

CHAPTER 17

OPTIMAL CONTRACTS

We now introduce a model of a two person “partnership” known as the principal-agent model. It introduces incentive issues by assuming that *actions are unobservable* and the contracting parties may have *direct preferences with respect to actions*, as opposed to the standard partnership in which actions are observable and preferences are defined over monetary outcomes (see Volume I, Chapter 4). The basic principal-agent model assumes that the principal owns a production technology. In order for the technology to be productive he must hire an agent to perform a task. How the agent performs the task is unobservable to the principal, but it affects the probability distribution of the monetary outcome of the production technology. The incentive problem is caused (in part) by assuming that the agent has direct preferences with respect to what he does in the task (usually interpreted as the agent’s effort), as well as his compensation (i.e., his share of the monetary outcome), while the principal is only concerned about the monetary outcome (net of the compensation paid to the agent). If the monetary outcome is the only contractible information available, then the sharing rule between the principal and the agent can only depend on the monetary outcome. Furthermore, the sharing rule based on the monetary outcome is the only mechanism available to the principal for inducing the agent to make action choices that are consistent with the principal’s preferences. More generally, other performance measures may exist, and the monetary outcome may not be reported within the time frame of the contract, but we leave exploration of such settings until Chapter 18.

In this chapter we assume the principal and agent share the outcome x from the production technology operated by the agent, and cannot share the risks associated with that outcome with any other parties. The principal can represent a sole proprietor or a set of partners who own and finance the production technology, and hire the agent. Alternatively, as explored in Chapter 18, the agent can own and operate the production technology, and the principal can represent a set of investors who contract to share the agent’s risk and provide investment capital. The capital market is not explicitly considered. However, the results obtained here are consistent with those obtained when the agency operates in a capital market, provided all risks are firm-specific, and therefore cannot be mitigated by appropriate investments in other firms (e.g., the market portfolio). The impact of economy-wide risk within a market setting is examined in Chapter 18.

The model examined in this chapter has an initial date at which the contract is signed and the agent exerts effort in a single task, and a terminal date at which the outcome x is realized and shared by the principal and the agent. The principal and the agent have the same information prior to signing the contract, and there is no additional information until the outcome is realized. In later chapters we extend the basic model to settings in which there are other performance measures at the contract termination date, the agent allocates effort among a number of tasks, the agent receives private information prior to taking his action and possibly prior to accepting the contract, and there is a sequence of action and consumption dates.

In this chapter we first (Section 17.1) introduce the basic principal-agent model, and provide a general discussion of the optimal contract when the agent has a finite number of alternative actions. In Section 17.2 we characterize first-best contracts, which, for example, apply if the principal can observe the agent's action. Section 17.3 explores the impact of the agent's risk and effort aversion on the characteristics of second-best contracts, which apply if the principal cannot observe the agent's action. Finally, Section 17.4 explores the characteristics of the second-best contract if the agent is risk neutral, but has limited liability constraints. Brief concluding remarks are provided in Section 17.5.

17.1 BASIC PRINCIPAL-AGENT MODEL

17.1.1 Basic Model Elements

As in the partnership model (see Volume I, Chapter 4), the outcome $x \in X \subseteq \mathbb{R}$ is determined by the action $a \in A$ (which, in this case, is an unobserved choice by the agent) and the outcome adequate events $\theta \in \Theta$. The principal and the agent have homogeneous beliefs about θ and those beliefs are denoted by a generalized probability density function $\varphi(\theta)$. However, it is useful in this analysis to suppress θ and focus on x as a random variable whose distribution depends on a . For example, if Θ is finite, then the generalized probability density function for x given a is

$$\varphi(x|a) = \sum_{\theta(x,a)} \varphi(\theta),$$

where

$$\Theta(x,a) = \{ \theta \mid \mathbf{x}(\theta,a) = x, \theta \in \Theta \}.$$

The principal's share of x is denoted π and the agent's share is c , so that $\pi = x - c$. We generally assume that the principal has unlimited resources so that $\Pi = \mathbb{R}$ is the set of possible values of π , but we assume (unless stated otherwise)