



Ex post participation constraint in a principal–agent model with adverse selection and moral hazard [☆]

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Abstract

This paper analyzes optimal contracting when an agent has private information before contracting and exerts hidden effort that stochastically affects the output. Additionally, the contract is constrained to satisfy the agent's ex post participation. We highlight three features of this model. First, the agent faces countervailing incentives. Second, the separation of types is never optimal. Third, the optimal constant bonus rewarding success is distorted downward below its efficient level.

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1. Introduction

Adverse selection and moral hazard are commonly recognized as polar cases of principal–agent models. In the real world, an agent may jointly have private information before contracting and exert hidden effort that stochastically affects the production level. This setting is prevalent for instance in employment relations. Information asymmetries arise both before and after the hiring process. They may result in the attraction of a candidate unfitted to the requirements of the job, and then in a divergence between the employee's behavior and the owner of the firm's goals

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(see, for instance, Lazear [10]). A second obvious example is that of financial contracts.¹ A bank faces the danger that the borrowers most interested in obtaining credit may be those wanting to pursue undeserving projects. Once the funds are in their hands, such borrowers may be tempted to undertake actions that raise the riskiness of the project.

The principal–agent relationship we study has the following main ingredients. We consider a continuum of efforts and types, and two possible outputs: success or failure. Agent's efficiency and effort positively influence the probability of success, but effort creates a monetary disutility for the agent. Efficiency also strictly increases the marginal productivity of effort. Effort and type are thus complements in determining the probability of success. We assume that the agent has infinite risk aversion below zero: he is risk neutral in the range of non-negative ex post payoff, and has an infinitely negative utility when his ex post payoff falls below zero. The contract is thus constrained to satisfy the agent's ex post participation.²

Our purpose is to determine how the principal optimally chooses the agent's compensation scheme that induces information revelation and effort, and ensures ex post participation. We highlight three key features of our model. First, the agent faces countervailing incentives. Second, the separation of types is never optimal. Third, the optimal constant bonus rewarding success is distorted downward below its efficient level.

To give the intuitions behind these results, let us describe the properties of the set of incentive compatible contracts and the rents given up to the agent.

To induce effort, the principal must offer high powered incentives: the contract is composed of a fixed payment increased by a positive bonus in the event of success. To induce information revelation, higher powered incentives are offered to higher types: the positive bonus has to be increasing with efficiency. Furthermore, the bonus and the fixed payment must covary in opposite directions, i.e., the fixed payment has to be decreasing.

But under an ex post participation constraint, the fixed payment cannot be reduced as much as with the traditional interim participation constraint. It has to cover the (monetary) disutility of effort incurred by the agent, or, equivalently, the agent's expected utility has to cover his expected bonus. This expected bonus is a costly ex post participation rent that the principal must give up to the agent. The information rent is thus the expected utility in excess of the ex post participation rent. Therefore, the agent's expected utility is referred to as an overall rent.

Let us explain our three results. First, countervailing incentives arise from the conflict between the agent's incentive and ex post participation constraints. On the one hand, an efficient agent may want to understate his productivity level in order to convince the principal that success is unlikely. This is the standard incentive problem. On the other hand, the agent's expected utility has to cover his expected bonus. This pushes the agent to overstate his type to benefit from a higher ex post participation rent. We show ultimately that the information rent needed to solve the adverse selection problem is strictly decreasing with efficiency.

Second, to understand the optimality of a fully pooling contract, it is useful to consider the case where the principal cannot observe the agent's effort, observes the agent's efficiency, and the agent is risk neutral for any ex post payoff. In this case, the optimal bonus implements the first best probability of success by letting the agent be a residual claimant. In what follows, this

¹ For instance, Laffont and Martimort [9] touch on the analysis of moral hazard and adverse selection in financial markets separately.

² See e.g., Stole [19]. A similar constraint occurs when the contract must be robust to the possibility that a risk neutral agent reneges on the contract, if ever he makes a negative ex post payoff.

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