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Optimal sequential delegation ☆

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Abstract

The paper extends the optimal delegation framework to a dynamic environment where the agent initially has private information merely about the distribution of the state and learns the true state only as the relation proceeds. The principal may want to elicit the agent's initial information and offers a menu of delegation sets where the agent first chooses a delegation set and subsequently an action within this set. We characterize environments under which it is optimal and under which it is not optimal to elicit the agent's initial information and characterize optimal delegation menus. In the former case, delegation sets may be disconnected and may feature gaps.

JEL classification: D02; D20; D82; D86

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1. Introduction

How much decision making discretion should be delegated to privately informed, but self-interested agents is an important question for the optimal design of firms' governance struc-

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tures, hierarchies, or for the regulation of markets. Following the seminal work of Holmström (1977, 1984), a large body of literature studies this question in a setting where monetary transfers are infeasible, and a principal offers a set of permissible actions (a *delegation set*) to an agent who is perfectly informed about the decision relevant "state of the world". The principal has to trade off her benefit from utilizing the agent's information and her costs of giving up control. In the standard setting with one-dimensional state and action spaces, the literature has identified conditions under which an optimal delegation set takes the remarkably simple form of an interval. This amounts to imposing upper and lower thresholds on the agent's permissible actions. These thresholds depend on the distribution of the state as well as the parties' conflict of interest (*bias*).

In this paper, we study a novel issue by considering a dynamic setting where the agent learns the state only gradually while, at the outset, he privately knows the distribution of the state (to which we refer as the agent's *type*). Rather than offering the same delegation set to all types, a principal may then want to elicit (screen) the agent's type by offering a *menu of delegation sets*.[1] Facing such a menu, the agent first chooses a delegation set when he only knows his type, and then, after having observed the state, chooses an action from this set. Since monetary transfers are infeasible, the only screening instrument available is the degree of discretion provided by the delegation sets in the menu.

A classical application is the regulation of a monopolist (agent) where monetary transfers are infeasible, and the regulator (principal) determines the monopolist's discretion over prices. In this case, the state corresponds to the monopolist's marginal costs, and the regulator's objective is a weighted average of consumer surplus and profits. Our setup captures the situation that at the regulation stage, marginal costs have not yet been realized, but the monopolist has private beliefs about his future costs. In practice, offering a menu of delegation sets resembles a regulatory framework where the regulator does not impose a single regulatory plan but offers the regulated firm a choice among several plans. Such regulatory options are observed in practice in the telecommunication industry and can be interpreted as a screening instrument of the regulator.[2]

The contribution of our paper is to characterize environments under which it is optimal and environments under which it is not optimal for the principal to elicit the agent's type.[3] In addition, we characterize optimal delegation menus. We show that for a large, precisely determined class of environments, it is not optimal to elicit the agent's type. In this case, interval delegation remains optimal, establishing the robustness of interval delegation as an optimal mechanism even if the agent's private information arrives sequentially. In particular, this is the case whenever the bias is sufficiently small. Crucially, however, we also show that the sequential arrival of information may call for richer forms of restricting the agent's discretion beyond simply imposing thresholds. In these environments, the agent's type is elicited, and optimal delegation sets may feature "gaps", allocating discretion over "extreme" actions only.

[1] Considering delegation menus is in the spirit of Holmström's (1977, 1984) delegation principle. From an optimal mechanism design perspective, this means we restrict attention to deterministic mechanisms.

[2] Sappington (2002, p. 234) reports the case of regional Bell Operating Companies which, in the 90s, were offered a menu of regulatory plans involving various combinations of earning sharings and price caps and, in line with our model, argues that regulatory options elicit "the regulated firm's superior knowledge of its operating environment" (Sappington, 2002, p. 272).

[3] We allow for environments, that is, distributions and bias functions, which essentially satisfy the conditions that, in a static setting, are necessary and sufficient for the optimal delegation set to be an interval as shown by Amador and Bagwell (2013). As explained in detail below, we allow for the same general preferences but consider slightly less general environments.