Economics Letters 120 (2013) 464–467

Contents lists available at SciVerse ScienceDirect

Economics Letters

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

Credence goods, experts and risk aversion

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HIGHLIGHTS

- We extend an expert model of credence goods by considering risk-averse consumers.
- Risk aversion reduces the incentive of the expert to invest in diagnosis.
- Risk aversion may lead to consumers' mistreatment.

ARTICLE INFO

Article history:
Received 30 January 2013
Received in revised form
23 May 2013
Accepted 31 May 2013
Available online 6 June 2013

JEL classification:
L15
D82

Keywords:
Credence goods
Expert services
Risk aversion

ABSTRACT

The existing literature on credence goods and expert services has overlooked the importance of risk aversion. In this paper we extend a standard expert model of credence goods with verifiable service quality by considering risk-averse consumers. Our results show that the presence of risk aversion reduces the expert's incentive to invest in diagnosis and may thus lead to consumers' mistreatment.

1. Introduction

In a number of activities, one agent's expertise substantially reduces the risk incurred by another agent. For instance, in agriculture, experts provide advice on the right use of pesticides, which dramatically lowers the output risk. In health care, medical doctors diagnose illnesses and prescribe the appropriate treatment. For legal services, the lawyer suggests the best strategy to win the trial. As a result, the customer's risk aversion is likely to play a crucial role in the expert's incentives to acquire information on the most efficient treatment. At the same time, expertise has a credence good dimension (see Darby and Karni (1973) or Emons (1997)) since the information collected by the expert is usually not observed by the agent. The agent's risk-aversion could therefore also cause the expert not to conduct a thorough diagnosis, and instead to propose useless but risk-free costly treatment.

In this paper we examine theoretically the impact of risk aversion on the expert's incentives to collect information in order to avoid either overtreatment or undertreatment in a credence good context with verifiable service quality.

For that purpose, we develop a simple model of an expert–customer relationship with risk-averse consumers, inspired by Dulleck and Kerschbamer (2006, 2009). We show that in a credence good context, risk aversion reduces rather than increases the incentives of the expert to exert effort to provide the right treatment.

Our starting point is the well-established result where the expert provides an efficient treatment if the following three assumptions hold (see Dulleck and Kerschbamer (2006, 2009)): (i) consumers are homogeneous, (ii) consumers are committed to an expert once the expert makes a recommendation, and (iii) the type of treatment provided and the diagnostic effort are verifiable. The key to this result is that, at the equilibrium, the expert charges the same markup for all possible treatments, removing

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0165-1765/$ – see front matter
http://dx.doi.org/10.1016/j.econlet.2013.05.033

any incentive to provide an inefficient treatment. The expert then has the right incentive to acquire information on the efficient treatment. In the present paper we extend this framework by considering risk-averse consumers, and show that the efficiency result may not hold. Our result is driven by the tension between the equal mark-up pricing and the risk borne by the consumers under this type of tariff. Even if it is known in principal–agent games that the optimal contract is second best when the agent is risk-averse, we show that the mechanism by which risk aversion leads to inefficiency is somewhat different in a basic model of credence goods.

The model is presented in the next section. We then analyze the expert's equilibrium strategy (Section 3) and its consequences for efficiency (Section 4).

2. The model

We use a standard expert model of credence goods similar to Dulleck and Kerschbamer (2006). We assume a continuum of identical consumers with a total mass of 1. Each consumer has a problem which can be major or minor. Two treatments are available: a minor treatment can only solve a minor problem while a major treatment can solve both types of problems. The parameter v is the gross gain of a consumer when his problem is solved, otherwise he gets 0. The consumer knows that he has a problem but he does not know the type. Ex-ante, each consumer expects that his problem is major with a probability h and minor with a probability $(1-h)$. The consumers are supposed to be risk-averse. Their utility follows a Von Neumann–Morgenstern form $u(x)$ with $u(0)=0$, x being the consumer's net gain.

An expert can detect the true type of the problem only by conducting a proper diagnosis. Without diagnosis, the expert cannot supply an appropriate treatment and can only choose to always supply a minor treatment (*undertreatment*) or a major one (*overtreatment*). The cost of a major treatment is $\overline{c}$, and the cost of a minor treatment is $\underline{c}$, with $\overline{c} > \underline{c}$. If a diagnosis is performed, the expert bears a cost d that is charged to the consumers. We assume that the type of treatment provided by the expert is verifiable.

In the first period of the game, the expert posts prices $\overline{p}$ and $\underline{p}$ respectively for a major and a minor treatment, and commits to conducting a diagnosis or not. Consumers observe these actions and decide whether to visit the expert or not (second period). In the third period, nature determines the type of the consumer's problem (major or minor). In the fourth period, the expert conducts a diagnosis or not, recommends a treatment, charges for it and provides it. The action of making a diagnosis is observed by the client[1] but the result of this diagnosis is not.

3. The expert's price-setting strategy

First, consider prices $(\overline{p}, \underline{p})$ that ensure equal markup for the expert for both treatments $(\underline{p}-\underline{c}=\overline{p}-\overline{c})$. If the expert performs a diagnosis, he is induced to provide the right treatment, so that the consumer's expected utility is equal to $hu(v-\overline{p}-d)+(1-h)\,u(v-(\overline{p}-\overline{c}+\underline{c})-d)$. The expert chooses prices that drive the consumer's expected utility down to 0. The consumer incurs a risk premium $\delta \in \left(0, (1-h)\left(\overline{c}-\underline{c}\right)\right]$ which is such that:

$$u(v-\overline{p}-d+(1-h)(\overline{c}-\underline{c})-\delta)$$
$$= h\,u(v-\overline{p}-d)+(1-h)\;u(v-(\overline{p}-\overline{c}+\underline{c})-d)=0. \quad (1)$$

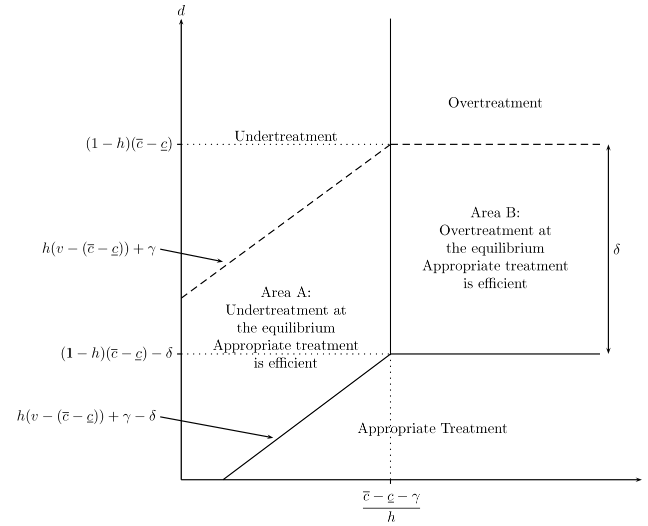

Fig. 1. Expert's choice and its efficiency impact.

Therefore, the expert posts prices satisfying:

$$\overline{p}=v-d+(1-h)\left(\overline{c}-\underline{c}\right)-\delta \quad \text{and} \quad \underline{p}=\overline{p}-\overline{c}+\underline{c}. \quad (2)$$

The expert could decide instead to post prices $\left(\overline{p},\underline{p}\right)$ that induce him to always provide the major treatment (i.e. $\overline{p}-\overline{c}>\underline{p}-\underline{c}$). No diagnosis is then required and the prices posted are:

$$\overline{p}=v \quad \text{and} \quad \underline{p}<\overline{p}-\overline{c}+\underline{c}. \quad (3)$$

The consumers' risk aversion plays no role here.

Finally, the expert could also post prices $\left(\overline{p},\underline{p}\right)$ that always lead to a minor treatment (i.e. $\overline{p}-\overline{c}<\underline{p}-\underline{c}$). The consumer does not pay any cost for diagnosis but bears the risk of an insufficient treatment. As a consequence there exists a risk premium $\gamma \in (0,(1-h)\,v]$ such that:

$$u((1-h)v-\underline{p}-\gamma)=h\,u(-\underline{p})+(1-h)\;u(v-\underline{p})=0 \quad (4)$$

and the expert posts prices satisfying:

$$\underline{p}=(1-h)v-\gamma \quad \text{and} \quad \overline{p}<\underline{p}-\underline{c}+\overline{c}. \quad (5)$$

The subgame perfect Nash equilibrium is the result of the comparison of previous profits.

Lemma 1. *The equilibrium prices* $\left(\overline{p},\underline{p}\right)$ *satisfy:*

(1) $\overline{p}-\overline{c}=\underline{p}-\underline{c}$ *with* $\overline{p}=v-d+(1-h)\left(\overline{c}-\underline{c}\right)-\delta$,

for $d \le \mathrm{Min}\left\{\begin{matrix}(1-h)\left(\overline{c}-\underline{c}\right), \\ h(v-(\overline{c}-\underline{c}))+\gamma\end{matrix}\right\}-\delta$

(2) $\overline{p}-\overline{c}>\underline{p}-\underline{c}$ *with* $\overline{p}=v$, *for* $d \ge (1-h)\left(\overline{c}-\underline{c}\right)-\delta$

and $v \ge \dfrac{\overline{c}-\underline{c}-\gamma}{h}$,

(3) $\overline{p}-\overline{c}<\underline{p}-\underline{c}$ *with* $\underline{p}=(1-h)v-\gamma$,

for $d \ge h(v-(\overline{c}-\underline{c}))+\gamma-\delta$ *and* $v \le \dfrac{\overline{c}-\underline{c}-\gamma}{h}$.

In case 1, the expert conducts the diagnosis and proposes the appropriate treatment. In cases 2 and 3, the expert does not conduct a diagnosis and proposes either overtreatment (case 2) or undertreatment (case 3). Solid lines in Fig. 1 delineate these 3 different cases.

This lemma shows that the consumers' risk aversion, captured by positive risk-premia δ and γ, clearly induces the expert to bias his pricing strategy towards full insurance of the consumer i.e. overtreatment. In the presence of risk aversion, the expert is thus more inclined than in the risk neutral case not to invest in diagnosis.

[1] Unlike Dulleck and Kerschbamer (2009), we do not consider here the case of unobservable diagnosis effort.