Economics Letters 119 (2013) 104–107

Contents lists available at SciVerse ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Observability of information acquisition in agency models

Eva I. Hoppe *,[1]

Department of Economics, University of Cologne, Albertus-Magnus-Platz, 50923 Köln, Germany

ARTICLE INFO

Article history:
Received 17 July 2012
Received in revised form
8 January 2013
Accepted 18 January 2013
Available online 30 January 2013

JEL classification:
D82
D86
C72

Keywords:
Adverse selection
Information gathering
Hidden information

ABSTRACT

We consider an adverse selection model in which the agent can gather private information before the principal offers the contract. In scenario I, information gathering is a hidden action, while in scenario II, it is observable. We study how the two scenarios differ. Specifically, the principal may be better off when information gathering is a hidden action.

1. Introduction

Agency models with precontractual private information play a central role in contract theory.[2] While in standard adverse selection models the information structure is exogenously given, more recently some authors have accounted for endogenous information structures.[3] The contributions to the literature on information gathering differ in several respects. In particular, some authors (e.g., Kessler, 1998) assume that the information gathering decision is observable, while others (e.g., Crémer et al., 1998) assume that it is a hidden action. Hence, it is interesting to investigate the effects of observability of information acquisition in a unified framework. Is the agent better off if information gathering is a hidden action? Is the principal better off if she can observe whether the agent has gathered private information?

In Section 2, we introduce a simple adverse selection model in which costly information gathering before the contract is offered may be pursued for rent seeking purposes only, since it is commonly known that it is always ex post efficient to trade.[4] We consider two scenarios. In the first scenario (Section 3), the principal cannot observe whether the agent has spent resources to gather information. In the second scenario (Section 4), the principal can observe the agent's information gathering decision. In Section 5, we analyze how the agent's expected rent, the principal's expected profit, and the expected total surplus differ between the two scenarios.

2. The model

Consider a principal and an agent, both of whom are risk-neutral. The principal wants the agent to produce the quantity $x \in [0, 1]$ of a specific good. The principal's return is xR and the agent's production costs are xc.

At date 0, nature draws the cost parameter c. While both parties know that the distribution of $c \in \{c_l, c_h\}$ is given by $p = prob\{c = c_l\}$, at date 0 no one knows the realization of c. At date 1, the agent decides whether ($\lambda = 1$) or not ($\lambda = 0$) he wants to incur information gathering costs $\gamma > 0$ to privately learn the realization of his production costs.[5] At date 2, the principal offers

* Tel.: +49 221 470 2999; fax: +49 221 470 5077.
E-mail address: eva.hoppe@uni-koeln.de.

1 I thank Patrick Schmitz and an anonymous referee for helpful comments and suggestions.

2 See the seminal contributions by Myerson (1981), Baron and Myerson (1982), and Maskin and Riley (1984).

3 For a survey, see Bergemann and Välimäki (2006).

4 Information gathering is also a strategic rent-seeking activity in Crémer and Khalil (1992, 1994) and Crémer et al. (1998). While Crémer and Khalil (1994), Crémer et al. (1998), and Kessler (1998) also assume that information gathering can occur before the contract is offered, some authors have studied models in which information gathering can occur after the contract is offered but before it is accepted (see Crémer and Khalil, 1992 and Hoppe and Schmitz, 2010). Note that in the latter case observability of information gathering is irrelevant.

5 We thus consider the same information gathering technology as Crémer and Khalil (1992, 1994) and Crémer et al. (1998). In contrast, Kessler (1998) studies a model in which the agent chooses information gathering expenditures that determine the probability with which he becomes informed.

doi:10.1016/j.econlet.2013.01.015

Table 1
The principal's choice of x_h and x_u depending on π.

	$\pi > \bar{\pi}(R)$	$\pi = \bar{\pi}(R)$	$\pi < \bar{\pi}(R)$
$\pi < \hat{\pi}(R)$	$x_h = x_u = 1$	$x_h \in [0, 1], x_u = 1$	$x_h = 0, x_u = 1$
$\pi = \hat{\pi}(R)$	$x_h = x_u = 1$	$x_h \in [0, 1], x_u \in [x_h, 1]$	$x_h = 0, x_u \in [0, 1]$
$\pi > \hat{\pi}(R)$	$x_h = x_u = 1$ if $R - c_h > \pi p(R - c_l)$ $x_h = x_u \in [0, 1]$ if $R - c_h = \pi p(R - c_l)$ $x_h = x_u = 0$ if $R - c_h < \pi p(R - c_l)$	$x_h = x_u = 0$	$x_h = x_u = 0$

a contract to the agent. At date 3, the agent decides whether to reject the contract (so that the principal's payoff is 0 and the agent's payoff is $-\lambda\gamma$) or whether to accept it. If the agent accepts the contract, at date 4 production takes place and the principal makes the contractually specified transfer payment t to the agent. Then the principal's payoff is $xR - t$ and the agent's payoff is $t - xc - \lambda\gamma$.

We assume that $R > c_h > c_l$. Thus, it is common knowledge that $x = 1$ is the first-best trade level, regardless of the state of nature. This implies that costly information gathering is an unproductive rent-seeking activity only.

We will compare two scenarios. In scenario I, the principal cannot observe the agent's information gathering decision λ. In contrast, in scenario II the principal observes the agent's decision λ (while she can never observe the realization of c).

3. Scenario I

In scenario I, the principal cannot observe whether the agent has gathered information. Let $\pi \in [0, 1]$ denote the probability with which the agent gathers information at date 1.

Consider first the principal's contract offer. Suppose the principal believes that the agent has gathered information with probability π. According to the revelation principle, the principal can confine her attention to direct mechanisms $[x_l, t_l, x_h, t_h, x_u, t_u]$ to maximize her expected payoff

$$\pi[p(x_lR - t_l) + (1 - p)(x_hR - t_h)] + (1 - \pi)(x_uR - t_u) \tag{1}$$

subject to the incentive compatibility constraints

$$t_l - x_lc_l \geq t_h - x_hc_l, \tag{IC_{lh}}$$
$$t_l - x_lc_l \geq t_u - x_uc_l, \tag{IC_{lu}}$$
$$t_h - x_hc_h \geq t_l - x_lc_h, \tag{IC_{hl}}$$
$$t_h - x_hc_h \geq t_u - x_uc_h, \tag{IC_{hu}}$$
$$t_u - x_uE[c] \geq t_h - x_hE[c], \tag{IC_{uh}}$$
$$t_u - x_uE[c] \geq t_l - x_lE[c], \tag{IC_{ul}}$$

the participation constraints

$$t_l - x_lc_l \geq 0, \tag{PC_l}$$
$$t_h - x_hc_h \geq 0, \tag{PC_h}$$
$$t_u - x_uE[c] \geq 0, \tag{PC_u}$$

and the feasibility constraints $x_l \in [0, 1]$, $x_h \in [0, 1]$, and $x_u \in [0, 1]$.

Observe that the participation constraint (PC_l) of the low-cost type is redundant, as it is implied by (IC_{lh}) and (PC_h). Similarly, the participation constraint (PC_u) is redundant because it is implied by (IC_{uh}) and (PC_h). Moreover, note that the incentive compatibility constraints (IC_{lu}) and (IC_{ul}) imply the monotonicity constraint $x_l \geq x_u$, while similarly (IC_{hu}) and (IC_{uh}) imply $x_u \geq x_h$.

Ignore for a moment the incentive compatibility constraints (IC_{hl}), (IC_{hu}), and (IC_{ul}), which will turn out to be satisfied by our solution. It is then easy to see that (PC_h) must be binding, i.e., it is optimal for the principal to set

$$t_h = x_hc_h, \tag{2}$$

because otherwise we could increase the principal's expected profit by decreasing t_h without violating any of the remaining constraints. Furthermore, (IC_{uh}) must be binding so that it is optimal for the principal to set

$$t_u = x_h(c_h - E[c]) + x_uE[c], \tag{3}$$

because otherwise she could decrease t_u without violating any of the remaining constraints. Observe that (2) and (3) together with the monotonicity constraint $x_u \geq x_h$ imply that the right-hand side of (IC_{lu}) is larger than the right-hand side of (IC_{lh}). Thus, it is optimal for the principal to set

$$t_l = x_h(c_h - E[c]) + x_u(E[c] - c_l) + x_lc_l, \tag{4}$$

so that (IC_{lu}) is binding. It is straightforward to check that the omitted constraints (IC_{hl}), (IC_{hu}), and (IC_{ul}) are indeed satisfied if (2)–(4), and $x_h \leq x_u \leq x_l$ hold.

Hence, the principal's problem can be simplified. She chooses $x_l \in [0, 1]$, $x_h \in [0, 1]$, and $x_u \in [0, 1]$ in order to maximize her expected profit

$$\begin{aligned} &x_l[\pi p(R - c_l)] + x_u[R - E[c] - \pi(p(E[c] - c_l) \\ &\quad + R - E[c])] + x_h[\pi(1 - p)(R - E[c]) - (c_h - E[c])] \end{aligned} \tag{5}$$

subject to the monotonicity constraint

$$x_h \leq x_u \leq x_l. \tag{6}$$

The payments t_l, t_h, and t_u are given by (2)–(4).

To solve the simplified problem, note that it is optimal for the principal to set $x_l = 1$, since $\pi p(R - c_l) \geq 0$. Moreover, the coefficient of x_u is strictly positive whenever

$$\pi < \hat{\pi}(R) := \frac{R - E[c]}{p(E[c] - c_l) + R - E[c]}. \tag{7}$$

Note that $0 < \hat{\pi}(R) < 1$. The coefficient of x_h is strictly positive whenever

$$\pi > \bar{\pi}(R) := \frac{c_h - E[c]}{(1 - p)(R - E[c])}, \tag{8}$$

where $\bar{\pi}(R) > 0$.

Hence, it is easy to verify that in order to maximize her expected profit (5) subject to the monotonicity constraint (6), the principal sets x_h and x_u as displayed in Table 1.

Consider now the agent's behavior. Suppose first that in equilibrium the agent always gathers information so that $\pi = 1 > \hat{\pi}(R)$. Then according to Table 1, the principal would set $x_h = x_u =: x$. Yet, if the agent always gathers information, his expected payoff would then be given by $p(t_l - c_l) + (1 - p)(t_h - xc_h) - \gamma = x(c_h - E[c]) - \gamma$, while his expected payoff would be $t_u - xE[c] = x(c_h - E[c])$ if he does not gather information. Hence, $\pi = 1$ cannot be part of an equilibrium.

Suppose next that the agent never gathers information so that $\pi = 0$. Then $\pi < \hat{\pi}(R)$ and $\pi < \bar{\pi}(R)$ so that according to Table 1 the principal would set $x_h = 0, x_u = 1$. If the agent gathers