Informed-principal problem with moral hazard, risk neutrality, and no limited liability ☆

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Abstract

We consider a principal–agent moral-hazard problem with risk-neutral parties and no limited liability in which the principal has private information. The principal's private information creates signaling considerations that may distort the implemented outcome. These distortions can explain, e.g., efficiency wages (Beaudry, 1994) and muted incentives (Inderst, 2001). We show that in a large class of environments these distortions vanish if the principal is allowed to offer sufficiently rich contracts.
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1. Introduction

In the standard principal–agent model, the principal has no private information and the optimal contract can be found by solving a constrained optimization problem. If the principal has private information, the model becomes a signaling game and the contract's value is determined endogenously in equilibrium. The signaling incentives introduce novel distortions, which may explain, e.g., efficiency wages (Beaudry, 1994) and muted incentives (Inderst, 2001).

We consider a principal–agent model with risk-neutral parties and no limited liability in which the principal has private information (her type) about the technology that translates the agent's effort into observables (Beaudry, 1994; Inderst, 2001). This environment is useful for understanding distortions that can be generated by the privacy of the principal's information since the benchmark environment in which the principal has no private information features nor distortions: the optimal contract is to "sell the firm" to the agent (see e.g. Grossman and Hart, 1983, Proposition 3(2)).

Under asymmetric information, the value of the firm is uncertain to the agent and the environment becomes that of the informed principal (Myerson, 1983; Maskin and Tirole, 1992). The model, however, differs from the literature because there exists an ex post verifiable variable, e.g., profit, that is correlated both with the agent's effort and the principal's private information.

In Section 3, we consider environments in which the first-best effort is constant across all principal types, and we provide two logically independent sufficient conditions under which the first best can be implemented. These conditions are (1) the first-best effort is the most costly action for the agent and (2) a linear independence condition on the distribution of the ex post verifiable variable, which is satisfied generically if the support of the variable is sufficiently large. In Section 4, we allow the first-best effort to vary with the principal's type and show that the first best can be implemented if a stronger linear independence condition holds, which is still generically satisfied if the support of the ex post verifiable variable is sufficiently large.

This result stands in contrast with the results in Beaudry (1994) and Inderst (2001), in which these independence conditions are violated. The conditions hold if the dimensionality of the support of the ex post verifiable variable is sufficiently large relative to the dimensionality of the type and effort spaces. Hence, the dimensionality is the key to the distortions that can be caused by the signaling considerations and, in sufficiently rich contractual environments, the privacy of the principal's information does not impose any costs on the principal. This observation can manifest itself in other moral hazard environments and, thus, it might prove useful when developing applications.

The result that the principal can implement the same outcome regardless of whether her information is private or publicly known to the agent has been observed in other environments. It holds in independent private value environments with risk-neutral players (Myerson, 1985; Maskin and Tirole, 1990; Tan, 1996; Yilankaya, 1999; Balestrieri, 2008; Skreta, 2009; Mylovanov and Tröger, 2014) if payoff functions satisfy a montononicty condition (Mylovanov and Tröger, 2014).

The contracts that attain the first best are strongly neologism-proof (Maskin and Tirole, 1992; Mylovanov and Tröger, 2012): they extract the entire surplus conditional on each type of the principal and cannot be dominated by any other contract. Severinov (2008) offers a full-surplus-extraction informed-principal result in environments with adverse selection, no moral hazard, and correlated types. Fleckinger (2007) presents a full-surplus-extraction result for an informed principal in an environment with adverse selection, no moral hazard, and countervailing incentives.