



Environmental services auctions under regulatory threat



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ABSTRACT

This paper examines how strategic responses of bidders and efficiency properties are impacted in auctions for the procurement of environmental services when a threat of regulation is levied. Laboratory experiments reveal characteristics of bidder behavior in different regulatory environments. Experimental results provide insight into efficiency and equity tradeoffs inherent in regulatory policy applications with respect to environmental services auctions. While it is possible to reduce the amount of public funds necessary to purchase a given level of environmental services, adverse selection costs and equity considerations may outstrip the benefits gained from threat implementation.

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1. Introduction

Market institutions are gaining popularity worldwide for use in the procurement of environmental services from private landowners. Recent service programs using auction mechanisms in which landowners competitively bid an amount of money they will accept in exchange for providing an environmental service include the U.S. Conservation Reserve Program (Khanna and Ando, 2009), as well as a number of incentive schemes in Australia (Reeson et al., 2011; Stoneham, 2003; Windle et al., 2009). Further scientific field studies of environmental services auctions have been recently conducted in Africa (Jindal et al., 2013; Khalumba et al., 2014) and South America (Narloch et al., 2013). These and other similar programs pursue various environmental objectives, such as increasing biodiversity, reducing dryland salinity, protecting groundwater, and extending wildlife habitat (Latacz-Lohmann and Schilizzi, 2005). While the potential benefits of using auctions to allocate contracts have been documented in economic theory (Chan et al., 2003; Klemperer, 1999; Latacz-Lohmann and Hamsvoort, 1997, 1998), there is still much that can be learned from conducting experimental and empirical research on the use of auctions in varying contexts. Procurement auctions for environmental services

(PES auctions hereafter) have demonstrated promise for reducing rents to landowners that result from the information asymmetry present between agencies that purchase environmental services and landowners who provide these services (Latacz-Lohmann and Schilizzi, 2005). This asymmetry exists because landowners have better information about their opportunity costs of providing services. In discriminatory price PES auctions, landowners bid dollar amounts they are willing to accept from the government or conservation agent in return for maintaining a certain ecosystem to agreed-upon rules.¹ After the bids are submitted, the conservation agent chooses to contract with the lowest bidders or, if other selection criteria are applied, those with the best benefit to cost ratio. The competitive process used to allocate contracts in auctions induces participants to carefully weigh the amount they bid above their cost, against the likelihood that their bid will be accepted (Cox et al., 1984; Vickrey, 1962). This may allow the conservation agent to purchase a larger quantity of services within a given budget than would be possible using a traditional fixed payment scheme in which each potential service provider is offered the same contract price regardless of their opportunity cost of providing the service. However,

¹ More generally, contracts between landowners and the conservation agent may specify extra measures for ecosystem improvement that must be implemented. The contract payments may also be made conditional on ecosystem outcomes and performance independent of specific actions to be taken by the landowner.

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there is empirical and laboratory evidence that landowners bid significantly higher than their opportunity costs when participating in discriminatory price PES auctions (Cason and Gangadharan, 2005; Kirwan et al., 2005). The resulting informational rents awarded to contract winners create a need for the allocation of a greater amount of public funds to purchase a given level of environmental services than would be necessary if landowners bid their true opportunity costs of providing services.

Ongoing research programs continue to explore the efficiency properties of PES auctions (Bulow and Klemperer, 2009; Khalumba et al., 2014; Klemperer, 2002; Reeson et al., 2012; Schilizzi and Latacz-Lohmann, 2007). However, one issue that has been left unaddressed in the literature stems from the fact that the procuring agent is often a government entity, and consequently, may be empowered with regulatory authority by lawmakers. Indeed, government regulation has a long history of use in the United States to prevent activities that are harmful to the public. Miceli and Segerson (1995) assert that “courts have long viewed it as a legitimate exercise of the government’s police power to ‘regulate’ property without the obligation to pay compensation, provided that the intent of the regulation is to protect the ‘health, morals, or safety’ of the community.” They expand on this concept by saying “actions that limit the use of but do not physically acquire property have generally been viewed as non-compensable.” Cases in which the land management practices of private landowners may adversely affect the health, morals, or safety of other members of a community include overextraction from a publicly owned environmental stock, such as a river or aquifer, removal of critical habitat for endangered species, and harmful situations that may arise from pesticide usage, manure storage, or other production practices. However, this does not mean that environmental problems are easily overcome by regulation. For reasons such as political feasibility, fairness, and the possibility of negative unforeseen and unintended consequences associated with regulatory action, policymakers have often opted instead to pursue voluntary action by offering economic incentives to encourage landowners to provide environmental services.

This paper studies a combination of voluntary and regulatory actions by examining PES auctions when a threat of regulation is levied. Laboratory experiments are conducted to reveal characteristics of bidder behavior in different regulatory environments. The experiments provide insight into the efficiency-equity trade-offs inherent in regulatory policy applications with respect to the use of PES auctions. Results indicate that it is possible to reduce the amount of public funds necessary to purchase a given level of environmental services by using an explicit threat of regulation in PES auctions. *Ceteris paribus*, this outcome represents an efficiency gain and improvement in the performance of the auction by increasing the amount of services that may be contracted within a given budget, thereby reducing the need for a government to collect distortionary taxes. However, adverse selection costs and equity considerations that arise from levying a regulatory threat may outstrip the potential benefits gained by paying lower prices to service providers.

2. Motivation and a review of the literature

To maximize the budgetary efficiency of the conservation agent, landowners’ bids in discriminatory price PES auctions should be equal to their true opportunity costs for providing the environmental services. However, contractual relationships arrived at through this bidding process are subject to asymmetries of hidden information and hidden action. Both asymmetries enable landowners to achieve rents, or windfall gains, from the conservation agent by either inflating their bids or failing to perform the services they are

contracted to provide. While each asymmetry creates inefficiency with regard to the provision of environmental services, this paper will focus on the former (hidden information).²

Hidden information becomes a problem when the opportunity cost of providing an environmental service varies across landowners. Auction theory predicts that bidders will weigh the amount at which they inflate their bid (the windfall gain from winning a contract in the auction), against the probability that their bid will be accepted when formulating bids in multiple unit discriminatory price auctions (Cox et al., 1984; Vickrey, 1962). Shoemaker’s (1989) early analysis of the Conservation Reserve Program (CRP), the largest PES initiative in the U.S., finds evidence of informational rents going to landowners. Further study of the CRP by Kirwan et al. (2005) quantifies windfall gains in the CRP as constituting between 10 and 40% of total contract values in 2002–2003 signup periods, the most recent of their sample. Additionally, the Economist’s (Anonymous, 1999) report on the California Headwater Forest purchase and Osterberg’s (1999) analysis of a German agri-environment payment program both contain further evidence of informational rents being captured by landowners.

Informational rents to landowners are an important problem because they generally come at the expense of tax payers. Because it is tax collections which are most often used to compensate landowners for providing environmental services, society as a whole will benefit if the payments to landowners are equal to the landowners’ opportunity costs of contract compliance, but no more than these costs (Ferraro, 2008). An alternative view is that society will benefit as long as the value of the environmental service is greater than the opportunity cost of providing it, regardless of the payment level. This view may be appealing, however, the cost of public funds used to pay for contracts must be considered. Dahlby (2008) describes this cost as a measure of the loss incurred by society in raising additional revenues to finance government spending due to the distortion of resource allocation caused by taxation. The cost of public funds may be significant. For example, Feldstein (1999) estimates an average cost of public funds of 30% for the USA. Regardless of which view is taken toward the social benefit of conservation payments, when auction participants are paid above their opportunity costs, it will reduce the amount and quality of environmental services which may be contracted within a given budget and increase the amount of public funds that must be collected through distortionary taxes in order to meet a particular environmental objective.

As mentioned in the introduction, an important aspect of PES auctions that is usually kept in the background in the relevant literature is the fact that the conservation agent is usually a government agency, and the government has the power to order the implementation of ecosystem management practices if lawmakers chose to empower the government agency in such a way. One case to illustrate this situation has taken place in the Flint River Basin of Georgia (U.S.A.). The river basin supports a thriving ecosystem of plants and animals while serving as the primary water supply for many local communities and as an irrigation source for farmers who extract water to irrigate their crops. In years in which a sufficiently serious drought occurs, biologists may determine that river basin ecosystem could be damaged or destroyed if farmers continue to irrigate their crops as usual. When this determination was made for the Flint River Basin in 2001 and 2002, the government decided to implement a PES auction to purchase enough of the water rights back from farmers so that the ecosystem and water supply were protected for the year (Cummings et al., 2003; Laury,

² Cox et al. (1996) provide an informative analysis of both information asymmetries in the context of government procurement from private contractors who may engage in costly effort to reduce overall costs of service provision.

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