Games and Economic Behavior 89 (2015) 17–33

Contents lists available at ScienceDirect

Games and Economic Behavior

www.elsevier.com/locate/geb

Do sellers offer menus of contracts to separate buyer types? An experimental test of adverse selection theory ☆

Eva I. Hoppe [a,c], Patrick W. Schmitz [b,c,*]

[a] University of Bonn, Department of Economics, Adenauerallee 24-42, 53113 Bonn, Germany
[b] University of Cologne, Department of Economics, Albertus-Magnus-Platz, 50923 Köln, Germany
[c] CEPR, London, UK

ARTICLE INFO

Article history:
Received 14 February 2014
Available online 11 November 2014

JEL classification:
D82
D86
C72
C92

Keywords:
Mechanism design
Incentive theory
Private information
Laboratory experiment

ABSTRACT

In the basic adverse selection model, a seller makes a contract offer to a privately informed buyer. A fundamental hypothesis of incentive theory is that the seller may want to offer a menu of contracts to separate the buyer types. In the good state of nature, total surplus is not different from the symmetric information benchmark, while in the bad state, private information may be welfare-reducing. We have conducted a laboratory experiment with 954 participants to test these hypotheses. While the results largely corroborate the theoretical predictions, we also find that private information may be welfare-enhancing in the good state.

1. Introduction

In the past three decades, the theory of contracts and incentives has been one of the most active fields of research in microeconomics.[1] In this paper, we report about a large-scale laboratory experiment designed to test basic hypotheses of incentive theory. Specifically, we examine subjects' behavior in a setting where a seller makes a contract offer to a buyer who has private information about his willingness-to-pay. This setting is often simply referred to as the canonical "adverse selection" problem and might be called the centerpiece of mechanism design theory.[2] A fundamental hypothesis

☆ We would like to thank an associate editor and two anonymous referees who made helpful comments. We have also benefited from discussions with seminar participants at the University of Regensburg and the WZB (Berlin). Eva Hoppe acknowledges financial support by the UniCredit & Universities Foundation through a Modigliani Research Grant. The experiment was partially funded under the Institutional Strategy of the University of Cologne within the German Excellence Initiative. We are grateful to Felix Meickmann for providing excellent research assistance in programming and conducting the experiment.

* Corresponding author at University of Cologne, Department of Economics, Albertus-Magnus-Platz, 50923 Köln, Germany.
E-mail addresses: eva.hoppe@uni-bonn.de (E.I. Hoppe), patrick.schmitz@uni-koeln.de (P.W. Schmitz).

[1] For comprehensive textbook expositions of contract theory, see Laffont and Martimort (2002), Bolton and Dewatripont (2005), and Salanié (2005).

[2] While "adverse selection" originally referred to a potential consequence of asymmetric information, by now the term is usually used whenever a party has private information at the time the contract is written (while post-contractual information asymmetries, e.g. due to hidden actions, go under the heading of "moral hazard," see Maskin and Riley, 1984, and Hart and Holmström, 1987). Adverse selection models are at the heart of Bayesian mechanism

http://dx.doi.org/10.1016/j.geb.2014.11.001

of incentive theory is that the seller may want to induce separation between high-valuation and low-valuation buyers by offering a suitable *menu* of contracts. In the second-best solution, high-valuation buyers then consume the same quantity or quality as in a setting with symmetric information, while there is a downward distortion in the case of low-valuation buyers. Our aim is to study whether these predictions are supported by the data and to assess the role that other-regarding preferences and decision errors might play in this context.

We consider the simplest possible adverse selection problem in which incentive theory predicts that the seller may want to separate buyer types by offering a menu of contracts. Specifically, suppose a seller can sell either good A or good B to a buyer. In line with the traditional mechanism design approach, the seller has full commitment power and makes a take-it-or-leave-it offer to the buyer. For simplicity, assume the seller has no costs. The buyer is either a low type or a high type with equal probability. A low-type buyer's valuation for a good is smaller than a high-type buyer's valuation for the good. Moreover, regardless of his type, a buyer's valuation for good A is always larger than his valuation for good B. Good B may thus be interpreted as a smaller quantity or quality of the same product.

Under standard assumptions of rationality and profit-maximizing behavior, when there is symmetric information, then the parties will trade the efficient good A and the seller will extract the total gains from trade. However, suppose now that the buyer has private information about his type. Depending on the parameter constellation, it can be optimal for the seller to offer a menu of contracts such that a high-type buyer will purchase good A, while a low-type buyer will purchase good B. In particular, if the low-type buyer's valuation for good A is very small, the seller would have to set a very small price if she wanted to ensure trade of the efficient good A regardless of the buyer's type. It can then be more profitable for the seller to trade only the inefficient good B with a low-type buyer, which allows the seller to obtain a higher price for good A from a high-type buyer. Hence, the same good as under symmetric information is sold in the good state of nature (i.e., there is "no distortion at the top"), while in the bad state of nature only good B is sold (i.e., there is a downward distortion of the quantity or quality traded).

In our experimental study, we have conducted two private information treatments. In parameter constellation I, incentive theory predicts that the seller offers a menu of contracts to separate the buyer types. In parameter constellation II, the low-type buyer's valuation for good A is sufficiently large such that according to theory, the seller wants to trade good A with both buyer types. In addition, we have conducted two benchmark treatments which are similar to the two main treatments, except that there is symmetric information.

Results. Consider first parameter constellation I. It turns out that when the buyers have private information, the vast majority of sellers indeed offer an incentive-compatible menu of contracts. As a result, high-valuation buyers typically buy good A, while buying good B is the most frequent decision of low-valuation buyers. Comparing the private information treatment to the benchmark treatment with symmetric information, we find that total surplus levels do not differ in the good state of nature, while the total surplus levels are smaller under private information in the bad state of nature. Hence, the presence of private information is welfare-reducing. These results are all in good accord with the main hypotheses of adverse selection theory.

However, there are deviations. In particular, we observe that some offers are rejected and that the prices are on average smaller than predicted. These deviations occur already in the symmetric information benchmark treatments and are reminiscent of similar findings in the literature on ultimatum game experiments (see Güth et al., 1982).[3]

Next, consider parameter constellation II. Most sellers offer only good A, and also when a menu is offered buying good A is the most frequent decision of the buyers, regardless of their type. As predicted, in the bad state of nature, the total surplus levels do not differ between the private information treatment and the corresponding benchmark treatment with symmetric information. However, in the good state of nature, the total surplus levels are *larger* under private information than under symmetric information. In contrast to standard theory, the presence of private information can thus be welfare-improving.

A closer look at the data reveals that the latter finding is due to the fact that standard theory is too optimistic about the efficiency attained under symmetric information. Once we take into account that buyers tend to reject offers that would give them only a very small payoff, the welfare-enhancing effect of private information is actually a consequence of the fact that sellers' price-setting behavior is in line with adverse selection theory. In parameter constellation II, incentive theory predicts that under private information sellers set prices for good A that are small enough to make them acceptable for low-type buyers. In contrast, under symmetric information the sellers set larger prices when they know that the buyer has a high valuation. As a result, in the good state of nature there are less rejections when there is private information.

Across all four treatments, inspection of the data reveals that the vast majority of buyer decisions is compatible with standard preferences. However, other-regarding preferences might be useful to explain the observed deviations. We employ the quantal response equilibrium (QRE) approach developed by McKelvey and Palfrey (1995) to estimate structural models, taking into account that buyers may have other-regarding preferences. It turns out that other-regarding preferences are helpful to explain the data; however, they are on average less pronounced than is suggested in the literature on inequity

design theory (cf. Fudenberg and Tirole, 1991, Ch. 7). See Nobel Prize Committee (2007) for an appraisal of mechanism design in celebration of the pioneering contributions by Hurwicz, Maskin, and Myerson.

[3] Since Güth et al. (1982) conducted the first experiment on the ultimatum game some thirty years ago, it has become one of the most prominent games in experimental economics. In the ultimatum game, a proposer makes a take-it-or-leave-it offer regarding the division of a pie to a responder. If the responder rejects, both parties get zero. Very unequal divisions are often rejected, and on average proposers offer 30–40% of the pie. See Güth and Tietz (1990), Güth (1995), and Camerer (2003) for surveys.