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Optimal delegation via a strategic intermediary ☆

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ABSTRACT

This paper studies the optimal design of delegation rule in a three-tier principal–intermediary–agent hierarchy. In this hierarchy, monetary transfer is not feasible, delegation is made sequentially, and all players are strategic. We characterize the optimal delegation mechanism. It is shown that the single-interval delegation *a la* Holmstrom is optimal only when the intermediary is moderately biased. Otherwise, as responses to the distortion caused by a biased intermediary, the optimal delegation set may involve a hole. Thus, multi-interval delegation set would arise when subordinates have opposing biases. This result sheds some light on policy threshold effects: "slight" changes in the underlying state cause a jump in the policy responses.

1. Introduction

This paper investigates the optimal design of delegation rule in a three-tier principal–intermediary–agent hierarchy. In this environment, all players are strategic, the principal cannot directly contract with the informed agent, and contingent monetary transfers are not feasible. For instance, the current policy-maker need to affect the behavior of future executives by restricting the choice set of the future policy-maker, whose interest might differ due to political turnover or shocks on preferences, etc.; delegation can be made only among certain parties within a multi-tier government; corporate headquarters need to command product-line managers via division managers. Following Tirole (1986) and McAfee and McMillan (1995), we will take the multi-tier hierarchy as granted, and highlight the implications of hierarchies on the optimal design of delegation rule.

It is well known that when a principal could delegate decision-making authority directly to an agent, the optimal delegation set is a single interval of decisions (Holmstrom, 1977; Melumad and Shibano, 1991; Alonso and Matouschek, 2008). Examples include budgeting on a manager who is biased toward invest too much on a project, price caps on a monopolist, etc. In this paper, we provide a characterization of the optimal delegation mechanism in multi-tier hierarchies. It is shown that ceiling strategy is optimal only when the intermediary is moderately biased. The optimal set of permissible decisions may be a finite union of intervals. In other words, some modest policy choices are deliberately discarded by the principal, while extreme decisions are reserved. The "hole" in delegation set arises as a principal's control device to limit the possible distortion in downstream delegation from an intermediary, whose preference opposes to the agent's, and gives rise to policy threshold effects: "slight" changes in the underlying state cause a jump in the policy responses.

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In this hierarchy, only the agent could observe the state of the world and undertake the decision. There is preference misalignment among all players due to different intrinsic preferences, compensation package, or personal career concerns, etc. Delegation is modeled as a sequential game. The principal knows the biases of all subordinates, and offers a set of permissible decisions to an uninformed intermediary. The latter then exerts control by specifying a set of options from which an agent may choose.[1] In other words, an intermediary could further shrink, but is unable to expand, the agent's choice set. The optimal delegation mechanism is an equilibrium outcome of this game. To make the model tractable, we adopt the standard quadratic utility specification as in Crawford and Sobel (1982).[2]

There are at least two different stories justifying the relevance of our sequential delegation game. First, a principal has limited commitment power in that she can only promise to delegate to the immediate subordinate, and put restrictions on the choice set. Thus, an intermediary plays a role in delegation. This is related to the study of cheap talk game with partial commitment power in Alonso and Matouschek (2007) and Kolotilin et al. (2012). Alternatively, if it is costly for a principal to verify an informed agent's decisions *ex post* due to time constraint or limited attentions, she may grant the agent with the discretion within a specified menu of actions, and hire an intermediary who specializes in monitoring the agent. This intermediary could overrule his decision within this choice set, e.g., take more strict stance in supervision; but is unable to approve any actions beyond his choice set, e.g., it may be easy to observe over-spending. The principal could be the legislature or a company board, the agent could be investment banks, or a CEO, and the intermediary may be the Securities and Exchange Commission, or an external audit. As long as both the principal and the intermediary could make some commitment, the spirit of this story is consistent with our delegation game. In this story, an agent essentially is delegated by two asymmetric principals who move sequentially. This interpretation is also related to the work of Goltsman and Pavlov (2011) that studies the cheap talk game with multiple receivers.

Whenever the subordinates have *like biases*, and the intermediary is moderately biased, i.e., the intermediary is less restrictive than the principal, then it is optimal for the principal to use ceiling strategy. The existence of an intermediary will not add any more distortion.[3]

However, when the subordinates have *opposing biases*, i.e., the intermediary is more restrictive than the principal, he wants to impose extra restrictions on the agent's choice set. The principal and intermediary's disagreement on delegation derives from their different ideal caps on the agent's choice set. Thus, attempting to use single-interval delegation alone will result in the flat (or unresponsive in terms of Alonso and Matouschek, 2008) agent's response for the realizations of the extreme state. It is optimal to exclude some moderate actions from the intermediary's choice set, in order to make the agent's decision-making partially responsive to the extreme state. By doing this, the principal can limit the additional distortion from the biased intermediary. The essence is similar to Melumad and Shibano (1991) and Alonso and Matouschek (2008), though here the unresponsiveness arises endogenously from the *derived conflict of interest*. This oppositely biased intermediary not only shrinks the agent's choice set, but also reduces the responsiveness for the realizations of the moderate and high state. The restricted optimal delegation set involves an interval of delegated decisions and a discrete option. This sheds light on policy overreaction, in the sense that we observe big differences in policy responses with respect to "small" changes in the underlying state. For instance, small changes in the extent of law violation would get quite different penalties.

There is a large body of literature on delegation. Dessein (2002) and Ambrus et al. (2011) investigate delegation via an uninformed intermediary, and suggest that under some conditions indirect delegation dominates direct principal–agent delegation. However, they don't allow the intermediary to make delegation decision, and by assuming noncontractible actions, Dessein (2002) treats delegation as an "All-or-Nothing" choice, e.g., the principal cannot restrict the subordinate's choice set. Holmstrom (1977) uses mechanism-design approach to study delegation under exogenous information structure, and establishes the optimality of interval delegation. Goltsman et al. (2009) further demonstrate that, by Holmstrom's interval delegation, a principal can implement the optimal universal mechanism (Myerson, 1982). Melumad and Shibano (1991), Martimort and Semenov (2006), Alonso and Matouschek (2008), Mylovanov (2008), and Kovac and Mylovanov (2009) also characterize the conditions for the optimality of interval delegation.

Tirole (1986) investigates a simple three-tier principal–supervisor–agent hierarchy. In his work, a supervisor holds private information about the type of agents, and the focus is the collusion between subordinates. He establishes the equivalence between coalition-proof contract and giving ownership to a supervisor, who subcontracts with a downstream agent. Prendergast (2002) uses this framework to study customer complaint management mechanism. Sequential delegation is a kind of subcontract, but differing from these works, monetary transfer is not allowed in this paper. Therefore, the equivalence fails and subcontract can implement the optimal delegation outcome only under certain conditions.

Some works have established the possibility of jump-discontinuity delegation rule. Melumad and Shibano (1991) show that when the principal and the agent have disparate sensitivities on preferred actions, it will be optimal to have a one-jump

[1] If we allow the intermediary to choose ordering the informed agent after hearing from him, i.e., cheap talk, then, as Dessein (2002) shows, under the standard specification, delegation always dominates informative communication. Thus, cheap talk between the intermediary and the agent cannot be a part of the Subgame Perfect Nash Equilibrium outcome of this sequential delegation game. If the agent communicates with the intermediary, but the latter could commit to rubber-stamp the agent's recommendations within a specified set, then it is equivalent to that the intermediary delegates a set of decisions to the agent, and the latter undertakes his preferred options within it.

[2] Quadratic utilities are convenient for obtaining first-order conditions, but the intuition for results does not depend on this. For more general payoff functions and priors, the optimal delegation mechanism may still contain a hole.

[3] By Goltsman et al. (2009), interval delegation can attain the best outcome of a universal mechanism.