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Analysis

Communication, competition and social gift exchange in an auction for public good provision

Nora Vogt [a,*], Andrew F. Reeson [b], Kilian Bizer [a]

[a] University of Göttingen, Department of Economics, Platz der Göttinger Sieben 3, 37073 Göttingen, Germany
[b] CSIRO Ecosystem Sciences, Clunies Ross Street, Black Mountain, Acton ACT 2601, Australia

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ABSTRACT

Reverse auctions are an established policy instrument for allocating conservation contracts. While the auction mechanism has been the subject of a number of studies, less attention has been paid to the post-bidding contract phase. As contracts involving natural resource management are usually incomplete, trust becomes crucial for the effectiveness of the programme. We test the effect of communication between auctioneer and bidders on bidding behaviour and contract fulfilment using experimental economics. We combine a repeated reverse auction with an effort-level game and use a bilateral chatting tool as treatment variable. Without communication, auctioneers tended to select the lowest-priced bidders, who invested substantially less than the socially optimal level of effort when fulfilling their contract to provide the public good. Relational contracting proved important, with effort levels and profits tending to be higher when auctioneers and bidders entered into consecutive contract relationships. In the communication treatment there was no evidence of price competition, as auctioneers were more likely to accept high-priced bids. However, an overall higher price level did not lead to efficiency losses, since contractors realised higher effort levels in return, establishing a 'social gift exchange'. Our results demonstrate the importance of trust-based relationships between the auctioneering institution and landholders.

1. Introduction

Conservation auctions do not take place in a social vacuum. These reverse[1] auctions (also known as competitive tenders) typically involve landholders submitting bids to provide conservation or other ecosystem services on their land. The conservation agency selects the most cost effective bids and enters into a contractual relationship with those landholders, which will usually run for several years. It is therefore appropriate to consider conservation auctions as a two-stage process, composed of a bid selection stage and a contract stage. While the bid selection stage serves to identify the optimal contractors according to a ranking rule, the ecological good is produced in the contract stage at a specified price. This price is determined as contractors make bids on the basis of their opportunity costs (foregone profit) and their prospective cost of effort. But, often neither the exact quantity nor quality of the targeted ecological good can be defined in concrete terms. Therefore, the resulting contractual agreement is in most cases incomplete. Furthermore, regular monitoring, and if necessary enforcement, of site activities after contract conclusion is often too costly to implement. Given these sources of information asymmetry, the success of the conservation measure hinges to a large extent on the willingness and capabilities of the contracting land managers and on the ability of the agency to select trustworthy bidders. This makes the social dimension a particularly important aspect of successful cooperation in natural resource management (cf. Reeson et al., 2011a).

Experimental economic research methods can contribute to what can be called the 'socio-ecologic' research agenda (Anderies et al., 2011; Ostrom, 2010). Laboratory experiments have already generated important insights on bidding behaviour in conservation auctions (e.g., Cason and Gangadharan, 2004; Reeson et al., 2011b; Schilizzi and Latacz-Lohmann, 2007). While most studies to date have focussed on the bidding phase, far less is known about the specific relationship between auctioneer and bidders and its potential relevance for ex-post contract fulfilment. It is the aim of this article to employ an experimental approach to examine the particular role of trust in conservation auctions.

Trust, which can be understood as an investment decision that leads to positive returns only if reciprocated by the trustee, is a prerequisite to successful cooperation (Ostrom, 2003, 2010; Pretty and Ward, 2001). Under the assumption of pure rationality, economic agents are not expected to trust as the implicit risk of defection prevents cooperation, leading to suboptimal results such as an underprovided public good.[2]

* Corresponding author. Tel.: +49 551 3912330; fax: +49 551 3919558.
E-mail addresses: nora.vogt@wiwi.uni-goettingen.de (N. Vogt), andrew.reeson@csiro.au (A.F. Reeson), bizer@wiwi.uni-goettingen.de (K. Bizer).

[1] Unlike auction formats which maximise the purchase price (e.g., English auction), a *reverse auction* establishes a downward bidding competition in order to select the *lowest-priced seller* of a specific good or service.

[2] As Mettepenningen et al. (2011) point out, trust in the participants of conservation programmes can increase efforts towards good programme design which potentially increases the effectiveness of the programme but raises public transaction cost as well.

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The diverse experimental literature on trust games shows that this result does not hold in an empirical context since there is robust evidence for trusting behaviour in double-blind one-shot trust games (e.g., Berg et al., 1995) and multi-stage trust games, such as the effort-level game (cf. Camerer, 2003, p.94).

Effort-level games have proven useful for examining fairness and reciprocity norms as well as relational aspects in the context of incomplete labour contracts (e.g., Brown et al., 2004, 2012; Gächter and Falk, 2002; Fehr and Schmidt, 1999; Fehr et al., 1997, 2009). As incorporated in the gift exchange model, positive reciprocity is a successful strategy to establish cooperation in an incomplete contract environment (Fehr et al., 1997). Moreover, markets characterised by an absence of third-party enforcement were found to be prone to market bilateralisation as principals and agents come to rely on one-to-one relationships as a basis for contracting (Brown et al., 2004, 2012; Fehr et al., 2009). In incomplete contracts, agents have an incentive to invest in their reputation as a trustworthy partner but these reputational investments do not have the same value if transacting with a different principal (cf. Williamson, 1985). At the same time a principal cannot be sure that they will do better with another agent. This lock-in effect leads to a weakened impact of outside competition but it does not necessarily lead to efficiency losses. Cooperation in long-term contract relations was even found to be superior to formal reputation mechanisms (Reeson et al., 2011b).

Amongst the different institutions tested to enhance trust and trustworthiness in experiments, communication has been reported as one of the most powerful tools to solve social dilemmas (e.g., Ben-Ner and Putterman, 2009; Davis and Holt, 1992; Isaac and Walker, 1988; Ostrom, 2003). Communication also enhances cooperation in economic transactions characterised by hidden information, as recently shown by Charness and Dufwenberg (2011). According to the game-theoretic baseline, non-costly and non-binding communication should not have any effect at all. Even though 'cheap talk' is not a credible commitment it has proven effective in a large number of experimental studies (cf. Balliet, 2010). The effectiveness of communication stems from different sources (cf. Bichhieri, 2002; Ostrom, 2003): Direct interaction triggers social and personal norms, such as promise keeping, altruism and fairness, but can also induce psychological phenomena such as social identity. Moreover, communication leads to the clarification of intentions and actions. It also allows the distribution of information as well as the reduction of misunderstandings. In that way, communication can encourage calculative and personal trust between market participants in an incomplete contract environment. Face-to-face talk was found to have the strongest effect relative to other forms of communication (such as text-based exchange or simple signalling), mainly because it provides the largest number of social cues to evaluate a person's credibility (Balliet, 2010; Ostrom, 2003).

In a reverse auction the effect of communication is not immediately obvious. Although we are not aware of a specific study that tests communication in a reverse auction, we can relate to some of the findings of experiments on different information conditions and learning. As communication has an information distributing effect, one could conjecture that communication encourages strategic bidding, especially, in repeated set-ups (cf. Ferraro, 2008; Hailu and Schilizzi, 2004; Schilizzi and Latacz-Lohmann, 2007). However, Reeson et al. (2012) show that the provision of information in a repeated reverse auction does not necessarily lead to efficiency losses if competitive forces are strong from the beginning. As well as bidding behaviour itself, we are interested in the impact of communication on post-bidding contract fulfilment. In a competitive market scenario, efficiency is maximised when competition forces bid prices down to exactly reflect bidder costs. However, under incomplete contracts this may not necessarily provide the best outcome. As in the gift exchange game, if higher bid prices relate to higher subsequent effort, higher bids do not necessarily lead to efficiency losses.

We examine the impact of text-based communication in repeated conservation auctions by combining a reverse auction market with an effort-level game stage. We use a modified effort-level game to account for the ecological dimension of the traded good. Contrary to the private returns approach, effort does not only affect the principal's payoff but leads to a public good type contract dividend shared among all participants. This creates a social dilemma, as contractors maximise their individual benefit if they implement a lower than socially optimal effort level. We find that text-based communication encourages trust between market participants and leads to a significantly higher degree of cooperation. We show that communication has a significant effect on bids and wages but also on effort levels.

2. Experimental Scenario

2.1. The Market

Our experimental scenario consists of two types of players, one auctioneer and n bidders. Based on a competitive bidding process, it is the auctioneer's task to conclude two contracts with two bidders in every round. Bidding and contracting are repeated for an indefinite number of periods, throughout which bidders can be identified by the auctioneer.

Every contract generates a contract dividend D_e that is split equally among all market participants, creating a classic public good dilemma. The contract dividend rises linearly with the level of effort e chosen by the respective contractor.[3] This design combines elements of a classic public good dilemma with the standard effort-level game. Splitting contract profits amongst the auctioneer and *all* market participants (i.e., bidders) reflects key aspects of contracts for conservation (or other ecosystem services), for which the benefits are shared.

$$D_e = \frac{ev}{n+1}, e \in [0.5, 1.5]$$

In every round, bidders can submit sealed bids to the auctioneer, indicating their costs of contract fulfilment. If chosen as a contractor they need to reinvest part of their bid as effort into the contract dividend. The contract is incomplete as the auctioneer can neither enforce a particular level of effort nor observe individual effort choices ex post. In each round the auctioneer obtains an exogenously fixed budget to pay two contractors' bids (hereafter referred to as wage) and any remaining funds are added to the auctioneer's profit.[4]

While the contract dividend increases linearly with rising effort, the cost of effort exhibits increasing marginal costs.[5] The contractors' effort choices are crucial for the overall market result. Given the functional shapes of effort costs and dividend, the contractors' net gains from contracting (i.e., dividend minus effort cost) follow a concave shape with an interior optimum (Fig. 1). The Pareto optimal solution is reached if the contract dividend is maximised by both contractors. Table 1 summarises the payoff structure for every type of market participant.

In this market the auctioneer and the contractors have a dominant strategy (not to implement high effort) that is Pareto inferior to the coordinated solution (in which both cooperate and maximise contract dividends). If all contractors and the auctioneer behave rationally, the social optimum cannot be reached as it implies foregoing all individual rents. Under the assumption of pure rationality, the auctioneer minimises labour cost and contractors will always implement the net gain maximising effort level e_i.[6] Although contractors could increase their

[3] The effort-range e is set from 0.5 to 1.5. During the experiment, for the sake of simplicity efforts are transformed to a percentage scale (corresponding to 0.01 increments). v is a level parameter, set to 900 in the experiment.

[4] There is no explicit rule for the auctioneer to always select the cheapest offers. In this way, the reverse auction stage adopts some elements of a posted-offer market (cf. Walker and Williams, 1988).

[5] The effort-cost function $c(e)$ is given by $c(e) = 25(4^e),\ e \in [0.5, 1.5]$.

[6] In the experiment, the individual rational effort level was given by $e_i = \log_4 \frac{25\ln 4v}{n+1}$ e ~ 1.06.