Optimal Allocation with Noisy Inspection*

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This paper considers a principal whose return from allocating to an agent is uncertain and inherent to the agent they allocate to. The principal has the ability to inspect the agent at a cost and learn about the true return, as well as the opportunity to receive a report from the agent of the private information they have about it. The agent, independent of their private information, strictly prefers to be allocated to. The paper shows that when information is *noisy* and privately held, inspection has two purposes: the verification of private information and the discovery of additional information.

The environment presented encompasses many important settings. A manager may seek to fill a position in their firm with a potential employee, a governing board may set the rules by which it allocates funding for a project to an applicant, or an investor may set a mechanism by which it evaluates and finances an early investment opportunity. In each of these examples, the agent has imperfect private information about the principal's allocation reward, it is costly for the principal to discover the reward themselves, and the use of transfers to align incentives are limited.

Modelling the agent's private information as a signal of *favourableness*, the unique separating mechanism that maximizes the expected return for the principal has a simple structure. To elicit truthful reports, the principal pools two types of signals from the agent - *high* and *low*. Agents with high signals are always inspected and only allocated post-inspection if the reward is sufficiently valuable. Agents with low signals are never inspected, compensated for their report with a small probability of unconditional allocation.

This induces three types of inefficiencies for the principal: over-allocation to agents with low types, over-inspection of agents with both high and low types, and under-allocation post-inspection. The paper further demonstrates that when commitment is relaxed, to the net detriment of the principal's objective, the losses from over-allocating to low types are magnified and losses from over-inspecting and under-allocating post-inspection are suppressed. It also shows that we can derive explicit comparative statics in this environment, demonstrating potential for empirical analysis.

This is related to a branch of the mechanism design literature devoted to costly inspection with no transfers. This paper demonstrates how we can recover interesting observations about inspection with noise, a feature mostly missing from this branch, and demonstrates how to model and analyse this feature. Extensions and applications of this analysis are widespread. Beyond the initial examples, consider the setting of application costs to academic journals, the assignment of food-safety inspectors to restaurants, or the granting of pharmaceutical patents.

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