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Car Mechanics in the Lab - Investigating the Behavior of Real Experts on Experimental Markets for Credence Goods

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Car Mechanics in the Lab

Investigating the Behavior of Real Experts on Experimental Markets for Credence Goods

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Abstract

We compare the behavior of car mechanics and college students as sellers in experimental credence goods markets. Finding largely similar behavior, we note much more overtreatment by car mechanics, probably due to decision heuristics they learned in their professional training.

JEL classifications: C91, D82, C72

Keywords: Artefactual field experiment, Car mechanics, Credence goods

1 Introduction

Goods and services where an expert seller (he) knows more about the quality of a good a consumer needs than the consumer (she) herself are called credence goods. Although consumers can ex post observe the utility derived from the good, they do not know whether the received quality is the ex ante needed one. Consumers might even be unable to observe the received quality. Typical credence goods include car repairs, medical services, or software programming.

The informational asymmetries prevalent in credence goods markets can lead to several types of inefficiencies: (1) *undertreatment*, i.e. the provided quality is insufficient to satisfy the customer's need; (2) *overtreatment,* i.e. the provided quality is higher than needed; and (3) *overcharging,* i.e. the expert charges for a higher quality than provided. In a recent experimental study, Dulleck, Kerschbamer and Sutter (2009) (hereafter DKS) have examined the influence of different institutional/informational and market conditions on behavior on experimental credence goods markets. While they have run their experiment with college students, we use real car mechanics as expert sellers in order to explore whether the provision and charging behavior of real practitioners in credence goods markets differs from that of college students. By doing so, we contribute to the issue of external validity of results produced in laboratory experiments.

In previous years there has been considerable interest in running experiments with subject pools drawn from the field (rather than from a college) in order to make reliable inferences about behavior in the field. For example, Fehr and List (2004) show that CEOs trust more and are more trustworthy than students. Alevy et al. (2007) find that market professionals from the Chicago Board of Trade are better able to discern the quality of public signals than student subjects. However, Haigh and List (2005) report that the same professionals are even more prone to the effects of myopic loss aversion (see Gneezy and Potters, 1997).

Our paper is organized as follows. Section 2 introduces a simple model of a credence goods market. Section 3 presents the experimental procedure and Section 4 the results. Section 5 concludes.

2 The Credence Goods Model

Consider the following credence goods game (hereafter condition ***B***), which is a simplified and parameterized version of a game studied by Dulleck and Kerschbamer (2006). There are two players, an expert seller and a customer. First, the expert posts two prices: P^L for a low quality service and P^H for a high quality service, where P^L, P^H $\in \{1,2, \ldots,11\}$ and $P^L \leq P^H$. The customer gets to know these prices and then decides whether to stay out of the market or to interact with the expert. If the customer stays out, the game ends and both parties receive an outside option of 1.6 points. If the customer decides to interact with the expert, nature determines with equal probability the need for the low or the high quality service. The expert learns the customer's need and provides either the low (q^L) or the high (q^H) quality, where the low (high) quality has costs of c_L = 2 (c_H = 6) points. Finally, the expert charges one of the posted prices: P^L if he claims to have provided the low quality and P^H otherwise. The customer receives a value of 10 points from the interaction if she receives a sufficient quality (i.e., if she needs the low quality and gets either the low or the high quality, or if she needs the high quality and gets it), otherwise she receives a value of zero. Whether or not the customer's need is satisfied, she must pay the price of the quality the expert claims to have provided. Figure 1 illustrates the sequence of moves in this game and the payoffs of each player.

In real credence goods markets various informational and institutional conditions might limit experts' fraudulent behavior. We consider two limitations on experts' strategy spaces (in comparison to condition ***B)***: *liability* (condition ***L***), requiring that the expert provides a sufficient quality, and *verifiability* (condition ***V***), requiring that the expert charges the price for the quality of service rendered. Thus, liability precludes *undertreatment*, and verifiability precludes *overcharging*. Note that liability does not preclude overcharging, whereas verifiability does not prohibit undertreatment. Neither of them prevents *overtreatment*.

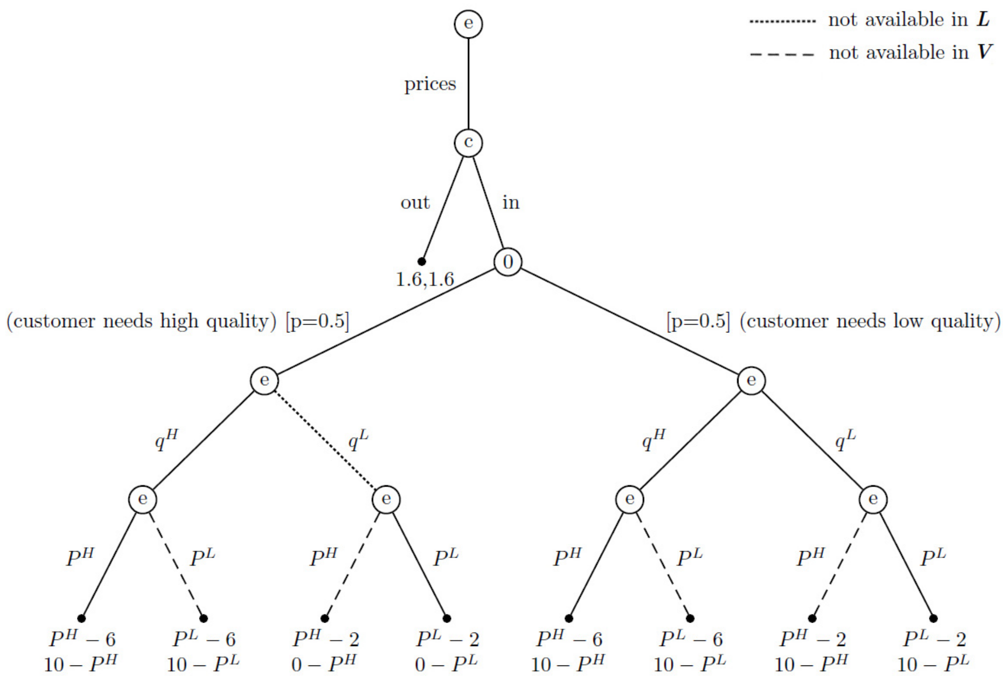

Figure 1: Game Tree

Assuming common knowledge that all players are rational and only interested in own material payoffs the three games can be solved via backward-induction: (*i*) In condition ***B***, the expert always provides the low quality and charges for the high one. Anticipating this, the customer only enters if $P^H \leq 3$. But with such a P^H no expert is able to earn the value of his outside option. Thus, the market breaks down. (*ii*) In condition ***L***, the expert always provides the appropriate quality and charges P^H. Anticipating this the consumer accepts if $P^H \leq 8$. Thus, the expert posts P^H=8 (P^L is irrelevant) and the customer enters the market. (*iii*) In condition ***V***, the expert always chooses (and charges for) the quality with the higher mark-up defined as the difference between price and cost. Since consumers correctly anticipate this, the expert cannot gain by cheating. Thus, the expert posts the most profitable equal mark-up vector that is accepted - which is the vector (P^L,P^H) = (6,10) - and the customer enters the market.

3 Experimental Procedure

We recruited car mechanic apprentices in their third or fourth year of professional training from the "Tiroler Fachberufsschule für Kraftfahrzeugtechnik", a vocational school located in Innsbruck, Austria. These apprentices work as regular employees at their respective auto repair shops and we use them as experts in our experiment. Students at the University of Innsbruck acted as customers. In total, 96 car mechanics and 96 undergraduate students participated in the computerized experiment (Fischbacher, 2007). Each session had 16 rounds. Four car mechanics and four students formed one independent matching group, with random re-matching of one car mechanic and one student after each round. The exchange rate between points and euros was 0.25 euro per point, and participants earned about 13 euros in less than 90 minutes.

DKS ran an experiment with the same procedure, but with a standard subject pool consisting of 280 college students. By comparing the results of the respective market conditions between DKS and our experiment, we are able to identify the effects of a change in subject pool and assess the external validity of their experimental results.

4 Experimental Results

In the following analysis we present data for rounds 7-16 in order to focus on experienced behavior of participants. Note that all results stay qualitatively the same when all periods are included.

Table 1 provides descriptive statistics for all experimental conditions, where ***B***, ***L*** and ***V*** indicate the three institutional conditions introduced above and subscript ***C*** or ***S*** refers to car mechanics or students, respectively, in the role of sellers. Interaction is calculated as the proportion of cases where customers agree to interact. Efficiency is calculated as the ratio of the actual average profit per period less the outside option and the maximum possible average profit per period less the outside option. Undertreatment (overtreatment) is calculated as the relative frequency with which the expert provides the low (high) quality when the customer needs the high (low) one. In order to make overcharging comparable between conditions ***B*** and ***L***, we define overcharging as satisfying the following conditions: (*i*) $P^H > P^L$, (*ii*) the customer needs the low quality, and (*iii*) the expert provides the low quality, but charges for the high one. Profits refer to averages per period, measured in points.

Experts are:	***Car Mechanics***			***Students***		
	B_C	L_C	V_C	B_S	L_S	V_S
Interaction	0.45	0.68	0.48	0.39	0.82	0.45
Efficiency	0.09	0.64*	0.22	0.16	0.88	0.14
Undertreatment	0.68	-	0.49	0.58	-	0.63
Overtreatment	0.11*	0.07*	0.20**	0.04	0.00	0.01
Overcharging	0.78	0.69	-	0.90	0.79	-
Profits of Experts	2.40	2.66*	2.13	2.55	3.60	2.45
Profits Customers	1.04	2.34	1.68	1.09	2.06	1.13
Number of Subjects	64	64	64	96	96	88

Table 1: Descriptive Statistics

(**/*) difference to experiment with other subject pool significant at the 1% / 5% level
(two-sided Wilcoxon rank-sum test)

Result 1. *Regardless of whether experts are car mechanics or students, (i) markets under condition **B** perform better than standard theory predicts, (ii) markets under condition **V** perform worse than standard theory predicts, and (iii) imposing **L** has a large and significant effect on interaction rates and efficiency, while imposing **V** does not.*

Support: (*i*) The interaction ratio is 0.45 in $\boldsymbol{B_C}$, respectively 0.39 in $\boldsymbol{B_S}$ which refutes the theoretical prediction of no interaction. In part, this is a consequence of experts' behavior (actual undertreatment and overcharging ratios are significantly below the predicted level of 100% which increases incentives for customers to enter the market), in part consumers are responsible (they are too credulous as they enter the market although it does not pay to do so).

(*ii*) and (*iii*) The benchmark solution suggests that both liability and verifiability should increase interaction rates up to 100%. However, only liability, but not verifiability, significantly increases the interaction rate in comparison to condition ***B***, controlling for the subject pool. The insignificant effect of verifiability on interaction – compared to condition ***B*** – is driven by two factors. (a) The prediction for ***V*** is based on expert sellers posting equal mark-up vectors. Such vectors are very rarely chosen in $\boldsymbol{V_C}$ (10%) and in $\boldsymbol{V_s}$ (2%), though. (b) The benchmark solution assumes that experts provide the appropriate quality under equal mark-up price vectors. However, experts frequently over- or undertreat even under such vectors.

While there is no significant subject pool effect in undertreatment and overcharging ratios in the different institutional conditions, we find strong differences between the behavior of students and car mechanics with respect to overtreatment in all of them:

Result 2*. Car mechanics provide overtreatment much more often than student experts.*

Support: In all 3 institutional conditions, car mechanics provide the high quality when the low one is needed significantly more often than students. Notice that under conditions ***B*** and ***L***, overtreatment causes unnecessary costs for the expert while the customer does not benefit. Thus, from an economic point of view overtreatment is pure waste. Also, in condition ***V*** and under undertreatment price vectors (i.e., $P^L - 2 > P^H - 6$) – where experts should provide the low quality to maximize their profit – we find significantly higher overtreatment ratios among car mechanics than among students in each single condition.

Car mechanics' professional trainings, routines, and norms could induce them to use decision heuristics different from those of students. In the current experiment, car mechanics are introduced to the new, unfamiliar environment of an economic experiment. When facing such an environment it seems natural that car mechanics rely on decision heuristics for similar situations experienced in the field. In this sense, the tendency of car mechanics to overtreat seems to be consistent with the incentives they face in everyday life. In the car repairing business undertreatment often implies serious consequences or is simply not possible, either due to institutional constraints or the car mechanic's concern about his reputation. Overtreatment, on the other hand, is difficult to detect and punish. Combined with the fact that in real life a diagnosis is typically subject to errors, this yields strong overtreatment incentives.[1] In the lab subjects seem to take quite some time to learn that diagnosis is perfect and that undertreatment has no immediate consequence for them. Figure 2 provides the development of the overtreatment ratio over the last 10 periods in all six conditions. Overtreatment ratios of car mechanics start much higher and remain much higher – despite falling over time – than those of student sellers.

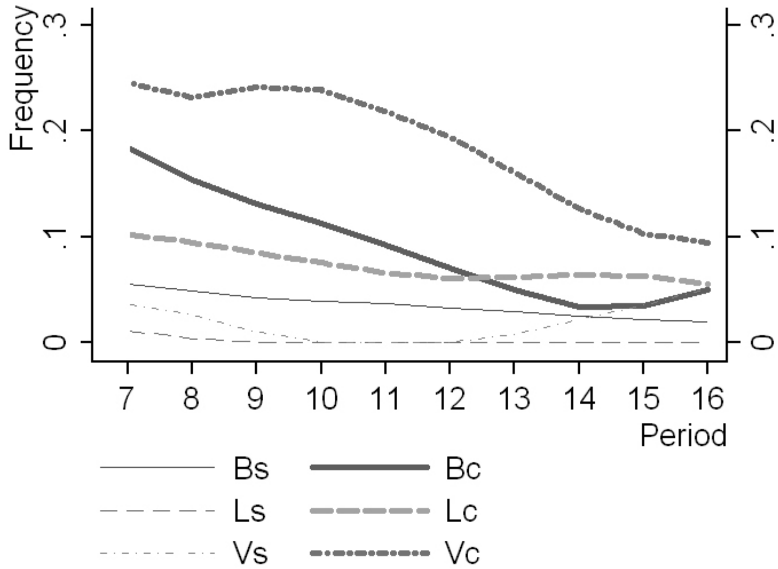

Figure 2: Overtreatment Over Time

5 Conclusion

Our results show that most findings regarding behavior on experimental credence goods markets are robust to a change in the subject pool. However, when comparing the provision behavior of car mechanics with that of a standard subject pool, we find that car mechanics have a strong propensity to provide unnecessary repairs. Since in the car repairing business – as in many other credence goods markets – overtreatment is hardly detectable and profitable, this behavior reveals patterns consistent with the incentives car mechanics face in their everyday professional life.

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[1] This might explain why overtreatment is a core problem in car repair. For instance, Wolinsky (1993) refers to a survey conducted by the US Department of Transportation, estimating that more than half of car repairs are unnecessary.

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