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Optimal contracts with privately informed agents and active principals

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ABSTRACT

This paper considers an optimal contracting problem between an informed risk-averse agent and a principal, when the agent needs to perform multiple tasks, and the principal is active, namely she can influence some aspect of the agency relationship on top of the contract itself (i.e. capital budgets, task assignments). The paper shows how asymmetric information makes incentives and investment decisions substitutes for the principal. This result yields novel implications for contracting models with moral hazard and asymmetric information, i.e., capital budgeting or external capital raising games.

1. Introduction

The canonical contracting problem involves an effort choice by a privately informed agent, and a principal who sets compensation as a function of output. But, in many real-world circumstances, the principal does much more than setting wages. For example, in a capital budget setting, the principal also decides on the capital allocation to be given to the manager. In a venture capital setting, the venture capitalist actively contributes to the enterprise by providing his/her expertise in the form of effort and capital.

The literature has extended the canonical model to allow for an "active" principal. Examples of the types of actions the principal may take include: a capital allocation rule (Bernardo et al., 2001), transfer-pricing decisions among divisions (Besanko and Sibley, 1991), control of the set of projects the agent has access to (Hirshleifer and Suh, 1992; Sung, 1995), task assignment decisions (Holmstrom and Milgrom, 1991), setting part of the firm's strategy (Dow and Raposo, 2002), design of the compensation measure (Feltham and Xie, 1994), auditing and capital allocation (Harris and Raviv, 1996), and/or a productive effort choice that complements the actions of the agent.

This paper builds a contracting model that nests the above settings. Our main goal is to understand the precise interplay of moral hazard and asymmetric information when principals can play such an active role. Our theoretical model considers a standard agency problem where the agent possesses some private information about his ability or about the profitability of the division he controls. The principal can influence the agent's effort choice by the compensation package she offers to the agent, and by other actions she may take that indirectly impact the agency relationship.

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Our main result is to show that, under fairly general conditions, asymmetric information makes wages and capital substitutes. The principal can influence the agent's information elicitation decision by offering more contingent pay, or instead offering more capital. Under the optimal contracts, the principal will use both, making capital and incentives substitutes. This is driven by the fact that informational rents are increasing both in capital and incentives. The model's main prediction, a negative relationship between investment and incentives, is consistent with the empirical evidence from internal capital markets provided in Wulf (2002).

Our general setup is then specialized to three different models in Sections 4–6. The first model, presented in Section 4, follows Bernardo et al. (2001), who present a theory where capital and incentives have a hierarchical structure: good managers get both contingent compensation and capital, average managers only get capital, and bad managers get neither. We show their results depend on the specific functional form they assume for output. When the informational advantage possessed by the agent is concentrated in the marginal value of investment, our model predicts a reversal of their ordering: top types get both contingent compensation and capital, but average managers only get contingent compensation (without new capital). The substitutability created by private information can make incentives and capital budgets be non-monotonically related. This paper solves analytically for a set of special cases, and it gives conditions under which different comparative statics will prevail, thereby generating a rich set of empirical implications.

The multi-project/task feature of most real-world incentive problems has sprung substantial recent interest (Holmstrom and Milgrom, 1991). The second model, discussed in Section 5, adds to this literature by analyzing the effects of private information in the project/task assignment decision. Action restrictions are shown to be optimal in a third-best world in a (weak) generic sense, even for cases in which the second-best solution does not involve any restrictions on the agent's action set. Therefore private information considerations bring new trade-offs to the optimality of such action restrictions, complementing the results shown in Holmstrom and Milgrom (1991). Moreover, the distortion in the optimal contingent compensation from the second-best to the third-best solution[1] is not necessarily downwards, as in the case where the principal is inactive: the optimal contracts can actually be more aggressive in the presence of private information than in the case of symmetrically informed parties.

While our model is cast within the standard one principal/one agent contracting problem, our results can shed some light as to the debate of diversification in the empirical literature. In particular, since our model implies task/project restrictions under the optimal contracts, it yields predictions with respect to value reactions to spinoffs and diversifying mergers.[2] Furthermore, the model predicts higher contingent compensation for managers with less scope of action, thus providing new empirical predictions (Wulf, 2007). The paper also develops a new set of empirical predictions with respect to action scope (number of tasks assigned to managers) and the underlying contracting variables. When the noise in measurable output is large, the principal will optimally allow the agents to tackle as many tasks as possible; whereas when the noise is small, action restrictions will generally be optimal.

Section 6 includes a further extension in which the risk of the projects is increasing in the investment amount, adding a risk–return tradeoff to the model. Our model gives conditions under which we may observe a positive relation between compensation and risk, contrary to most of the principal agent literature. The driving force is the monotonicity properties that, under some conditions, tie compensation with investment. Thus our paper may shed some light on the empirical evidence on the relationship between equity compensation and risk.[3]

There is a large literature in finance, started with the seminal Leland and Pyle (1977) paper, which analyzes the effects of asymmetric information in financial contracting settings. The analysis in this paper follows the tradition in the capital budgeting literature started with Harris et al. (1982) and Antle and Eppen (1985).[4] The model in Section 4 is formally very close to that in Bernardo et al. (2001), who also jointly model optimal capital budgeting and compensation under private information and moral hazard, but allowing for more general relationships between information, investment, effort and output.[5]

This paper also contributes to the moral hazard literature where there is an investment decision on top of an effort elicitation problem,[6] by studying the effects of asymmetric information on the optimal contracts and capital budgeting decisions. Also closely related is the literature that discusses deviations from the standard NPV rule due to contracting imperfections (e.g. Berkovitch and Israel, 2004). The optimal capital budgeting schemes in the paper depart from naive NPV rules due to the distortions that arise both due to asymmetric information and moral hazard considerations.

[1] As usual in the literature, I will refer to the case where the action taken by the agent is unobservable but there is no private information as the second-best world, and the case where there is also adverse selection as the third-best world.

[2] The diversification discount literature (Berger and Ofek, 1995; Campa and Kedia, 2002; Fauver et al., 2004; Lang and Stulz, 1994) is related, see Martin and Sayrak (2003) for a survey. More relevant for our theoretical results are cross-sectional studies (McNeil and Moore, 2005).

[3] See, for example, Aggarwal and Samwick (1999), Cheng et al. (2013), Coles et al. (2006), Jin (2002).

[4] For some recent work in this area see Almazan et al. (2012), Bernardo et al. (2001), Bernardo et al. (2004), Milbourn and Thakor (1996), Stoughton and Zechner (2003), Sung (2005). The literature on capital budgeting with other types of frictions is also large — see Core and Qian (2002), Goldman (2002), Harris and Raviv (1996, 1998) and the references therein.

[5] See Chemmanur and Fulghieri (1997), DeMarzo (2005), DeMarzo and Duffie (1997), He (2005) for some recent work in the signaling literature in which the informed party can signal her quality through multiple actions, very close in spirit to the main contribution of this paper. Daniel and Titman (1995) survey prior literature related to this class of models in finance, including an analysis with multiple actions. Our main contribution to the theoretical mechanism design literature (i.e., Laffont and Tirole, 1986) is the consideration of multiple screening instruments (see Matthews and Moore, 1987, for the first effort along this dimension).

[6] See Hermalin (1993), Hirshleifer and Suh (1992), and Sung (1995).

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