Gathering imperfect information before signing a contract

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ABSTRACT

I study information gathering for rent-seeking purposes in contracting. In my model, an agent learns his payoff type only after accepting a contract, but can at costs acquire imperfect information while deliberating whether to accept. I show that the principal deters the acquisition if *and only if* the costs are high. The result stands in contrast to a finding by Crémer and Khalil (1992), who demonstrate that the acquisition of perfect information will always be deterred. A key insight is that the case of imperfect information is an instance of a sequential-screening problem.

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1. Introduction

This paper offers a new perspective on information gathering for rent-seeking purposes in contracting. Consider the following procurement relationship. A principal seeks to buy parts, which an agent can produce. The agent's production costs are at first unknown to both parties. *After* accepting a contract, the agent privately learns the exact state when he makes the necessary preparations for production. In particular, he learns his costs early enough so that the output level could still be adjusted, if the contract allows this. *While deliberating* whether to accept, he can acquire preliminary information, but at an extra expense.

The acquisition of such precontractual information would be a rent-seeking activity: From a social perspective, the information is redundant, and its acquisition thus wasteful, given that uncertainty resolves in any case before production. To the agent, on the other hand, the information may be valuable, because it would allow him to forecast more precisely whether or not the offered contract would be profitable for himself. A similar situation prevails with the sale of experience goods. Here, the consumers may be able to gather information about their valuation before making the purchase decision, which has little social value if the sellers can take back and resell the good.

How does the possibility for such rent seeking affect contract design? Specifically, to what distortions does it lead? That is the question that I address in this paper. In a seminal paper, Crémer and Khalil (1992) (hereafter CK) demonstrate that if precontractual information would already remove all uncertainty, the principal will design the contract such that the agent accepts without acquiring information. I consider the case of imperfect information. I show that, there, the principal deters

the acquisition if *and only if* the agent's investigation costs exceed some cutoff. A key insight is that the case of imperfect information is an instance of a sequential-screening problem.[1]

The result, and the importance of the imperfection of precontractual information, can be explained as follows. Ex post, the agent will earn a rent, given that he will learn his payoff type (i.e., in the above procurement setting, his production costs) privately. Since he will learn the type only after the signing of the contract, the principal can try to extract the *expected* rent with a participation fee. But now, by acquiring information, the agent has the costly option to examine whether his *actual* rent is likely to be larger than the fee, and to sign the contract only then. Unless such rent seeking is prohibitively costly, the principal must make a trade-off between efficiency and surplus extraction.

The crucial step is to recognize that precontractual information is relevant for the agent's expectation of his rent, and thus his willingness to pay participation fees. If the acquisition entails low costs, so that the contract must anyway be designed almost as if the agent *had* the information, it is therefore better to make the terms of trade contingent on the information—and thus to induce the acquisition. In particular, if the agent does acquire information, the principal can implement a more efficient contract menu with a larger participation fee conditional on the agent receiving good news about his payoff type, and a less efficient menu with a smaller fee in case of bad news. The corresponding contract screens the agent sequentially, so as to elicit not just the payoff type but also the posterior belief thereof upon information acquisition.

Of course, precontractual information would be relevant for the agent's expectation of his rent also if the information was perfect, as in CK's analysis. But in that case, the information would be identical to the one that the agent obtains after signing, when he finally learns his payoff type. Hence, a contract that deters the acquisition could nevertheless condition on the information. This explains why my result differs from the one by CK.

The paper thus identifies a possible form of inefficiency in contracting: before the signing of the contract, parties possibly waste resources to acquire information about parameters that, after signing, they learn anyway. Even though this act is inefficient, the social surplus may be larger if the acquisition does take place. Specifically, in my model, the principal's best contracts that induce information acquisition implement different, possibly more efficient terms of trade than the best contracts that deter information acquisition. The exact welfare properties of these contracts highly depend on the details of the model.

The analysis suggests implications for the use of trial subscriptions as a marketing device, for example by newspapers. A trial subscription allows consumers to learn about their valuation before deciding whether to buy a regular subscription. Effectively, such a test has little social value if subscription plans can be canceled at short notice. But in case that the consumers can easily obtain precontractual information anyway, then, according to this paper, a supplier may find it optimal to induce information gathering—for which free trial subscriptions are an effective means.

A key insight is that the contracting problem is closely related to the ones considered in the sequential-screening literature (e.g., Courty and Li, 2000; Esö and Szentes, 2007; Krähmer and Strausz, 2015). There, agents gradually receive private information over time before the allocation takes place.[2] In the seminal paper by Courty and Li (2000), in particular, the agent exogenously *has* imperfect information from the outset and learns his exact payoff type after the signing of the contract. That setting is equivalent to the special case of my model in which information acquisition entails zero costs.[3] For this case, the question of whether optimal contracts induce information acquisition can be rephrased as whether they condition on the information—and thus indeed screen the agent sequentially. Courty and Li provide a *complete* characterization of optimal contracts, using regularity assumptions concerning the probability distributions of their model. Under these assumptions, the optimal contracts do screen sequentially. I focus on the optimality of sequential screening and verify this property assuming just a first-order stochastic dominance ordering of the posterior distributions. The optimality of sequential screening is also studied by Krähmer and Strausz (2015). They show that if the agent has the right to withdraw from the contract when he learns his payoff type, optimal contracts are static, and only condition on the payoff type.

With nonzero investigation costs, the contracting problem differs from the one in Courty and Li (2000) by a moral hazard issue. Specifically, to induce information acquisition the principal may have to provide extra incentives; contracts that do not condition on the information, on the other hand, need not be designed as if the agent had it. The polar case, endogenous *post*contractual information, is studied by Krähmer and Strausz (2011). There, the agent's incentives to acquire information differ, since he cannot quit the contract afterwards.

Various papers analyze profit-maximizing contracts for related settings in which an agent can acquire information before signing (see Bergemann and Välimäki, 2002 for *surplus*-maximizing mechanisms in a general mechanism-design framework with endogenous information). In particular, Crémer et al. (1998a), Lewis and Sappington (1997), and Szalay (2009) assume that the agent never learns his payoff type for free (see Shi, 2012 for an auction setting). Crémer and Khalil (1994) as well as Crémer et al. (1998b), on the other hand, consider the case that information gathering must take place already before the contract is offered, and thus cannot be induced or deterred by contract design. Finally, Compte and Jehiel (2008)

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[1] To be precise, it is irrelevant in both CK's and my analysis whether the agent learns the unknown state after the signing of the contract fully. The crucial property of CK's model is that precontractual information is identical to the postcontractual information, whereas I assume that it is a garbling.

[2] Another closely related literature considers settings with dynamic adverse selection and *multiple* allocations (see, e.g., Battaglini, 2005 and Boleslavsky and Said, 2013). Occasionally, I refer to both strands as the *dynamic contracting literature*. See Pavan et al. (2014) for a unified framework.

[3] In Courty and Li's model, the agent receives precontractual information already before the contract is offered, rather than only before the signing decision. This difference is irrelevant: in either case, the agent begins to act with the signing decision. A technical difference is that Courty and Li assume a continuum of types whereas I, to facilitate the comparison with CK, assume a finite number.