wage,* $w^P = \bar{u} - \Omega$, *a share of the project output,* β_L^P, *which is less than* β_M^P, *complete strategy-choice autonomy, and no project-choice autonomy, i.e.,* $\eta_E^P = 1$ *and* $\eta_T^P = 0$. *Both the agent's participation and incentive-compatibility constraints are binding.*

Moreover, Z_H^{*P} *is decreasing in the principal's ability to correctly identify project* G *from the portfolio, i.e.,* $\partial Z_H^{*P}/\partial \tau < 0$.

The key of this proposition is that the agent's monetary incentive, β^P, and his project-choice autonomy, η_T^P, are *complements* in the case with private benefit but no disagreement; β^P is lower when η_T^P is lower. The intuition is as follows. The principal uses both high-powered monetary incentives and project-choice autonomy to combat the agent's preference to invest in the financially-inferior project B (which yields the agent a private benefit). Each mechanism, however, entails a cost. Taking project-choice autonomy away from the agent can diminish the agent's ability to invest in project B, but it causes a loss of the agent's "local knowledge" in project selection, and hence generates a potential selection error. Recall that when the principal selects the project, she erroneously selects project B with probability $1 - \tau$. Giving the agent a relatively high share of the project output, β^P, can also incent the agent to choose project G rather than project B, but an increase in β^P in the optimal contract leads to less efficient risk sharing with the risk-averse agent. When the agent's incentive to invest in project B is sufficiently strong (sufficiently high Z), the cost to the principal of giving project-choice autonomy, η_T^P, to an agent strongly prone to select the wrong project and then incenting him to select the right project with a very high β^P exceeds the cost of a potential project-selection error by the principal. Thus, the principal sets $\eta_T^P = 0$. Since the agent has no project choice autonomy, the principal's need to rely on a high-powered monetary incentive to induce the agent to choose project G is also eliminated, so the principal chooses a relatively small β^P.[11] By contrast, when Z is sufficiently low, giving the agent project-choice autonomy is not particularly costly for the principal, so the principal sets $\eta_T^P = 1$, giving the agent complete project-choice autonomy. This has the benefit of also allowing the principal to capture the agent's local knowledge in project selection. However, the only instrument now left for the principal to ensure that the agent selects project G is the monetary incentives, β^P. So, β^P is set relatively high.

4.2 Optimal Contract with Disagreement But No Private Benefit

Now suppose there is no private benefit associated with project B. However, the principal and the agent may disagree with each other due to different prior beliefs about the proper strategy for the project. It is clear that project-choice autonomy is irrelevant in this case, since the agent has no incentive to choose project B. That is, η_T can take any value in $[0, 1]$.

Before analyzing the principal's optimal contracting problem, we first discuss the economic role of strategy-choice autonomy, η_E. As in the standard principal-agent problem, the principal can cope with the moral hazard stemming from the agent's aversion to expending effort to develop the project by giving him a sufficiently high-powered incentive contract (sufficiently high β). However, in our model, the principal has an additional incentive instrument at her disposal. As we showed in Lemma 3, strategy-choice autonomy is valuable to the agent. Moreover, as we saw in Lemma 1, the greater is the agent's strategy-choice autonomy, the greater is the enhancement in the agent's reputation ex post conditional on project success. This means that agent with a higher η_E has more to gain reputationally from a project success and is therefore less likely to shirk in his project-development effort. In other words, in addition to β, the principal can use η_E as an incentive device in coping with effort-aversion moral hazard. We now have:

Proposition 2. *In the case with disagreement, strategy-choice autonomy, η_E, and the monetary incentive provided by the agent's share of the project output, β, are substitutes for the principal in resolving the moral hazard stemming from the agent shirking from project development.*

This substitution effect between η_E and β is the main tradeoff we explore when we characterize the optimal contract in this case. It captures an important economic function played by agent autonomy not previously examined in the agency literature. The idea is that strategy-choice autonomy interacts with the agent's career concerns, so that providing the agent greater auton-

[11] The reason why β^P is not set at zero is that the agent still needs to be provided an incentive to invest in project development to generate the project portfolio at a personal cost, Ω.

omy permits the principal to reduce the reliance of the optimal contract on the costly monetary incentive represented by β. This may be efficient because any increase in β sacrifices risk sharing and is costly to the principal.

This substitution effect in our model stands in apparent contrast to the result in Van den Steen (2005) that agents subject to authority (in our terminology, an agent subject to more authority has lower autonomy) have lower-powered incentives (i.e., lower β). One reason for the difference is that we endogenize both autonomy (authority) and monetary incentives (β) and then solve for the principal's optimal contracting problem, whereas Van den Steen (2005) treats authority as exogenously given.

The principal's optimal contracting problem at $t = 0$ solves:

$$\max_{\{w,\beta,\eta_T=1,\eta_E\}} \bar{q}(1-\eta_E+\eta_E\rho)(1-\beta)-w, \tag{13}$$

subject to the agent's participation constraint requiring that the agent gets at least his reservation utility from project development:

$$\bar{q}[\eta_E+(1-\eta_E)\rho]\left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right]+\left[1-\bar{q}[\eta_E+(1-\eta_E)\rho]\right]\left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right] \geq -e^{-r(\bar{u}+\alpha\bar{q})}, \tag{14}$$

and the agent's incentive-compatibility constraint such that project development is no worse than shirking for the agent:

$$\bar{q}[\eta_E+(1-\eta_E)\rho]\left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right]+\left[1-\bar{q}[\eta_E+(1-\eta_E)\rho]\right]\left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right] \geq -e^{-r(w+\Omega+\alpha\bar{q})}. \tag{15}$$

The following proposition characterizes the main features of the optimal contract.[12]

Proposition 3. *In the case with disagreement but no private benefit, there exists an optimal contract, $\{w^D, \beta^D, \eta_T^D, \eta_E^D\}$, that has the following features:*

1. *The agent receives a fixed wage, $w^D = u_A - \Omega$;*
2. *The agent's share of the project output, β^D, is decreasing in the level of agreement between the principal and the agent, ρ, and the degree of the agent's risk aversion, r, i.e., $\partial\beta^D/\partial\rho < 0$ and $\partial\beta^D/\partial r < 0$;*

[12] We use the superscript "D" to denote the case with disagreement but no private benefit.

3. The agent's strategy-choice autonomy, η_E^D, is increasing in the level of agreement between the principal and the agent and the degree of the agent's risk aversion, i.e., $\partial\eta_E^D/\partial\rho > 0$ and $\partial\eta_E^D/\partial r > 0$. The agent's project-choice autonomy, η_T^D, can take any value in $[0, 1]$.

This characterizes how autonomy and monetary incentives interact in the optimal contract. In particular, the interaction is driven primarily by the effect of two mediating variables: the agent's risk aversion and the degree of principal-agent agreement. An increase in the agent's risk aversion or the degree of principal-agent agreement causes monetary incentives to weaken (β^D declines) and the agent's autonomy to increase. The intuition is as follows. Although moral hazard can be resolved by giving the agent either a sufficiently high monetary incentive (high β^D) or a sufficiently high autonomy (high η_E^D), each mechanism entails a cost. The principal can incent the agent to invest in project development by giving him a relatively high η_E^D, but the cost of doing so is that the agent may select a strategy for the project that the principal does not consider proper. Similarly, the principal can incent the agent by giving him a relatively high β^D, but this distorts risk sharing. As the agreement between the principal and the agent increases, the cost to the principal of relying on strategy-choice autonomy declines because the principal considers it more likely that the agent will choose the proper strategy for the project. Hence, the agent's strategy-choice autonomy increases, and this permits the principal to weaken monetary incentives by lowering β^D and improving risk sharing.

4.3 Does the Agent's Strategy-Choice Autonomy always Increase with Agreement?

The preceding analysis suggests that higher agreement between the principal and the agent is Pareto improving and leads invariably to higher strategy-choice autonomy for the agent. While this is true given our assumption thus far, we now point out that there are circumstances in which this need not be true. Assume, as in the previous subsection, that there is principal-agent disagreement but no private benefit. Suppose the payoff of project G, when it is successful, is $x = \rho x_P + (1 - \rho)x_A$, with $x_A > x_P$ are positive constants. Note that $\partial x/\partial\rho = x_P - x_A < 0$, which implies that as principal-agent agreement increases (higher ρ), the incremental value of the agent's contribution of the project outcome decreases. This is a reduced-form characterization that captures the notion that higher agreement can sometimes be attained only at the expense of efficient information aggregation between the principal and the agent.[13] The question we ask now

[13]That is, if we contract with those who are like us, we may disagree less, but we will also have less to learn from each other.

is: how does this feature of agreement affect the agent's strategy-choice autonomy in the optimal contract?

This question is addressed in the following proposition:

Proposition 4. *There exists a cutoff value of principal-agent agreement, ρ^*, such that the agent's equilibrium strategy-choice autonomy is decreasing in principal-agent agreement for $\rho < \rho^*$, and increasing in principal-agent agreement for $\rho > \rho^*$.*

The intuition is as follows. When principal-agent agreement, ρ, is relatively high, the cost to the principal of giving the agent more strategy-choice autonomy is increasing in ρ for the reason discussed in Section 4.2. However, the twist now is that as ρ declines from a high value, the project payoff in the successful state is increasing. Because of the substitutability between strategy-choice autonomy, η_E^D, and the monetary incentive, β^D, the decline in η_E^D as ρ declines is accompanied by an increase in β^D. For each value of ρ, the principal's optimal contract is determined such that the principal is just indifferent between a decrease in η_E^D and an increase in β^D. However, the marginal cost to the principal of an increase in β^D is increasing as ρ falls because the project payoff conditional on success is increasing as ρ declines. Once ρ becomes sufficiently small, say below ρ^*, the marginal cost of an increase in β^D will therefore exceed the marginal cost of an increase in the agent's strategy-choice autonomy, and the relationship between ρ and β^D and thus between ρ and η_E^D *reverses.*

In *Figure 3*, we show how strategy-choice autonomy and principal-agent agreement are related. This result has an interesting implication. In situations in which the principal is hiring the agent to perform a task with which the principal has little familiarity and the agent has expertise and beliefs that create relatively low agreement between the principal and the agent, it may turn out that the agent gets substantial autonomy. This may be the case, for example, when a founder is hiring a professional manager to take the business in a very different direction by implementing a growth strategy that differs significantly from the firm's past strategy.

[*Figure 3* goes here]

4.4 Optimal Contract with Both Private Benefit and Disagreement

Finally, we analyze the case with both private benefit associated with project B and disagreement between the principal and the agent over the proper project-investment strategy.

Combining the analysis in the previous two cases, we can characterize the optimal contract in the following proposition.[14]

Proposition 5. *In the case with private benefit and disagreement, there exists two cutoff values for the agent's private benefit, Z_L^{*PD} and Z_H^{*PD}, such that the optimal contract, $\{w^{PD}, \beta^{PD}, \eta_T^{PD}, \eta_E^{PD}\}$, is as follows:*

1. *If $Z \leq Z_L^{*PD}$, then the agent receives: (i) a fixed wage, $w^{PD} = \bar{u} - \Omega$; (ii) a share of the project output, β_M^{PD}, that is decreasing in the principal-agent agreement, ρ, and the agent's risk aversion, r; (iii) complete project-choice autonomy, i.e., $\eta_T^{PD} = 1$; and (iv) strategy-choice autonomy, $\eta_E^{PD} \in [0,1]$, that is increasing in ρ and r. The agent always chooses project G. Both the agent's participation and incentive-compatibility constraints are binding.*

2. *If $Z \in \left(Z_L^{*PD}, Z_H^{*PD}\right]$, then the agent receives: (i) a fixed wage, $w^{PD} < \bar{u} - \Omega$; (ii) a share of the project output, β_H^{PD} that exceeds β_M^{PD}, and is decreasing in ρ and r; (iii) complete project-choice autonomy, i.e., $\eta_T^{PD} = 1$; and (iv) strategy-choice autonomy, $\eta_E^{PD} \in [0,1]$, that is increasing in ρ and r. The agent always chooses project G. The agent's participation constraint is binding, whereas his incentive-compatibility constraints is not binding.*

3. *If $Z > Z_H^{*PD}$, then the agent receives: (i) a fixed wage, $w^{PD} = \bar{u} - \Omega$; (ii) a share of the project output, β_L^{PD}, that is smaller than β_M^{PD}, and decreasing in ρ and r; (iii) no project-choice autonomy, i.e., $\eta_T^{PD} = 0$; and (iv) strategy-choice autonomy, $\eta_E^{PD} \in [0,1]$, that is increasing in ρ and r. Both the agent's participation and incentive-compatibility constraints are binding.*

Moreover, Z_H^{*PD} is decreasing in the principal's ability to correctly identify project G, and in ρ, i.e., $\partial Z_H^{*PD}/\partial \tau < 0$ and $\partial Z_H^{*PD}/\partial \rho < 0$.

This result combines Propositions 2 and 3. The additional insight here is that, Z_H^{*PD}, the cutoff value of Z such that the agent receives no project-choice autonomy, when Z exceeds Z_H^{*PD}, is *decreasing* in the degree of principal-agent agreement, ρ. That is, as the degree of principal-agent agreement decreases, the agent is more likely to receive complete project-choice autonomy. This surprising result comes from the substitution effect between monetary incentives and strategy-choice autonomy in the case with pure disagreement, and the complementarity effect between monetary incentives and project-choice autonomy in the case with pure private benefit. When

[14] We use the superscript "PD" to denote the case with both private benefit and disagreement.

principal-agent agreement decreases, *ceteris paribus* the principal gives the agent less strategy-choice autonomy, but greater monetary incentives (see Proposition 3). Note that greater monetary incentives via a higher β can curb the agent's desire to choose the financially-inferior project B, and this tilts the principal's tradeoff between project-choice autonomy and β in combating the agent's private-benefit induced moral hazard in favor of project-choice autonomy (see Proposition 1). Consequently, lower agreement leads to less strategy-choice autonomy but more project-choice autonomy for the agent in equilibrium.

Thus, our analysis has some clear implications that quite sharply delineate the effects of principal-agent disagreement over project choice induced by the agent's private benefits (the "pure private benefit" case) from the effects of disagreement over strategy choice induced by heterogenous priors (the "pure disagreement" case). We summarize these implications here. First, with pure private benefit, monetary incentives, β, and *project-choice* autonomy, η_T, are *complements*; when one is lower in the optimal contract, the other is lower too. Second, in contrast, with pure disagreement, monetary incentives and *strategy-choice* autonomy, η_E, are *substitutes*; an increase in principal-agent agreement, ρ, causes an increase in η_E in the optimal contract, and a decrease in β. Third, when both private benefit and disagreement are present, we essentially get a pasting together of the two "pure" cases in the sense that project-choice autonomy and monetary incentives are complements, whereas strategy-choice autonomy and monetary incentives are substitutes. Fourth, when both private benefit and disagreement are present, a surprising difference between strategy-choice autonomy and project-choice autonomy emerges. While strategy-choice autonomy is increasing in principal-agent agreement ρ, project-choice autonomy may actually be *higher* at a *lower* ρ. This points to an interesting interaction between private benefits and disagreement in the optimal contract.

5 Application of the Analysis to Psychological and Objective Ownership

One of the features that distinguishes the preceding analysis from the usual principal-agent optimal contracting literature is that the optimal contract includes not only the standard pecuniary incentives (fixed wage and payoff-contingent compensation), but also the allocation of control rights over both a project choice decision and a project implementation (strategy choice) decision. This permits us to link our analysis to the literature in organization behavior and psychology on "psychological ownership" and its role in affecting the behavior of agents. The purpose of this section is to first briefly introduce the literature on psychological ownership and then use our preceding analysis to provide economic content into the various aspects of psychological ownership discussed in the literature.

5.1 Psychological and Objective Ownership

The common thread running through the economics and psychology literatures on the issue of agent incentives and behavior is *control*. While the dominant paradigm in economics suggests that agents value control merely to garner some variant of pecuniary benefits generally labeled as "private benefits of control," psychologists have taken a more holistic view of why agents value control in organizations. They have coined the term "psychological ownership" to include control in the economic sense. But to go beyond it, the literature in psychology has developed the idea that "ownership can be thought of as a dual creation – part an objective and part a psychological state" (Pierce and Rodgers (2004)). The "objective ownership" refers to the agent's share of the financial ownership (akin to a shareholder's share of company profits), and the "psychological ownership" refers to the control the agent perceives over the eventual outcome. Psychologists argue that the value agents attach to psychological ownership may stem rationally from its utility enhancement value (e.g., Richins (1994)) or simply because of the agent's innate desire to possess and control, a desire that has deep biological (evolutionary) and social roots (e.g., Dittmar (1992), and Pierce, Kostova and Dirks (2003)). Pierce, Kostova and Dirks (2001) conceptually define psychological ownership as "the state in which individuals feel as though the target of ownership or a piece of that target is 'theirs'." Examples abound: the quibbles among young children over toys (it is "*my*" car, not yours) (Isaacs (1933)), numerous lawsuits in which scientists go to the court to defend themselves as the original creators of "their" ideas and inventions, "territoriality" behavior of organization members over their physical spaces (it is "*my*" office), ideas (it is "*our*" project) and relationships ("*I*" am his supervisor) (Brown, Lawrence and Robinson (2005)), and many other cases of feelings of possession that people develop, regardless of their legal ownership. Pierce, Kostova and Dirks (2003) identify three aspects of psychological ownership: (1) *efficacy*, which is the ability to effect desired outcomes; (2) *self-identity*, which is the desire to achieve recognition and prestige; and (3) *territoriality* (something to call one's own). The psychology literature has extensively investigated the root causes of the desire for psychological ownership and the function it serves (e.g., Dittmar (1992), Furby (1978), and Pierce, Kostova and Dirks (2003)), the mechanisms through which psychological ownership is achieved (e.g., Prelinger (1959), and Weil (1952)), and the effects of psychological ownership (e.g., Organ (1988)).

This literature, however, has little apparent economic content, and it is not obvious what *economic* motivations drive agents to desire psychological ownership. Moreover, if psychological and objective ownership are both known to matter to agents, then incentive contracts should exploit this and should display certain properties that reflect the relative values agents attach to psychological and objective ownership. We now examine these issues within the context of our preceding analysis.

5.2 Psychological and Objective Ownership within the Framework of Our Model

Given the above definitions of the three components of psychological ownership, we can now relate each component to an endogenous variable in our model. For example, it is easy to see that objective ownership can be defined as the agent's share of the project payoff, β. We now turn to psychological ownership.

Consistent with the view in psychology that psychological ownership refers to the control the agent perceives over the final outcome, we define psychological ownership as the agent's project-choice autonomy, η_T, at $t = 1$ and his strategy-choice autonomy, η_E, at $t = 2$, with higher η_T and η_E representing larger psychological ownership for the agent. This definition of psychological ownership deserves some explanation. First, larger autonomy for the agent does *not* itself represent a larger ownership of the project for the agent financially: it just means that the agent has greater control in affecting the distribution of the project outcome that may impact his financial as well as reputational payoffs. That is, psychological ownership is distinct from objective ownership. Second, project-choice autonomy and strategy-choice autonomy capture an important means for the agent to gain psychological ownership, namely through control. This is in the spirit of the psychology literature that one mechanism through which an individual develops psychological ownership of an object is through greater control over the object. The agent's strategy-choice autonomy corresponds to the "efficacy" aspect of psychological ownership that grants the agent the ability to produce his desired outcome by choosing the strategy he prefers. The agent's project-choice autonomy corresponds to the "territoriality" nature of psychological ownership that fulfills the agent's "territorial needs" in terms of the project "in his territory." These territorial needs refer to the agent's feeling of *ownership* of the project, which gives him the right to decide what to do with the project.

We now have the following proposition which addresses the question of *where* the agent's desire for psychological ownership comes from. That is, the proposition seeks to provide economic content to *why* agents seek self-identity, efficacy and territoriality.

Proposition 6. *The agent's desire for the three components of psychological ownership, namely, self-identity, efficacy and territoriality, arises from the agent's career concerns, principal-agent disagreement due to heterogenous prior beliefs, and the agent's private benefit, respectively.*

Thus, we see that the desire for self-identity, which is merely a reflection of the value the agent attaches to recognition and prestige, is analogous to career concerns in that the reputational enhancement linked to an elevation in the agent's ability perception by the market is very similar to greater prestige. Efficacy is analogous to control over outcomes, which in our model is achieved through strategy-choice autonomy. However, strategy-choice autonomy is valuable to the agent in our model only because of the possibility of principal-agent disagreement. Hence, disagreement due to differing priors can be a source of the agent's desire for efficacy. Finally, territoriality reflects a sense of ownership over an object or a domain, which in our model can be achieved by being in control of project choice. And project choice matters to the agent largely because of his private benefit. That is, the desire for territoriality may be engendered by private control benefits. Interestingly, because strategy choice can matter to the agent even without private benefits as long as the agent has career concerns, our analysis suggests an interesting interaction between self-identity and efficacy, two components of psychological ownership, in the sense that self-identity can generate a desire for efficacy.

With this perspective, our analysis makes a number of points. First, an optimal contract will generally include both objective ownership and psychological ownership. Second, objective ownership and psychological ownership may be either complements or substitutes, depending on whether disagreement or private benefit represents the dominant concern. When disagreement is the dominant concern, objective ownership and psychological ownership are substitutes. When private benefit is the dominant concern, objective ownership and psychological ownership are complements. Third, when both disagreement and private benefit are present, different aspects of psychological ownership interact in different ways with objective ownership. The agent's desire for self-identity serves as the springwell of his intrinsic motivation for project success and reinforces the positive incentive effects of objective ownership. The efficacy part of psychological ownership is a substitute for objective ownership in that an optimal contract that gives the agent greater efficacy gives him lower objective ownership. And the territoriality part of psychological ownership is a complement for objective ownership in that agents given more territoriality are also given greater objective ownership. This analysis thus provides a new perspective on the tension between extrinsic rewards and intrinsic motivation that Bénabou and Tirole (2003) study.

6 Conclusion

We have explored why agents care about control *ex ante*, and examined the desire of optimal incentive contracts when the principal is confronted with three challenges: moral hazard arising from the agent's propensity to shirk in the provision of a private-costly input, potentially distorted project choice by an agent motivated by private benefits but possessing a local-knowledge advantage over the principal in project selection, and heterogeneous prior beliefs that generate potential disagreement with the agent over *how* best to make the project successful. The properties of the optimal contract reveal the important role that various forms of decision-making autonomies for the agent play in providing the appropriate behavioral incentives for the agent. The sharp difference between private benefits and heterogeneous priors in the optimal contract highlights the very specific dependence of our results on difference in beliefs.

Our analysis also infuses the notion of "psychological ownership" with economic content. In particular, career concerns and different types of decision control for the agent map nicely into different components of psychological ownership. Thus, something as seemingly fuzzy as psychological ownership is essentially "contractible."

Several areas seem promising for future research. One would be to more deeply investigate the potential tension between principal-agent agreement and the loss in value from creating a principal-agent team that "thinks too much alike." The conflict between the benefits of harmony and the benefits of aggregating diverse viewpoints has a familiar ring, and it could generate interesting insights in a heterogeneous-priors setting. Another area would be to examine incentive contracts with heterogeneous priors in a repeated-game setting with partial learning. To the extent that priors are not entirely dogmatic, principal-agent agreement may change through time, and the speed of change could be affected by the autonomy given to the agent. Anticipation of this by the principal is then likely to change the autonomy given to the agent in the optimal contract, relative to the static setting.

Appendix

Proof of Lemma 1: Given the contract $\{w, \beta, \eta_T, \eta_E\}$, the labor market knows the following things. With probability $1-\eta_E$ the principal chooses the strategy and the agent's ability is irrelevant to project outcome (with probability $\theta/2$ the project succeeds and with the remaining probability $1-\theta/2$ the project fails); with probability η_E, the agent chooses the strategy and the agent's ability is relevant to project outcome (with probability $q/2$ the project succeeds and with the remaining probability $1-q/2$ the project fails). Suppose project $i \in \{G, B\}$ is selected. The labor market's posterior beliefs about the agent's ability can be calculated as follows.

If the project succeeds, i.e., $\mathcal{F} = \{success, i\}$,

$$f(q|success, i) = \frac{\left[\frac{\eta_E q}{2} + \frac{(1-\eta_E)\theta}{2}\right] f(q)}{\int_0^1 \left[\frac{\eta_E q}{2} + \frac{(1-\eta_E)\theta}{2}\right] f(q)dq} = \frac{\left[\eta_E q + (1-\eta_E)\theta\right] f(q)}{\eta_E \bar{q} + (1-\eta_E)\theta},$$

and hence

$$\mathbf{E}(q|success, i) = \int_0^1 q f(q|success, i)dq = \bar{q} + \frac{\sigma^2 \eta_E}{\bar{q}\eta_E + \theta(1-\eta_E)}. \tag{A1}$$

If the project fails, i.e., $\mathcal{F} = \{failure, i\}$,

$$f(q|failure, i) = \frac{\left[\eta_E \left(1-\frac{q}{2}\right) + (1-\eta_E)\left(1-\frac{\theta}{2}\right)\right] f(q)}{\int_0^1 \left[\eta_E \left(1-\frac{q}{2}\right) + (1-\eta_E)\left(1-\frac{\theta}{2}\right)\right] f(q)dq} = \frac{\left[\eta_E(2-q) + (1-\eta_E)(2-\theta)\right] f(q)}{\eta_E(2-\bar{q}) + (1-\eta_E)(2-\theta)},$$

and hence

$$\mathbf{E}(q|failure, i) = \int_0^1 q f(q|failure, i)dq = \bar{q} - \frac{\sigma^2 \eta_E}{(2-\bar{q})\eta_E + (2-\theta)(1-\eta_E)}. \tag{A2}$$

It is clear from (A1) and (A2) that $\partial \mathbf{E}(q|success, i)/\partial \eta_E > 0$, and $\partial \mathbf{E}(q|failure, i)/\partial \eta_E < 0$. □

Proof of Corollary 1: Suppose project $i \in \{G, B\}$ is chosen. A priori the labor market believes that s_P and s_A are equally likely to be the proper strategy. Thus, the labor market believes that with probability $\frac{\bar{q}\eta_E + \theta(1-\eta_E)}{2}$ the project succeeds, whereas with probability $1 - \frac{\bar{q}\eta_E + \theta(1-\eta_E)}{2}$ the project fails. Hence, the labor market's prior expectation about its posterior assessment of the agent's ability is

$$\left[\frac{\bar{q}\eta_E + \theta(1-\eta_E)}{2}\right] \mathbf{E}(q|success, i) + \left[1 - \frac{\bar{q}\eta_E + \theta(1-\eta_E)}{2}\right] \mathbf{E}(q|failure, i) = \bar{q}.$$

The agent, however, always perceives s_A is the proper strategy when he disagrees with the principal. Thus, the agent believes that with probability $\bar{q}\eta_E + \theta(1-\eta_E)\rho$ the project succeeds, whereas with probability $1 - \bar{q}\eta_E - \theta(1-\eta_E)\rho$ the project fails. Hence, the agent's prior expectation about the labor market's posterior assessment of his ability is

$$\left[\bar{q}\eta_E + \theta(1-\eta_E)\rho\right] \mathbf{E}(q|success, i) + \left[1 - \bar{q}\eta_E - \theta(1-\eta_E)\rho\right] \mathbf{E}(q|failure, i)$$

$$= \bar{q} + \frac{\sigma^2 \eta_E[\bar{q}\eta_E + \theta(1-\eta_E)(2\rho-1)]}{[\bar{q}\eta_E + \theta(1-\eta_E)][(2-\bar{q})\eta_E + (2-\theta)(1-\eta_E)]}, \text{which is,} \begin{cases} > \bar{q} & \text{if } \bar{q} > \frac{\theta(1-\eta_E)(1-2\rho)}{\eta_E}, \\ = \bar{q} & \text{if } \bar{q} = \frac{\theta(1-\eta_E)(1-2\rho)}{\eta_E}, \\ < \bar{q} & \text{if } \bar{q} < \frac{\theta(1-\eta_E)(1-2\rho)}{\eta_E}. \end{cases}$$

This proves the corollary. □

Proof of Lemma 2: Suppose the agent has complete project-choice autonomy. For a given contract $\{w, \beta, \eta_T, \eta_E\}$, if he chooses project G, his expected utility is

$$U_{AG} \equiv \underbrace{\left[\bar{q}\eta_E + \theta(1-\eta_E)\rho\right] \left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right]}_{\text{project } G \text{ succeeds}} + \underbrace{\left[1 - \bar{q}\eta_E - \theta(1-\eta_E)\rho\right] \left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right]}_{\text{project } G \text{ fails}},$$

whereas if he chooses project B, his expected utility is

$$U_{AB} \equiv \underbrace{\left[\bar{q}\eta_E + \theta(1-\eta_E)\rho\right]\left[-e^{-r[w+\beta\delta+Z+\alpha\mathbf{E}(q|success,B)]}\right]}_{\text{project } B \text{ succeeds}} + \underbrace{\left[1-\bar{q}\eta_E - \theta(1-\eta_E)\rho\right]\left[-e^{-r[w+Z+\alpha\mathbf{E}(q|failure,B)]}\right]}_{\text{project } B \text{ fails}},$$

where $\mathbf{E}(q|success,i)$ and $\mathbf{E}(q|failure,i)$, $i \in \{G,B\}$ are given by (A1) and (A2), respectively. Note that

$$U_{AG} - U_{AB} \propto \left[\bar{q}\eta_E + \theta(1-\eta_E)\rho\right]e^{-r\alpha[\mathbf{E}(q|success,G)-\mathbf{E}(q|failure,B)]}\left[e^{-r(\beta\delta+Z)} - e^{-r\beta}\right] - \left[1-\bar{q}\eta_E - \theta(1-\eta_E)\rho\right]\left[1-e^{-rZ}\right].$$

It is clear that $U_{AG} - U_{AB}$ is increasing in β, whereas decreasing in Z. Then, there must exist a cutoff value, β^*, such that $U_{AG} - U_{AB} \geq 0$ if $\beta \geq \beta^*$, and $U_{AG} - U_{AB} < 0$ if $\beta < \beta^*$. The result that $\partial\beta^*/\partial Z > 0$ is straightforward. □

Proof of Lemma 3: Without loss of generality, we assume that project G is chosen; the proof for the case in which project B is chosen is similar. For a given contract $\{w, \beta, \eta_T, \eta_E\}$, the agent's ex ante expected utility is

$$U_{AG} = \left[\bar{q}\eta_E + \theta(1-\eta_E)\rho\right]\left[-e^{-r[w+\beta+\alpha\mathbf{E}(q|success,G)]}\right] + \left[1-\bar{q}\eta_E - \theta(1-\eta_E)\rho\right]\left[-e^{-r[w+\alpha\mathbf{E}(q|failure,G)]}\right],$$

where $\mathbf{E}(q|success,G)$ and $\mathbf{E}(q|failure,G)$ are given by (A1) and (A2), respectively. Note that

$$\frac{\partial U_{AG}}{\partial \eta_E} \propto \left[\bar{q}-\theta\rho\right]\left[1-e^{-r[\beta+\alpha[\mathbf{E}(q|success,G)-\mathbf{E}(q|failure,G)]]}\right] + \left[\bar{q}\eta_E + \theta(1-\eta_E)\rho\right]\left[r\alpha e^{-r[\beta+\alpha[\mathbf{E}(q|success,G)-\mathbf{E}(q|failure,G)]]}\left[\frac{\partial\mathbf{E}(q|success,G)}{\partial\eta_E}\right]\right] + \left[1-\bar{q}\eta_E - \theta(1-\eta_E)\rho\right]\left[r\alpha\left[\frac{\partial\mathbf{E}(q|failure,G)}{\partial\eta_E}\right]\right].$$

Note that $\partial\mathbf{E}(q|success,G)/\partial\eta_E > 0$ and $\partial\mathbf{E}(q|failure,G)/\partial\eta_E < 0$. It is then clear that if $\bar{q}$ is sufficiently large, we have $\partial U_{AG}/\partial\eta_E > 0$. This positive relationship is stronger for a larger α. □

Proof of Lemma 4: We know from Lemma 3 that the agent's ex ante expected utility is increasing in his strategy-choice autonomy. Thus, it is clear that $\eta_E^P = 1$. Hence,

$$\mathbf{E}(q|success,i) = \bar{q} + \frac{\sigma^2}{\bar{q}}, i \in \{G,B\},$$
$$\mathbf{E}(q|failure,i) = \bar{q} - \frac{\sigma^2}{2-\bar{q}}, i \in \{G,B\}.$$

When the agent has the project-choice autonomy, if he chooses project G, his expected utility is

$$U_{AG} \equiv \bar{q}\left[-e^{-r\left(w+\beta^P+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right],$$

whereas if he chooses project B, his expected utility is

$$U_{AB} \equiv \bar{q}\left[-e^{-r\left(w+\beta^P\delta+Z+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+Z+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right].$$

Note that

$$U_{AG} - U_{AB} \propto \bar{q}\left[e^{-r\left[\beta^P\delta+Z+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} - e^{-r\left[\beta^P+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]}\right] - (1-\bar{q})\left(1-e^{-rZ}\right).$$

The cutoff value, β^{*P}, is defined by letting $U_{AG} - U_{AB} = 0$, i.e.,

$$e^{-r\left[\beta^{*P}\delta+Z+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} - e^{-r\left[\beta^{*P}+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} = (1-\bar{q})\left(1-e^{-rZ}\right). \quad \text{(A3)}$$

This proves the lemma. □

Proof of Proposition 1: First, we analyze *Case A* with $\beta \geq \beta^{*P}$, where β^{*P} is given by (A3). Since the agent prefers to choose project G whenever he has project-choice control, and the principal may not be able to correctly identify project G when she selects the project, it is then clear that $\eta_T^P = 1$ in this case. The principal's problem can be rewritten as:

$$\max_{\{w,\beta\}} \bar{q}(1-\beta) - w, \tag{A4}$$

such that

$$\bar{q}\left[-e^{-r\left(w+\beta+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right] \geq -e^{-r(\bar{u}+\alpha\bar{q})}, \tag{A5}$$

and

$$\bar{q}\left[-e^{-r\left(w+\beta+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right] \geq -e^{-r(w+\Omega+\alpha\bar{q})}. \tag{A6}$$

It is clear that the agent's participation constraint (A5) must be binding in equilibrium since we place no lower bound on w. The agent's incentive compatibility constraint (A6), however, may or may not be binding, depending on the value of β^{*P}, which is determined by Z. Note that β^{*P} is increasing in Z. There are several subcases:

- *Case A1*: If Z is sufficiently low, i.e., $Z \leq Z_L^{*P}$, where Z_L^{*P} is defined as follows. For β such that

$$e^{-r\left[\beta\delta+Z_L^{*P}+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} - e^{-r\left[\beta+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} = (1-\bar{q})\left(1-e^{-rZ_L^{*P}}\right), \tag{A7}$$

  the agent's incentive-compatibility constraint (A6) is binding. Then, for $\forall Z < Z_L^{*P}$, any β satisfying (A7) will violate the agent's incentive-compatibility constraint (A6), whereas for $\forall Z > Z_L^{*P}$, any β satisfying (A7) will make the agent's incentive-constraint (A6) not binding. It is then clear that for $\forall Z \leq Z_L^{*P}$, the principal will give the agent the same project-payoff share, β_M^P, such that

$$e^{-r\left[\beta_M^P\delta+Z_L^{*P}+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} - e^{-r\left[\beta_M^P+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} = (1-\bar{q})\left(1-e^{-rZ_L^{*P}}\right), \tag{A8}$$

  because this represents the highest expected payoff to the principal: there is no rent extracted by the agent since both the agent's participation and incentive-compatibility constraints are binding; and project G is always selected. The agent's fixed wage is given by the binding participation and incentive-compatibility constraints, i.e.,

$$w^P = u_A - \Omega. \tag{A9}$$

- *Case A2:* Consider $Z > Z_L^{*P}$. If the principal still gives the agent complete project-choice autonomy, the agent will choose project B, unless the principal gives the agent a sufficiently high share of the project payoff, β_H^P, such that

$$e^{-r\left[\beta_H^P\delta+Z+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} - e^{-r\left[\beta_H^P+\frac{2\alpha\sigma^2}{\bar{q}(2-\bar{q})}\right]} = (1-\bar{q})\left(1-e^{-rZ}\right), \tag{A10}$$

  for $Z > Z_L^{*P}$. It is then clear that $\beta_H^P > \beta_M^P$, and hence the agent's incentive-compatibility constraint (A6) will not be binding. The agent will extract some rent from the principal in this case. From the continuity argument, there will be a region, $Z \in \left(Z_L^{*P}, Z_H^{*P}\right]$, in which the principal is willing to give the agent some rents in order to insure that project G is chosen. It is clear that the fixed wage will be lower than that in *Case A1*, i.e., $w^P < \bar{u} - \Omega$ because of the agent's binding participation constraint and $\beta_H^P > \beta_M^P$. The cutoff, Z_H^{*P}, will be determined below.

If Z is sufficiently large, then the rents that the principal needs to provide to the agent in order to incent the agent to choose project G under complete agent project-choice autonomy are so high that the principal will find it optimal to give the agent no project-choice autonomy, $\eta_T^P = 0$, and at the same time will need to give the agent only relatively low β to satisfy his incentive compatibility constraint for project development. In the latter case, the principal's problem can be rewritten as:

$$\max_{\{w,\beta\}} \tau[\bar{q}(1-\beta) - w] + (1-\tau)[\bar{q}(1-\beta)\delta - w], \tag{A11}$$

such that such that

$$(1-\tau)\left[\bar{q}\left[-e^{-r\left(w+\beta\delta+Z+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+Z+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right]\right]$$
$$+\tau\left[\bar{q}\left[-e^{-r\left(w+\beta+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right]\right] \geq -e^{-r(\bar{u}+\alpha\bar{q})}, \tag{A12}$$

and

$$(1-\tau)\left[\bar{q}\left[-e^{-r\left(w+\beta\delta+Z+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+Z+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right]\right]$$
$$+\tau\left[\bar{q}\left[-e^{-r\left(w+\beta+\alpha\bar{q}+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(w+\alpha\bar{q}-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right]\right] \geq -e^{-r(w+\Omega+\alpha\bar{q})}, \tag{A13}$$

The agent's fixed wage is given by the binding participation and incentive-compatibility constraints, (A12) and (A13), i.e.,

$$w^P = u_A - \Omega. \tag{A14}$$

The agent's share of the project payoff, β_L^P, is then given by the agent's binding incentive-compatibility constraint (A13), i.e.,

$$(1-\tau)\left[\bar{q}\left[-e^{-r\left(\beta_L^P\delta+Z+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(Z-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right]\right]$$
$$+\tau\left[\bar{q}\left[-e^{-r\left(\beta_L^P+\frac{\alpha\sigma^2}{\bar{q}}\right)}\right] + (1-\bar{q})\left[-e^{-r\left(-\frac{\alpha\sigma^2}{2-\bar{q}}\right)}\right]\right] = -e^{-r\Omega}. \tag{A15}$$

It is clear that $\beta_L^P < \beta_M^P$. To see this, note that β_M^P is determined by the agent's binding incentive-compatibility constraint in developing project portfolio and selecting project G when $Z = Z_L^{*P}$, while β_L^P is determined by the agent's incentive compatibility constraint in developing project portfolio and randomly selecting project G or B, see (A15). It is clear that in (A15), the agent prefers project B since $Z > Z_L{*}P$. Thus, we must have $\beta_L^P < \beta_M^P$.

The cutoff, Z_H^{*P}, is determined by equating the principal's expected payoffs from: (1) giving the agent complete project-choice autonomy and relying on a higher objective ownership (β_H^P) to incent the agent to select project G by giving the agent some rents; and (2) giving the agent no project-choice autonomy and relying on a lower project-payoff share (β_L^P). It is then clear that as τ increases, the second option becomes more appealing to the principal, and the cutoff Z_H^{*P} decreases. □

Proof of Proposition 2: The agent's incentive-compatibility constraint to develop the project portfolio is

$$\bar{q}[\eta_E + (1-\eta_E)\rho]\left[-e^{-r\left[w+\beta+\alpha\left(\bar{q}+\frac{\sigma^2\eta_E}{\bar{q}}\right)\right]}\right] + \left[1-\bar{q}[\eta_E+(1-\eta_E)\rho]\right]\left[-e^{-r\left[w+\alpha\left(\bar{q}-\frac{\sigma^2\eta_E}{2-\bar{q}}\right)\right]}\right]$$
$$\geq -e^{-r(w+\Omega+\alpha\bar{q})}. \tag{A16}$$

It is clear that the left-hand-side (LHS) of (A16) is increasing in β. Also, note that

$$\begin{aligned}
\frac{\partial \text{LHS}}{\partial \eta_E} &= \bar{q}(1-\rho)\left[e^{-r\left[w+\alpha\left(\bar{q}-\frac{\sigma^2\eta_E}{2-\bar{q}}\right)\right]} - e^{-r\left[w+\beta+\alpha\left(\bar{q}+\frac{\sigma^2\eta_E}{\bar{q}}\right)\right]}\right] \\
&\quad +\bar{q}[\eta_E+(1-\eta_E)\rho]\left[\left(\frac{r\alpha\sigma^2}{\bar{q}}\right)e^{-r\left[w+\beta+\alpha\left(\bar{q}+\frac{\sigma^2\eta_E}{\bar{q}}\right)\right]}\right] \\
&\quad -\big[1-\bar{q}[\eta_E+(1-\eta_E)\rho]\big]\left[\left(\frac{r\alpha\sigma^2}{2-\bar{q}}\right)e^{-r\left[w+\alpha\left(\bar{q}-\frac{\sigma^2\eta_E}{2-\bar{q}}\right)\right]}\right] \\
&> 0,
\end{aligned}$$

if $\bar{q}$ is sufficiently large. Thus, η_E and β are substitutes in satisfying the agent's incentive-compatibility constraint. □

Proof of Proposition 3: From the agent's binding participation and incentive-compatibility constraints, we have

$$w^D = u_A - \Omega. \tag{A17}$$

The principal's optimization problem can be written as:

$$\max_{\{\beta,\eta_E\}} \bar{q}(1-\eta_E+\eta_E\rho)(1-\beta) - (u_A-\Omega), \tag{A18}$$

subject to

$$\bar{q}[\eta_E+(1-\eta_E)\rho]\left[-e^{-r\left(\beta+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right)}\right] + \big[1-\bar{q}[\eta_E+(1-\eta_E)\rho]\big]\left[-e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)}\right] = -e^{-r\Omega}. \tag{A19}$$

Denote the multiplier of the agent's incentive-compatibility constraint as $\gamma \geq 0$, and take first-order-conditions (FOCs) for β and η_E, respectively, we have

$$\begin{aligned}
0 &= -\bar{q}(1-\eta_E+\eta_E\rho) + \gamma\bar{q}[\eta_E+(1-\eta_E)\rho]re^{-r\left(\beta+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right)}, \\
0 &= -\bar{q}(1-\rho)(1-\beta) + \gamma\bar{q}(1-\rho)\left[e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)} - e^{-r\left(\beta+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right)}\right] \\
&\quad +\gamma[\eta_E+(1-\eta_E)\rho]r\alpha\sigma^2e^{-r\left(\beta+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right)} - \gamma\big[1-\bar{q}[\eta_E+(1-\eta_E)\rho]\big]\left(\frac{r\alpha\sigma^2}{2-\bar{q}}\right)e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)}.
\end{aligned}$$

Combining the two FOCs, we have

$$\begin{aligned}
\Lambda &\equiv \alpha\sigma^2\left(\frac{1}{1-\rho}-\eta_E\right) - \bar{q}(1-\beta) + \gamma\bar{q}\left[e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)} - e^{-r\left(\beta+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right)}\right] \\
&\quad -\gamma\left(\frac{1-\bar{q}\rho}{1-\rho}-\bar{q}\eta_E\right)\left(\frac{r\alpha\sigma^2}{2-\bar{q}}\right)e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)} \\
&= 0.
\end{aligned} \tag{A20}$$

It is clear that

$$\begin{aligned}
\frac{\partial\Lambda}{\partial\beta} &= \bar{q} + \gamma r\bar{q}e^{-r\left(\beta+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right)} > 0, \\
\frac{\partial\Lambda}{\partial r} &= \gamma\left(\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)e^{\frac{r\alpha\sigma^2\eta_E}{2-\bar{q}}}\left[2\bar{q}+\frac{r\alpha\sigma^2}{2-\bar{q}}\left(\bar{q}\eta_E-\frac{1-\bar{q}\rho}{1-\rho}\right)-\frac{1-\bar{q}\rho}{(1-\rho)\eta_E}\right] \\
&\quad +\gamma(\bar{q}\beta+\alpha\sigma^2\eta_E)e^{-r\left(\beta+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right)} > 0, \\
\frac{\partial\Lambda}{\partial\rho} &= \frac{\alpha\sigma^2}{(1-\rho)^2}\left[1-\gamma r\left(\frac{1-\bar{q}}{2-\bar{q}}\right)e^{\frac{r\alpha\sigma^2\eta_E}{2-\bar{q}}}\right] > 0,
\end{aligned}$$

if $\bar{q}$ is sufficiently high. Thus, by the Implicit Function Theorem, we must have $\partial\beta^D/\partial r < 0$ and $\partial\beta^D/\partial\rho < 0$ for the optimal contract. From Proposition 3, we know that η_E^D and β^D are substitutes. Hence, we also have $\partial\eta_E^D/\partial r > 0$ and $\partial\eta_E^D/\partial\rho > 0$ for the optimal contract. □

Proof of Proposition 4: Following analysis similar to that in the proof of Proposition 3, the principal's optimization problem can be written as

$$\max_{\{\beta,\eta_E\}} \bar{q}(1-\eta_E+\eta_E\rho)[\rho x_P+(1-\rho)x_A](1-\beta)-(u_A-\Omega), \tag{A21}$$

subject to

$$\bar{q}[\eta_E+(1-\eta_E)\rho]\left[-e^{-r\left[\beta[\rho x_P+(1-\rho)x_A]+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right]}\right]+\left[1-\bar{q}[\eta_E+(1-\eta_E)\rho]\right]\left[-e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)}\right]$$
$$= -e^{-r\Omega}. \tag{A22}$$

Similar to the analysis in Proposition 3, β and η_E must satisfy the following equation:

$$\begin{aligned}\Lambda \;\equiv\;& \alpha\sigma^2\left(\frac{1}{1-\rho}-\eta_E\right)-\bar{q}(1-\beta)+\gamma\bar{q}\left[e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)}-e^{-r\left[\beta[\rho x_P+(1-\rho)x_A]+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right]}\right]\\ &-\gamma\left(\frac{1-\bar{q}\rho}{1-\rho}-\bar{q}\eta_E\right)\left(\frac{r\alpha\sigma^2}{2-\bar{q}}\right)e^{-r\left(-\frac{\alpha\sigma^2\eta_E}{2-\bar{q}}\right)}\\ =\;& 0.\end{aligned} \tag{A23}$$

It is straightforward to show that

$$\begin{aligned}\frac{\partial\Lambda}{\partial\beta} &= \bar{q}+\gamma r[\rho x_P+(1-\rho)x_A]\bar{q}e^{-r\left[\beta[\rho x_P+(1-\rho)x_A]+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right]}>0,\\ \frac{\partial\Lambda}{\partial\rho} &= \frac{\alpha\sigma^2}{(1-\rho)^2}\left[1-\gamma r\left(\frac{1-\bar{q}}{2-\bar{q}}\right)e^{\frac{r\alpha\sigma^2\eta_E}{2-\bar{q}}}\right]-\gamma\bar{q}r\beta(x_A-x_P)e^{-r\left[\beta[\rho x_P+(1-\rho)x_A]+\frac{\alpha\sigma^2\eta_E}{\bar{q}}\right]}.\end{aligned}$$

Note that $\partial^2\Lambda/\partial\rho^2 > 0$. There exists a cutoff value, ρ^*, such that $\partial\Lambda/\partial\rho < 0$ if $\rho < \rho^*$, and $\partial\Lambda/\partial\rho > 0$ if $\rho > \rho^*$. Thus, we have, in equilibrium $\partial\beta^P/\partial\rho > 0$ for $\rho < \rho^*$, and $\partial\beta^P/\partial\rho < 0$ for $\rho > \rho^*$. Combining this with the fact that η^P and β^P are substitutes in the principal's optimal contract, we have $\partial\eta_E^P/\partial\rho < 0$ for $\rho < \rho^*$, and $\partial\eta_E^P/\partial\rho > 0$ for $\rho > \rho^*$. □

Proof of Proposition 5: We only need to show that Z_H^{*PD} is decreasing in ρ. Note that Z_H^{*PD} is determined as follows. If the principal gives the agent complete project-choice autonomy, and gives the agent a sufficiently high β to induce him to select project G. This will give the agent some rents as his incentive-compatibility constraint is not binding. Denote the principal's expected payoff as $\Pi_1(Z,\rho)$ in this case. If the principal gives the agent no project-choice autonomy, and gives the agent a relatively low β to make his incentive-compatibility constraint binding in equilibrium. Denote the principal's expected payoff as $\Pi_0(Z,\rho)$ is this case. Z_H^{*PD} is the cutoff value there the principal is just indifferent between these two contracts, i.e., $\Pi_1(Z_H^{*PD},\rho)=\Pi_0(Z_H^{*PD},\rho)$. Suppose two levels of principal-agent agreement, $\rho_h > \rho_l$, and denote the cutoffs as Z_{Hh}^{*PD} and Z_{Hl}^{*PD} for ρ_h and ρ_l, respectively. That is, $\Pi_1(Z_{Hh}^{*PD},\rho_h)=\Pi_0(Z_{Hh}^{*PD},\rho_h)$ and $\Pi_1(Z_{Hl}^{*PD},\rho_l)=\Pi_0(Z_{Hl}^{*PD},\rho_l)$. We need to show to that $Z_{Hh}^{*PD} < Z_{Hl}^{*PD}$. It suffices to show that $\Pi_1(Z_{Hh}^{*PD},\rho_l) > \Pi_0(Z_{Hh}^{*PD},\rho_l)$, i.e., $\Pi_1(Z_{Hh}^{*PD},\rho_h)-\Pi_1(Z_{Hh}^{*PD},\rho_l) < \Pi_0(Z_{Hh}^{*PD},\rho_h)-\Pi_0(Z_{Hh}^{*PD},\rho_l)$. This is true since a decrease in ρ has a greater impact on the principal's expected payoff in the case with no agent project-choice autonomy and a relatively low β: the agent's incentive-compatibility constraint is already binding in that case. □

Proof of Proposition 6: The "self-identify" aspect of the psychological ownership clearly stems from the agent's career concerns. The "territoriality" aspect of the psychological ownership, referring to the agent's preference for a particular project (project B), comes from the private benefit that the agent can derive from that particular project (see Lemma 2). The "efficacy" aspect of the psychological ownership stems from the disagreement between the principal and the agent: if there is no disagreement, then the agent does not value the strategy-choice autonomy. □

References

[1] Abel, Andrew, and George Mailath, 1994, "Financing Losers in Competitive Markets," *Journal of Financial Intermediation* 3, 139-165.

[2] Aghion, Philippe, and Patrick Bolton, 1992, "An Incomplete Contracts Approach to Financial Contracting," *Review of Economic Studies* 59, 473-494.

[3] Aghion, Philippe, Mathias Dewatripont, and Patrick Rey, 2004, "Transferable Control," *Journal of the European Economic Association* 2, 115-138.

[4] Aghion, Philippe, and Jean Tirole, 1997, "Formal and Real Authority in Organizations," *Journal of Political Economy* 105, 1-29.

[5] Allen, Franklin and Douglas Gale, 1999, "Diversity of Opinion and Financing of New Technologies," *Journal of Financial Intermediation* 8, 68-89.

[6] Alonso, Ricardo, and Niko Matouschek, 2004, "Relational Delegation," working paper, Northwestern.

[7] Baker, George, Robert Gibbons, and Kevin Murphy, 2006, "Contrating for Control," working paper, Harvard.

[8] Bénabou, Roland, and Jean Tirole, 2003, "Intrinsic and Extrinsic Motivation," *Review of Economic Studies* 70, 489-520.

[9] Besley, Timothy, and Maitreesh Ghatak, 2005, "Competition and Incentives with Motivated Agents," *American Economic Review* 95, 616-658.

[10] Boot, Arnoud, Radhakrishnan Gopalan, and Anjan Thakor, 2006, "The Entrepreneur's Choice Between Private and Public Ownership," *Journal of Finance* 61, 803-836.

[11] Brau, James, and Stanley Fawcett, 2006, "Initial Public Offerings: An Analysis of Theory and Practice," *Journal of Finance* 61, 399-436.

[12] Brown, Graham, Thomas Lawrence, and Sandra Robinson, 2005, "Territoriality in Organizations," *Academy of Management Review* 30, 577-594.

[13] Coval, Joshua, and Anjan Thakor, 2005, "Financial Intermediation as a Beliefs-Bridge Between Optimists and Pessimists," *Journal of Financial Economics* 75, 535-569.

[14] Deci, Edward, Richard Koestner, and Richard Ryan, 1999, "A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation," *Psychological Bulletin* 125, 627-668.

[15] Dessein, Wouter, 2002, "Authority and Communication in Organizations," *Review of Economic Studies* 69, 811-838.

[16] Dittmar, Helga, 1992, *The Social Psychology of Material Possessions: To Have is to Be*, New York: St. Martin's Press.

[17] Furby, Lita, 1978, "Possession in Humans: An Exploratory Study of Its Meaning and Motivation," *Social Behavior and Personality* 6, 49-65.

[18] Hart, Oliver, and Bengt Holmstrom, 2002, "A Thoery of Firm Scope," working paper, MIT.

[19] Hart, Oliver, and John Moore, 1999, "On the Design of Hierarchies: Coordination Versus Specialization," working paper, Harvard.

[20] Holmstrom, Bengt, and Joan Ricart i Costa, 1986, "Managerial Incentives and Capital Management," *Quarterly Journal of Economics* 101, 835-860.

[21] Isaacs, Susan, 1933, *Social Development in Young Children*, London: Routledge & Kegan Paul.

[22] James, William, *The Principles of Psychology*, New York: Henry Holt & Co, 1890.

[23] Jensen, Michael, and Kevin Murphy, 1990, "Performance Pay and Top-Management Incentives," *Journal of Political Economy* 98, 225-264.

[24] Kandel, Eugene, and Neil Pearson, 1995, "Differential Interpretation of Public Signals and Trade in Speculative Markets," *Journal of Political Economy* 103, 831-872.

[25] Kreps, David, 1990, *A Course in Microeconomic Theory*, Princeton University Press.

[26] Kurz, Mordecai, 1994a, "On the Structure and Diversity of Rational Beliefs," *Economic Theory* 4, 877-900.

[27] Kurz, Mordecai, 1994b, "On Rational Belief Equilibria," *Economic Theory* 4, 859-876.

[28] Morris, Stephen, 1995, "The Common Prior Assumption in Economic Theory," *Economics and Philosophy* 11, 227-253.

[29] Murdock, Kevin, 2002, "Intrinsic Motivation and Opitmal Incentive Contracts," *Rand Journal of Economics* 33, 650-671.

[30] Organ, Dennis, 1988, *Organizational Citizenship Behavior: The Good Soldier Syndrome*, Lexington, MA: Lexington Books.

[31] Pierce, Jon, Tatiana Kostova, and Kurt Dirks, 2001, "Toward a Theory of Psychological Ownership in Organizations," *Academy of Management Review* 26, 298-310.

[32] Pierce, Jon, Tatiana Kostova, and Kurt Dirks, 2003, "The State of Psychological Ownership: Integrating and Extending a Century of Research," *Review of General Psychology* 7, 84-107.

[33] Pierce, Jon, and Loren Rodgers, 2004, "The Psychology of Ownership and Worker-Owner Productivity," *Group & Organizational Management* 29, 588-613.

[34] Prelinger, Ernst, 1959, "Extension and Structure of the Self," *Journal of Psychology* 47, 13-23.

[35] Prendergast, Canice, 2002, "The Tenuous Trade-off between Risk and Incentives," *Journal of Political Economy* 110, 1071-1102.

[36] Richins, Marsha, 1994, "Valuing Things: The Public and Private Meanings of Possessions," *Journal of Consumer Research* 21, 504-521.

[37] Song, Fenghua, and Anjan Thakor, 2006, "Relationship Banking, Fragility, and the Asset-Liability Matching Problem," *Review of Financial Studies*, forthcoming.

[38] Van den Steen, Eric, 2004, "Rational Overoptimism (and Other Biases)," *American Economic Review* 94, 1141-1151.

[39] Van den Steen, Eric, 2005, "Too Motivated?" working Paper, MIT.

[40] Van den Steen, Eric, 2006, "Disagreement and the Allocation of Control," working Paper, MIT.

[41] Weil, Simone, 1952, *The Need for Roots: Prelude to A Declaration of Duties towards Mankind*, London: Routledge & Kegan Paul.

[42] Zabojnik, Jan, 2002, "Centralized and Decentralized Decision-Making in Organizations," *Journal of Labor Economics* 20, 1-22.

Figure 1: **A Schematic of Project Payoffs**

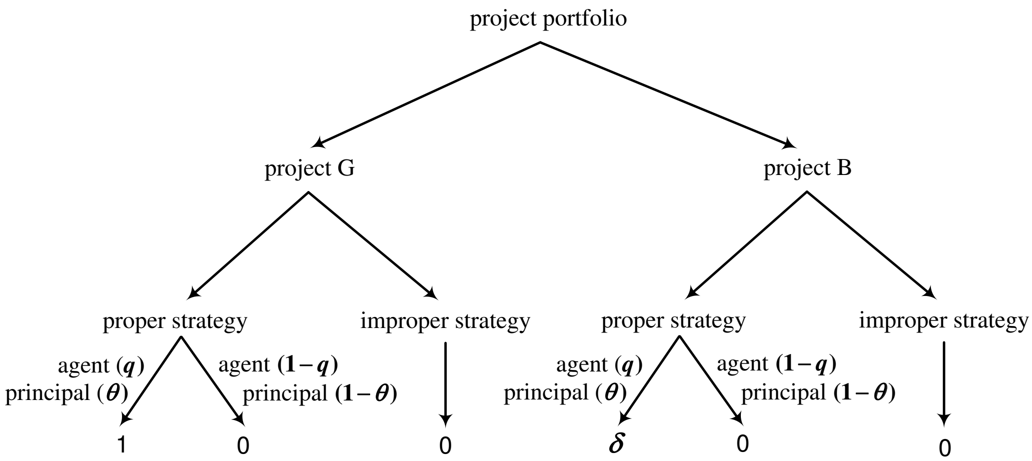

Figure 2: **Sequence of Events**

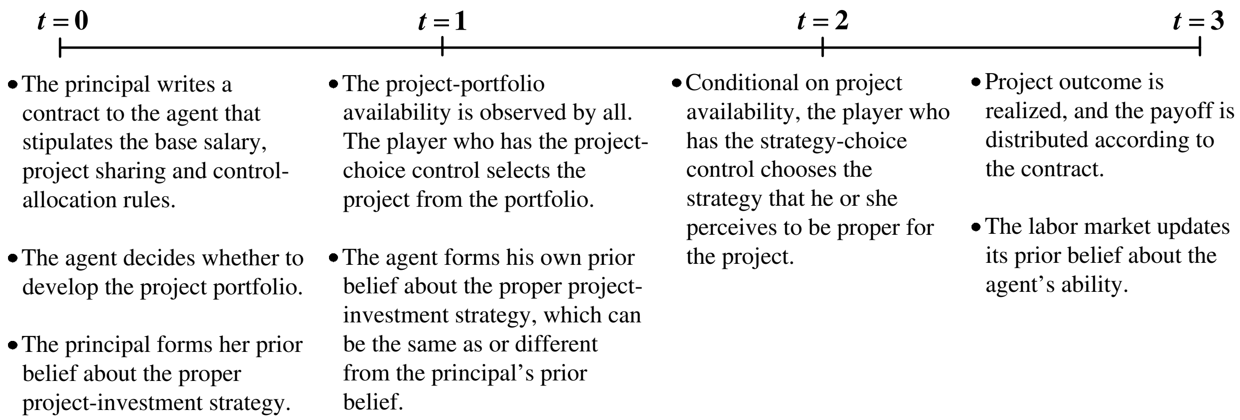

Figure 3: **The Relationship between Strategy-Choice Autonomy and Agreement with Disagreement and No Private Benefit**