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# Signaling quality with increased incentives

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ABSTRACT

Previous work on informed-principal problems with moral hazard suggested that the principal should signal project quality by retaining a larger share of the project and hence lowering incentives for the agent. We show that this view is incomplete. If project quality and effort are complements and effort is more valuable for high-quality projects, a principal with a high-quality project may separate from a principal with a low-quality project by increasing incentives for the agent. This holds with a risk-neutral agent who is protected by limited liability as well as with a risk-averse agent and unlimited liability. A dynamic version of our model in which the agent learns project quality in later periods provides an explanation for the use of initially reduced royalty rates in business-format franchising contracts.

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## 1. Introduction

Consider a principal who hires an agent to realize a project. The principal may have better information about the expected profitability of the project than the agent. For example, if the principal is a large franchising firm, he has better information about the market potential of its product than a franchisee who operates the new outlet. The incentive contract that the principal offers to the agent then may transmit his private information. In this case, the agent's effort depends not only on the contract itself, but also on the information revealed through the contract (Maskin and Tirole, 1992). The question is how this signaling aspect of the contract changes the intensity of effort incentives for the agent.

Previous work on informed-principal problems with moral hazard suggests that the principal will signal high project quality by keeping a larger share of the revenues and hence reducing incentives for the agent, see Gallini and Lutz (1992), Beaudry (1994), Desai and Srinivasan (1995), Inderst (2001), Martimort and Sand-Zantman (2006), and Martimort et al. (2010). There is a strong intuition for this negative relationship between project quality and incentives. Suppose that the unique optimal contract under symmetric information at the contracting stage specifies full marginal returns for the agent, i.e., the principal sells the project to the agent. At a given price per share, keeping shares of the project is then more costly for a principal with low project quality since the expected returns are smaller than those of a principal with high project quality.[1] Thus, to credibly separate from the low-type, the principal with high project quality retains a larger share of his business and thereby reduces effort incentives.

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[1] Such an argument was first made by Leland and Pyle (1977) in the context of adverse selection in financial markets. An entrepreneur who wishes to sell his business can signal profitability by investing his own equity into the business.

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In this paper, we demonstrate that this view is incomplete. Depending on the production function, a principal with a high-quality project may credibly signal quality by leaving a larger share of his business to the agent. Moreover, we show that a positive relationship between project quality and incentives is empirically relevant for business-format franchising contracts.

Two features of the production function cause the reversal: first, the agent's effort and the quality of the principal's project are complements in the production function; and second, for the high-type principal the agent's effort is more valuable than for the low-type (i.e., a larger fraction of the output is due to the agent's effort and not due to project quality per se). These features have the following effect on equilibrium contracts: When the principal's type is observable, the (second-best) optimal level of incentives increases in project quality; when the principal's type is unobservable, mimicking the high-type principal creates both benefits through higher effort by the agent and costs through lower marginal returns. Increasing incentives then creates only second-order costs for the high-type, but first-order costs for the low-type principal. Hence, the least-cost separating contract for the high-type specifies an increase in incentives so that we obtain a positive relationship between project quality and incentives.

This result holds in a number of settings. In our baseline version of the model, we assume that the agent is risk-neutral and protected by limited liability. However, the positive correlation between quality and incentives also occurs when the agent is risk-averse and has unlimited liability. We also show that when there is a complementarity between effort and project quality, but effort has a greater value for the low-type, the high-type signals project quality through decreased incentives. This result generalizes the previous literature on informed-principal problems with moral hazard.

In a dynamic setting, our result implies that incentives may decrease over time. At the beginning of the contractual relationship, the principal signals high quality through increased incentives. In later periods, the agent learns project quality by observing cash flows and profits. The incentives in the optimal contract then decrease to their second-best optimal level.

Indeed, we find such patterns in business-format franchising. A franchise contract typically specifies a franchise fee and revenue-dependent royalties to the franchisor. The payment rules are usually stable over time. However, some franchisors offer “initially reduced royalty rates.”[2] A franchisee who benefits from this arrangement keeps a larger share of his revenues in the first years of the contractual relationship. Since franchisors generate the largest part of their revenues through royalties, granting initially reduced royalty rates is costly for them. As we will argue in detail below, the use of initially reduced royalty rates in business-format franchising cannot be easily explained by other means. Our model thus provides a signaling-based explanation for the use of initially reduced royalty rates.

The paper is related to several strands of the contract theory literature. A general analysis of informed-principal problems in common-value environments is provided in Myerson (1983), Maskin and Tirole (1992), Severinov (2008), and Balkenborg and Makris (2015).[3] These papers discuss equilibrium existence, selection, and the efficiency of the equilibrium allocation. Informed-principal problems with moral hazard on the side of the agent are considered in Gallini and Lutz (1992), Beaudry (1994), Desai and Srinivasan (1995), Inderst (2001), Chade and Silvers (2002), Bénabou and Tirole (2003), Martimort and Sand-Zantman (2006), Martimort et al. (2010), Kaya (1992), Fong and Lee (2013), and Wagner et al. (2015). We contribute to this literature by demonstrating that the equilibrium correlation between principal type and incentives depends on the properties of the production function. In particular, this correlation is positive if effort and quality are complements and effort is more important for high-quality projects.

A number of theoretical and empirical papers explicitly analyze the properties of franchise contracts. Gallini and Lutz (1992) show that the quality of a franchise chain can be signaled through dual distribution, i.e., the franchisor owns a fraction of his stores and franchises the rest. A high-type franchisor then owns a larger fraction of all outlets (as suggested by Leland and Pyle, 1977).[4] However, as Blair and Lafontaine (2005) point out, franchisors usually want to expand their market rapidly, but are often cash constrained. This limits the benefit of vertical integration as a signaling device. Bhattacharyya and Lafontaine (1995) show in a model with double-sided moral hazard that the optimal franchise contract is linear and largely invariant to market conditions and the franchisees' attributes. Lafontaine (1992), Lafontaine and Shaw (1999), and Kaufmann and Dant (2001) analyze the monetary contract terms of franchise contracts. Importantly, they find that there is no negative relationship between franchise fee and royalty rate. Thus, a reduction in the royalty rate implies a transfer of rents to the franchisee, which is consistent with our signaling model.

The rest of the paper is organized as follows. In Section 2, we introduce our model. In Section 3, we illustrate our main results for linear production functions. In Section 4, we provide the general results. In Section 5, we extend the analysis to a risk-averse agent with unlimited liability and consider alternative equilibrium refinements. In Section 6, we analyze a dynamic version of our model, examine the empirical evidence for initially reduced royalty rates, and discuss alternative explanations. Section 7 concludes. The proofs of the main results are in the Appendix. An Online Appendix contains additional results and robustness checks.

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[2] Bhattacharyya and Lafontaine (1995) find in a large sample of disclosure documents that 7.4 percent of franchisors grant initially reduced royalty rates.

[3] For an analysis of informed-principal problems in private-value environments (in which the agent's payoff is not directly affected by the principal's type), see Maskin and Tirole (1990), and Mylovanov and Tröger (2012, 2014).

[4] There is only little empirical evidence for this prediction. An exception is Fadairo and Lanchimba (2012), who consider emerging markets in South America.

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