Should conservation contracts include incentive payments and also be put up for tender?

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Abstract

In order to maximize efficiency, should conservation contracts include incentive payments and also be put up for tender? This work uses laboratory experiments to investigate this question. We find that there exists an optimal share of performance payment which yields maximum total stewardship effort and expected environmental outcome. While cost-effectiveness is maximized with the totality of payments linked to outcomes, it comes at the cost of reduced participation. Tendering such contracts yields additional benefits in terms of effort extraction and cost-effectiveness, but these benefits rapidly decline with the share of performance payment. Combining high shares of performance payments with tendering runs the risk of falling far short of the environmental target.

Keywords: Conservation tenders, auctions, incentive contracts, agricultural policy, market-based instruments, experimental economics

JEL: C92, D44, D82, D86, H57, Q24, Q28

SHOULD CONSERVATION CONTRACTS INCLUDE INCENTIVE PAYMENTS AND ALSO BE PUT UP FOR TENDER?

I. INTRODUCTION

In the last three decades, governments around the globe have developed market-based policy instruments to procure environmental services from private landholders. Conservation contracting represents the most commonly used policy instrument in this respect. The increased importance of environmental contracting has, to date, hardly been reflected in innovative policy design. It remains the norm in most conservation programs to offer a uniform payment for compliance with a uniform set of management prescriptions. This paper aims to explore two proposals that have been made to enhance the effectiveness of conservation contracting: linking contract payments to environmental outcomes (rather than conservation activities) and putting the contracts up for tender (rather than paying landholders uniform prices). Whereas the two aspects have been studied in isolation in the literature, the focus of the present paper is on exploring the combined effect of outcome-based payments and tendering on conservation behavior and policy performance. In the interest of clarity, we will however explore the two aspects consecutively. We will first investigate the impact of linking payments to environmental outcomes in a non-tendered setting. Subsequently, we will study the additional impact on conservation behavior and policy performance of putting such incentive contracts up for tender.

Outcome-based payments harness the self-interest of their recipients to act in the interest of the conservation agency by optimizing their stewardship effort. At the same time, they create previously absent risks for landowners, some or many of which are beyond their control. It can happen that, due to factors such as disease, pest invasions, fire, drought, or natural fluctuations in wildlife populations, the environmental outcome is much diminished or even nil – in spite of the fact that costly on-ground actions have been carried out. This is likely to reduce participation in the scheme and thereby its environmental effectiveness. There is thus a tradeoff to be studied between an incentive effect on the one hand and a participation effect on the other. If the latter outweighs the incentive effect, linking payments to uncertain outcomes is likely to be unproductive.

The motivation for studying the impact of tendering lies with the property of auctions of creating competition among potential providers of environmental benefits. Landholders facing competition for a limited number of contracts have an incentive to moderate bids if they wish to be awarded a contract. Allocating incentive contracts through an auction thus has the potential further to enhance the performance of conservation programs. At the same time, this approach exposes landholders to further risk, that of not winning a contract, potentially creating another deterrent to participation in conservation schemes. There is thus an incentive and a participation effect to be studied for both mechanisms: the contracting on uncertain outcomes and the tendering of such contracts.

The present paper aims to further current knowledge in the field of conservation contracting by clarifying key aspects of tendering contracts with payments linked to uncertain outcomes. Specifically, we wish to clarify the conditions under which the performance of conservation programs can be enhanced by combining incentive contracts with auctions. In order to examine the effect of the two opposing forces, the incentive effect and the participation effect, we shall study several points on the continuum between no payments linked to uncertain outcomes and the totality of payments thus linked. The analysis is based on controlled economic experiments which were carried out in two locations: at the University of Kiel, Germany, and the University of Western Australia, in Perth, Australia.

The following section 2 reviews previous research on incentive contracts and conservation auctions and provides an overview of existing conservation schemes with payments linked to environmental outcomes. Section 3 describes the laboratory experiments. Section 4 reports the experimental findings. In order to disentangle the effects of the two policy mechanisms we first examine incentive contracts that are not tendered, then compare the results under tender. In this way we are able to address the combined effect of tendering outcome-based contracts. A final section concludes.

II. PREVIOUS WORK

This study builds on three strands of previous work: the problem of incentive contract design; the theory of auctioning incentive contracts; and the design and implementation of conservation auctions. These represent a logical progression from how to get landholders to provide conservation services efficiently, to the idea of tendering incentive contracts and finally to investigating how far this idea can be made to work for conservation policy.

The traditional environmental contracting approach of linking payments to conservation activities, subsequently referred to as the action- or activity-based approach, has been criticized on at least two counts: First, such contracting schemes lack environmental efficacy. Many ecological evaluations of activity-based conservation programs found that environmental outcomes in terms of both targeted species protection and general biodiversity are often rather poor (see e.g. Berendse et al., 2004; Bisang et al., 2009; Kleijn et al., 2001, 2004; Vickery et al., 2004; Zechmeister et al., 2003). Second, such schemes often provide poor value for money. Action-based schemes have been criticized for not being incentive-compatible: they fail to provide landholders with the right incentives to be innovative and productive in providing the environmental services targeted by the scheme. Rather, they are plagued by incentives problems such as moral hazard (e. g. Hart and Latacz-Lohmann, 2005; Fraser, 2002) and adverse selection (e. g. Quillérou and Fraser, 2010), resulting in poor policy performance and high information rents reaped by landholders. Against this backdrop, first tentative steps have been taken towards schemes that link payments to environmental outcomes. Burton and Schwarz (2013) provide an up-to-date overview of such programs in Europe. Some of the reviewed programs are purely outcome-based, while others combine action-based and outcome-based elements such as bonus payments in the Higher Level Stewardship Scheme in England. Most of the past and current schemes have or had a prototype character and focused on biodiversity conservation.

There is a broad consensus in the literature that outcome-based programs have the potential to deliver better environmental results and better value for money than action-oriented approaches. First, when landholders are paid by results, it is in their self-interest to optimize stewardship effort. They will supply effort up to the point where the marginal cost of effort equals the marginal expected increase in payment from improved environmental outcomes – negating the adverse selection and moral hazard effects (Hart and Latacz-Lohmann, 2005; Quillérou and Fraser, 2010). Second, when landholders are permitted to innovate in environmental provision (rather than being bound to rigid management prescriptions), they are able to harness their knowledge of local circumstances to improve the efficiency of production, for example by choosing the land that will produce the best environmental results or by exploring alternative techniques of encouraging biodiversity (Klimek et al., 2008; Matzdorf et al., 2008; Zabel and Roe, 2009). In fact, the latter may be seen as a breach of contract in an action-based scheme. Moreover, outcome-based payments may also incentivize collaborative efforts among landholders with contiguous land in collectively producing environmental benefits. Third, linking payments to outcomes enables the procurer to target precise conservation goals, thus providing the producers with an improved ability to control the ecological effectiveness of the scheme

(Klimek et al., 2008; Zabel and Holm-Müller, 2008). In addition, value for money will be enhanced as payments are only made for results achieved, thus avoiding payment for non-delivery. Finally, some commentators argue that allowing farmers to act as entrepreneurs in providing environmental services may increase scheme uptake (e.g. Wittig et al., 2006; Klimek et al., 2008). Burton and Schwarz (2013) note that, while it is difficult to attribute causality, the initial uptake rates of result-based pilot schemes have indeed been encouraging, suggesting that the schemes are as attractive as action-based programs despite the increased risks (e.g. Matzdorf and Lorenz, 2010).

While the work on outcome-based contracts in environmental policy is largely qualitative and evidence remains largely anecdotal, there exists a broad theoretical literature on optimal contracts in the principal-agent literature. Getting the contracted parties to provide the necessary effort to deliver the contracted goods to quality specifications was a problem first clearly formulated by Green in 1979. This problem was cast into the analytical framework of the principal-agent relationship by Laffont and Tirole (1993), McAfee and McMillan (1999) and Laffont and Martimort (2002). Leitzel and Tirole (1993) applied this framework to the procurement setting. This idea had also been pursued by Laffont and Tirole (1987) by combining and integrating the linking of contractual payments to outcomes and the auctioning of the contracts in a competitive setting. Branco (1993) generalized some of the results obtained by Laffont and Tirole in 1987. The static setting was also expanded to the dynamic setting by Laffont and Tirole (1988), with a follow-up by Sun Ching-jen in 2007. This work provided the theoretical bedrock on which applications to environmental policy could be formulated.

Whitten et al (2007) consider a scheme promoting conservation of ground-nesting birds in the Murray Catchment in Australia. They apply the principal-agent framework to combine an auctioned ex ante payment for management actions with an ex post payment for conservation outcomes. They conclude from their theoretical model that setting the outcome payment high relative to the ex-ante payment is desirable: it induces landowners with high ecological potential to participate and supply higher levels of stewardship effort. This, however, comes at the expense of fewer participants for a fixed budget. Based on these theoretical insights, Whitten et al. put the combined scheme to the test with farmers in the area. They conclude that the cost of securing a given area of land enrolled was lower with outcome-based contacts, with a cost saving of around 30%.

With the exception of Whitten et al. (2007), the literature on the design of conservation contracts has mainly focused on action-based contracts. The problem of optimally selecting conservation actions and sites includes investigations by Van Teefelen and Moilanen (2008) and by Costello and Polasky (2004). Casting the solution of this problem into an appropriate analytical economic framework includes work by Moxey et al. (1995) and Davis et al. (2006). This framework highlighted the issue of moral hazard in a principal-agent relationship (Fraser, 2002; Hart and Latacz-Lohmann, 2005). Accordingly, the problem of how to design contracts in such a way as to address this problem was studied by authors like Moxey et al. (1999), Ozanne and White (2007) and Ferraro (2008); White (2005) also analyzes the correlative issue of contract monitoring.

Besides contract design, the second key problem in the present study is how to optimally select contracts for conservation works that are to be carried out by landholders (Hajkowicz et al., 2007). Latacz-Lohmann and Schilizzi (2005) review the literature on how ideas from auction design and implementation have been applied to conservation contracting, and Latacz-Lohmann and Van der Hamsvoort (1997) propose a specific model for doing so when budgets are constrained (which is normally the case). A number of policy implementations were reviewed, mainly in the USA and Australia (Reichelderfer and Boggess, 1988; Stoneham et al., 2003). Evaluation of this experience by Grafton (2005), Gole et al. (2005) and Connor et al. (2008) highlight the problematic nature of paying landholders uniquely on actions or inputs, e.g. fencing, weeding or planting trees, without specific reference to the actual environmental outcomes, such as streamwater quality, a measure of biodiversity or the rate of soil erosion. At this juncture, the idea of tendering contracts to landholders and that of linking contract payments to environmental outcomes were brought together, linking the two previous strands of literature. This integration has now begun to be investigated both theoretically (Whitten et al., 2007; Goddard et al., 2008) and practically, with The Australian Auction for Landscape Recovery Under Uncertainty (ALRUU) leading the way (White et al., 2005), and some explorations also carried out in Europe, e.g. in Germany (Groth, 2009; Klimek et al., 2008) and Sweden (Zabel and Holm-Müller, 2008). This latter work, as well as that by Goldman et al. (2007), has also highlighted the importance of landholder cooperation in achieving the contracted environmental outcome: the effects of individual landholder actions extend beyond the boundaries of their private properties, especially when mobile species and synergistic ecological effects are involved.

III. EXPERIMENTAL DESIGN

General setup

The previous section highlighted the central role of policy incentives for the supply of stewardship effort in achieving environmental outcomes. In order to test this nexus we conducted a series of economic experiments, designed to study, in the light of agent heterogeneity, the tradeoff between the two counteracting effects, the incentive effect and the participation (or risk) effect. Agent heterogeneity in this case means that landholders can have different productivity types in the production of environmental benefits, as well as different risk attitudes.

The core idea of these experiments is, first, to examine how increasing the *proportion* of the uncertain performance payment relative to the (sure) fixed payment affects the supply of individual and aggregate effort; second, to replicate this under both non-tendered and tendered scenarios, the goal being to examine the net effect of the tender.

Bidders' key decision variables are participation and provision of stewardship effort. The level of environmental outcome is directly related to effort; more specifically, it reflects total effort *obtained* rather than individual *supply* of effort. Total effort obtained is also a function of the participation rate: individual effort of those who have 'opted in' may be high, but if their number is small relative to those who have 'opted out' due to the risk effect, the total level of effort obtained will be small, as will the corresponding environmental outcome.

The experimental setup is shown in Table 1.

TABLE 1

EXPERIMENTAL RESEARCH PLAN

Treatment	Effort (0 to 10)	Fixed Payment (ECU)	Performance Payment (ECU)
Non-tendered (NT) incentive contracts		Benchmark computed for Performance Payment = 0	
1) NT 50 (L + H)	✓; min 3	150	150
2) NT 67 (L + H)	✓; min 3	100	200
3) NT 100 (L + H)	✓	0	300
Tendered (T) incentive contracts		Benchmark computed for Performance Payment = 0 [1]	
4) T 50 (L + H)	✓; min 3	150	150
5) T 67 (L + H)	✓; min 3	100	200
6) T 100 (L + H)	✓	0	300

Legend: ✓ = bidder's decision (There was no minimum effort when no fixed payment was offered.)
L and H are the two participant productivity types
T and NT refers to the tendered and non-tendered setting
50, 67 and 100 indicate the percentage of total payment linked to environmental outcome
Payment amounts in ECUs (experimental currency units)

In both the non-tendered (NT) treatments (1-3) and the tendered (T) treatments (4-6), the share of total payment linked to environmental outcomes was varied from 50 through 67 to 100 per cent. A computed zero per cent scenario, representing the standard action-based contract, served as benchmark. In all treatments, the nominal total payment was set at 300 Experimental Currency Units (ECU). In the NT scenarios, subjects were asked to indicate whether they were willing to participate and, if so, to indicate the level of stewardship effort they were willing to supply. The same experimental setup was used in the tendered scenarios, safe that subjects were told that they were now competing against each other and only two thirds of those who submit a bid would be awarded a contract based on the level of effort offered. This experimental setup is unusual in that bidders do not compete by submitting price bids, but compete by offering different levels of effort. In the first case, which is standard, participants bid for a contract with predefined management

[1] The computation of this scenario was actually based on another series of similar experiments, where bidders competed through payment (price) bids with predetermined fixed effort, instead of through supply of effort with given payments. The 0%PP results were used and recalibrated using effort to payment ratios.

prescriptions (i.e. a fixed effort level), whereas in our study they bid for a contract which offers a predetermined payment to those bidders who have committed the highest effort level. In our experiments, we kept things simple for subjects by letting them choose effort as a simple number over a given range; in reality, bidders in such a setup would offer an 'effort level' by selecting from a menu of permissible conservation measures. This is done for instance in the Higher Level Stewardship Scheme in England (Quillérou *et al.*, 2011).

The experiments did not aim to study the effort response to performance payments *per se*, but rather whether any efficiency gains in terms of effort provision, expected environmental outcome and budgetary cost-effectiveness, could be obtained by combining performance payments and tendering. To disentangle these two effects, it was necessary to compare the tendered and non-tendered contracts. The non-tendered case thus served as a benchmark for the tendered case.

Details of experimental setup

In our experiments, effort could be chosen between 0 and a maximum of 10 units. Whenever a non-zero fixed payment was offered, a minimum level of effort of 3 units was required. Effort was costly, with a linear cost function of 10 Experimental Currency Units (ECUs) per unit of effort. In addition to the cost of effort, participants incurred a fixed transaction cost of 50 ECUs. An 'environmental production function' defined the probability of achieving an environmental performance threshold (EPT) as an increasing function of effort (Figure 1). This probability had two possible values for any given level of effort: a higher and a lower value, representing, respectively, a favorable and an unfavorable series of uncontrollable environmental events (disease, drought, fire, etc.), thereby defining a state-contingent production function (Chambers and Quiggin, 2000). Each of these two states was equiprobable.

Participants were divided into two groups equal in numbers: half were endowed with a higher environmental productivity (denoted by the letter H in Figure 1), and half with a lower environmental productivity (denoted by the letter L in Figure 1). For the same level of effort, an H participant had a higher average probability, across the two states of nature, of achieving the EPT than an L participant. This distinction implemented in the simplest possible way bidder heterogeneity (in reality, more than two types exist). The combined effect of two environmental states and two participant types yields the four environmental productivity curves depicted in Figure 1.

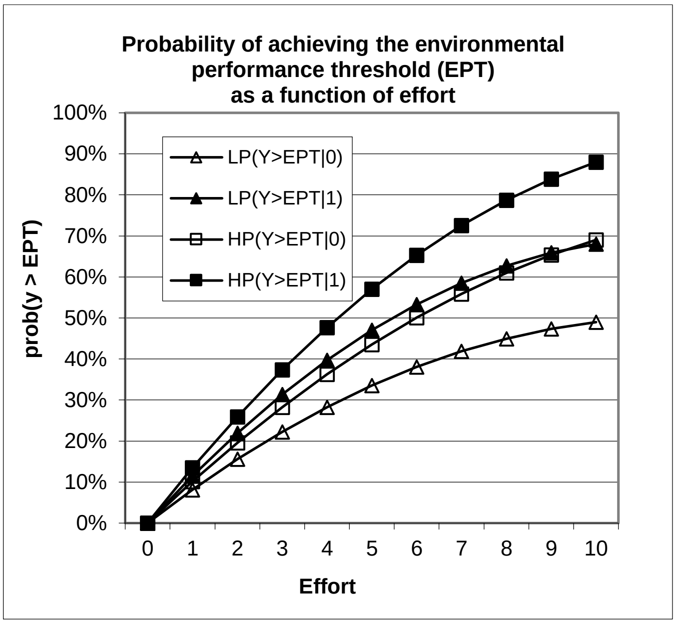


FIGURE 1

ENVIRONMENTAL STATE-CONTINGENT PRODUCTION FUNCTIONS FOR TWO STATES OF NATURE (0,1) AND TWO PRODUCER TYPES (L,H)

These quadratic production curves were carefully calibrated using the values shown in Table 2.

TABLE 2

PRODUCTION FUNCTION COEFFICIENTS

Common equation p(Y>EPT) = $aE - bE^2$	Favorable environment $\theta = 0$	Unfavorable environment $\theta = 1$
For type L	$a = 0.085$ $b = 0.0036$	$a = 0.12$ $b = 0.0052$
For type H	$a = 0.105$ $b = 0.0036$	$a = 0.14$ $b = 0.0052$

p(Y>EPT) = probability of achieving the environmental performance threshold
E = participant's level of effort provided
a and b = quadratic function coefficients

Experimental subjects played all six treatments listed in Table 1, the non-tendered (NT) treatments first, followed by the tendered (T) treatments. Subjects were distributed in equal numbers to the high and low-productivity type. They were informed of the production function relating to their productivity type and the two states of nature. However, only in the tendered setting were they made aware of the productivity type distinction and informed of their own type, which was private information. Subjects retained their productivity type throughout the experiment. As explained above, the cost per unit of effort was the same for all: 10 ECU. However, since effort translated differently into environmental outcomes as per the production functions in Figure 2, the cost per unit of environmental outcome varied between subjects.

Results were likely to be affected by risk attitudes. We therefore submitted all participants to a simple lottery. We asked them to consider a lottery ticket that had a 50% chance of earning them \$X. They were then asked the maximum amount they were willing to pay to purchase one. A number below \$(0.5X) was a measure of risk aversion, while a number above \$(0.5X) was a measure of risk taking. This was all done prior to, and independently of, the core part of the experiment, albeit in the same session and with the same participants.

The experiments were carried out in two different locations, in Perth, Western

Australia, and in Kiel, Germany, to control for robustness of the results. The number of participants in each session varied somewhat but averaged 20, half of the H type and half of the L type. The resolution of the state of the environment (favorable or not) was done by tossing a coin at the end of a session (the two states being equiprobable). This determined for all participants, depending on their type, which of their two (stochastic) production functions obtained. Resolving whether they had achieved the EPT was done by the computer using a random number generator based on the probability specific to their production function and their chosen level of effort.

The auction was of the target-constrained rather than of the budget-constrained type (see Schilizzi and Latacz-Lohmann (2007) for an analysis of their comparative advantages), and selected two-thirds of the bidders with the highest effort supply. Ties were selected randomly. As explained above, experimental cost parameters were held equal for all and consisted of a fixed transaction cost of 50 ECUs plus a variable cost per unit of effort equal to 10 ECUs. Initial wealth endowments, which were added to net gains at the end, were calibrated so as to avoid the possibility of net losses in real currency for participants[2]. Their decisions involved participating versus opting out and, if opting in, choosing their level of effort. The payment mix of fixed and performance payments was given in each scenario, but different treatments varied the mix, as per Table 1. An overview of the experimental parameters and their values is given in Appendix 1. The experimental data is given in Appendix 2.

[2] The University Human Ethics Commission does not allow experimental subjects to lose any personal money.

IV. RESULTS

Organization of results

Examining the impact of performance payments on participant effort carries its own value; however, the focus of this study is to assess the value of tendering conservation contracts and therefore also how to disentangle the two aspects when combined. As explained in the previous section, the non-tendered (NT) treatment focuses on the effects of increasing the proportion of performance (i.e. incentive) payments relative to fixed action-based payments, while the tendered (T) treatment focuses on how tendering the contracts *modifies* the NT results. The NT treatment is thus carried out to serve as a benchmark for analyzing the results of the T treatment. Accordingly, we present the NT results separately from, and prior to, the T treatment results. These two treatments affect both individual behavior and the performance of the policy, as shown in Table 3.

TABLE 3

STUDY OF INCENTIVES INVOLVED

	Individual incentive effect	**Total incentive effect**
Non-tendered incentive contract: performance payment effect	**1** Effort level over and above minimum pre-scribed effort	**2** = (1) × participation rate
Tendering: competition effect (bidding through effort level)	**3** Extra effort over and above (1)	**4** = (3) × participation rate × selection rate

Table 3 organizes the results and disentangles the incentive interactions involved in tendering incentive contracts. The *performance payment effect* results from linking (part of) the payment to the achievement of an uncertain environmental outcome in a non-tendered setting. Cell (1) in Table 3 represents the *individual* incentive effect, i.e. the effort chosen by subjects who have 'opted in' over and above the minimum level prescribed by an action-based program. Cell (2) represents the *total* incentive effect of performance payments and is the combined effect of individual effort and participation rate. If subjects are risk-averse, the participation rate may decline as a result of the uncertainty of achieving the environmental outcome and being paid only if it is achieved.

The *competition effect* results from creating competition among subjects by letting them bid for a contract and selecting the most cost-effective providers. Recall that in our experimental setup bidders compete by offering different levels of effort rather than price bids. Cell (3) in Table 3 represents the extra effort provided, if any, over and above (1) by putting the contracts up for tender. Cell (4) represents the total incentive effect when incentive contracts are tendered. Not only, like in (2), does it depend on the participation rate; it also depends on the selection rate, as decided by the tendering authority. Tendering thus introduces an additional level of uncertainty for agents – that of not being selected.

Individual behavior focuses on: 1) the participation rate (or whether subjects choose to opt out and not participate); 2) the individual effort supplied by participants (NT treatment) or bidders (T treatment) if they have chosen to 'stay in'; 3) the impact of risk attitudes on participation and effort provision; and 4) in the T treatment, how the behavior of low-productivity (L) and high-productivity (H) types differ.

Policy performance is measured by 1) total effort obtained; 2) expected environmental outcome; 3) 'value for money' in the form of budgetary cost-effectiveness, i.e. dollar outlay per unit of expected environmental outcome. Expected environmental outcome is obtained by inserting individual effort levels into the respective environmental production functions (Figure 1), taking into account the two productivity types and the two equiprobable states of nature, and aggregating the function values across all participants.

Non-tendered (NT) treatment: impact of increasing performance payments

Individual behavior: participation and effort provision

Participation rate. Because of the potential role of risk aversion, the hypothesis here is that, as the 'performance payment' (henceforth %PP) linked to the uncertain environmental outcome increases, participation should fall. Participation reflects an individual's rationality constraint. This intuition is borne out by our results, on average and consistently across all four experimental groups (Figure 3). In our experiments participation started dropping (by 1%) at 67% PP, but only became significant at 100% PP, where the participation rate fell to 69%. For the remaining 31% of subjects, the risk of a net loss was not worth investing any effort; they decided to 'opt out' and not sign a contract.

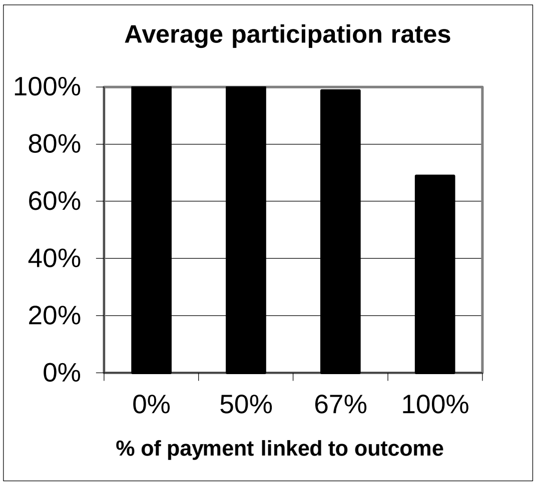


FIGURE 3

PARTICIPATION RATES AS A FUNCTION OF THE SHARE OF PAYMENT LINKED TO OUTCOME

Supply of individual effort. The hypothesis here is that, due to the incentive effect, the supply of individual effort increases with %PP. Experimental results confirm this on average and consistently across all four subject groups (Figure 4a and 4b): effort increases when moving from the 0%PP to the 50%PP scenario. In 0%PP, the total payment is made up front, requiring only the minimum of 3 effort units. However, the increase occurs only up to a point. As Figure 4 shows, at intermediate rates of %PP (around 50% in our case), individual effort levels off and remains roughly constant in spite of further increases in %PP. An unpaired two-sample t-test with unequal variances (pairwise comparisons) confirms that the differences between the 50%, 67% and 100% cases are not statistically different (nor are the differences between the four experimental groups in Fig. 4b).

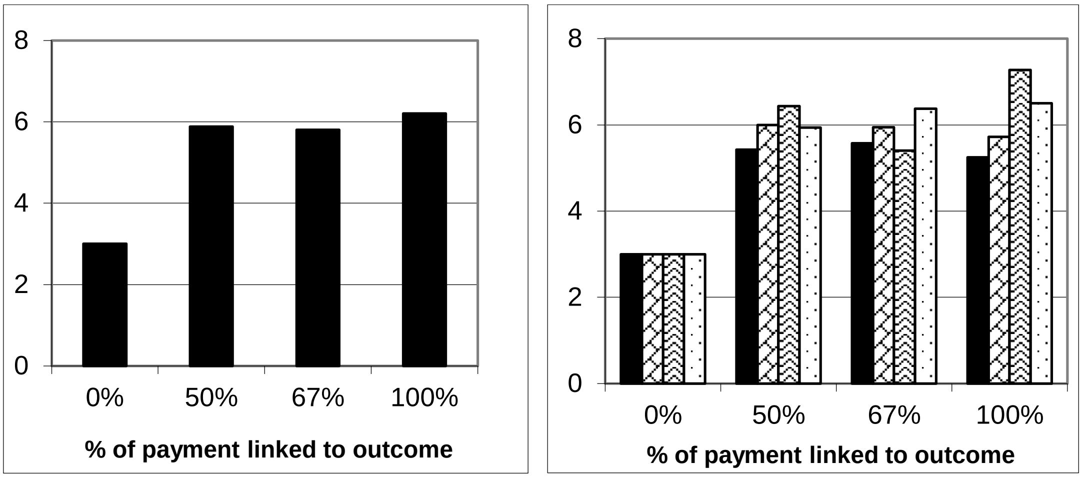


FIGURE 4 a,b

INDIVIDUAL EFFORT OFFERED AS A FUNCTION OF THE SHARE OF PAYMENT LINKED TO OUTCOME

(4a: ON AVERAGE, 4b: SPECIFIC TO GROUPS K1, K2, P1, P2, IN THAT ORDER)

Risk attitudes and participation rate. Because individuals who are more risk-averse are more sensitive to uncertain outcomes, one would expect that higher risk aversion should reduce participation with more of the payment linked to the uncertain outcome. However, as Table 4 indicates, risk-averse participants opt out only at the highest %PP rate, while non-risk-averse participants do not behave differently from the risk-averse at lower levels of %PP. And in the 100%PP case, the effect of risk aversion is relative rather than absolute: like risk-averse participants, the non-risk-averse also opt out, but at a lower rate. Thus our first intuition is borne out only in the extreme case where the totality of the payment is made contingent on the uncertain outcome. We must therefore deduce that, according to our experimental results, when *part* of the payment is made up front independently of achieving the EPT, the individual incentive effect outweighs the participation effect.

TABLE 4: Risk attitudes and participation rates in the NT treatments

(all four groups, N = 77)

NT	**50%PP**	**67%PP**	**100%PP**
RA	100%	100%	**63%**
RN	100%	95%	**67%**
RP	100%	100%	**88%**

Legend: RA = risk-averse; RN = risk-neutral; RP = risk-prone

Risk attitudes and supply of individual effort. Recall that in all scenarios where participants are offered a fixed up-front payment, they choose a level of effort between a minimum of 3 and a maximum of 10; in the 100%PP case, there is no minimum limit of 3. The intuition here is that, all other things held equal, a higher degree of individual risk aversion should increase optimal effort: that is, more risk-averse participants should be willing to 'pay' more, in the form of increased effort, to reduce the risk of not achieving the EPT. Our experimental results vary somewhat from this intuition, as Table 5 shows. Read vertically (to keep the treatment parameter constant), risk attitudes appear to have no effect on the supply of individual effort whatsoever: a Tukey-Kramer pairwise comparison test confirms this.

TABLE 5

RISK ATTITUDES AND INDIVIDUAL EFFORT PROVISION (ALL GROUPS, N = 77)

NT	**50%PP**	**67%PP**	**100%PP**
RA	5.9	5.9	6.7
RN	5.7	5.6	5.6
RP	6.1	5.8	5.9

Legend: RA = risk averse; RN = risk neutral; RP = risk prone

To understand this result, recall that these participants include only those who have chosen *not* to opt out. Were those who opted out in the '100%PP' treatment more risk-averse than those who decided to 'stay in'? Averaged across all groups, the certainty equivalent (CE) of those who 'opted out' was 0.76, while for those who 'stayed in' it was 0.93: clearly, the former were significantly more risk-averse than the latter, who were, on average, much closer to risk-neutral (defined by a CE of 1.00). This suggests that, in the extreme treatment of 100%PP, where the totality of the payment was conditional on achieving the uncertain EPT, most of the more risk-averse individuals selected themselves out. For those that 'stayed in', everything happened as if their weaker degree of risk-aversion was roughly cancelled out by the incentive effect (this is true even in the extreme combination of the top right cell in Table 5, as indicated by the Tukey-Kramer test).

The combined effect of risk aversion on participation and effort provision can thus be summarized as follows: higher risk aversion ends up reducing participation, but, for those who do decide to participate, it extracts a higher level of effort. From the risk-averse individual's point of view, the decision seems to be either to opt out or, if not, to put in a high level of effort to reduce the risk of not achieving the EPT. In the extreme 100%PP case, average participation drops with rising risk aversion from 88% to 58%, or by −30% (Table 4), whereas average individual effort increases from 5.8 to 6.7, or by +16% (Table 5). In relative terms, the drop in participation ends up more than outweighing the increase in individual effort.

Policy performance implications: environmental outcomes and cost-effectiveness

Total effort and expected outcome. Total effort results from the combination of individual effort and participation (Table 1, cell 2). Since increases in %PP were shown to increase effort but reduce participation, it is not surprising that total effort exhibits an inverse U curve, as per Figure 5a. There thus exists an optimum level of %PP that extracts maximum total effort. Given the parameterization of our experiments, it ranged between 50%PP and 67%PP. The same pattern can be observed for expected environmental outcome (Figure 5c). As explained above, expected environmental outcome is computed by inserting individual effort levels into the respective environmental production functions (Figure 1) and aggregating the function values across all participants. Since outcome is measured as probability of achieving the EPT, the resulting figure is the sum of probabilities across participants. An outcome value of 9, for example, can be interpreted as 9 of the participants achieving the EPT with probability of one. As with total effort, maximum environmental outcome is obtained between 50%PP and 67%PP, that is, at some intermediary level rather than as a corner solution.

Cost-effectiveness. Defining cost-effectiveness by the payment outlay per unit of expected outcome, the story changes: in this case, the higher the %PP, the lower the payout per unit of expected outcome, and so the higher the cost-effectiveness, as shown in Figure 5c. From a policy perspective, when deciding what %PP rate is best, one must thus make trade-offs between the two objectives of outcome level, often promoted by ecologists, and cost-effectiveness, often preferred by economists. While maximum outcome is achieved at intermediate levels of %PP, highest cost-effectiveness is obtained with the totality of payments linked to outcome.

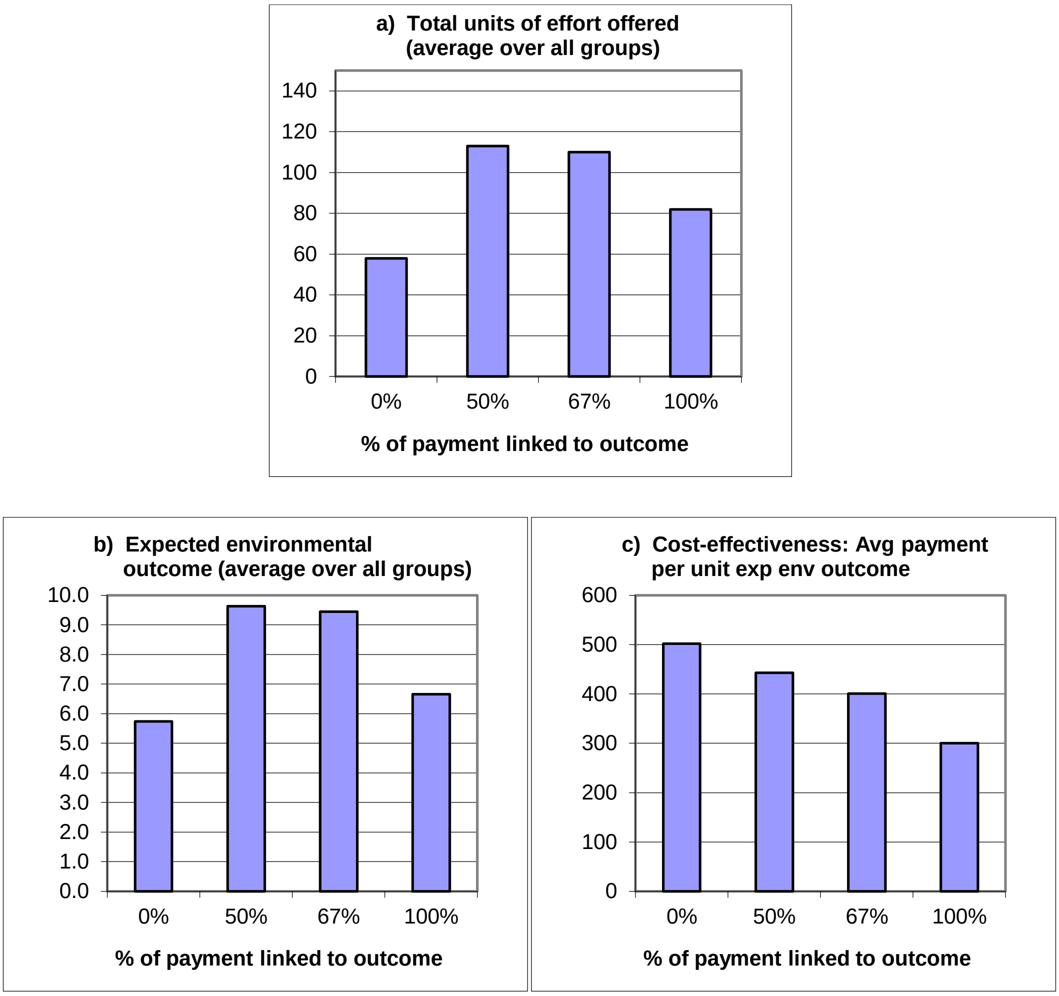


FIGURE 5 a,b,c: TOTAL EFFORT, EXPECTED ENVIRONMENTAL OUTCOME AND BUDGETARY COST-EFFECTIVENESS AS A FUNCTION OF THE SHARE OF PAYMENT LINKED TO OUTCOME (AVERAGES ACROSS ALL FOUR GROUPS)

Tendered (T) treatment: impact of tendering the contracts

Individual behavior: participation and effort provision

Participation rate. Tendering exposes landholders to further risk, that of not winning a contract, potentially creating a deterrent to participation in conservation schemes. The hypothesis thus is that tendering reduces participation rates obtained in the non-tendered case. Figure 6 shows however this not to be entirely true, at least for low values of %PP.

For the 0%PP and 50%PP levels, reflecting low contractual risks, we observe no drop in participation. Only at the 100%PP level do we observe a 10 percentage point drop on average across the four groups, from 69% to 59%. A correlation analysis between participation (or not) and tendering (or not) reveals that only for 100%PP are the two (weakly) anti-correlated ($r^2 = -0.16$ at a 4% confidence level). This drop in participation can be interpreted in terms of the extra mental loading of having to also include the uncertainty of being selected. This is a form of transaction cost coupled with a form of ambiguity aversion: the combined probability of winning a contract subject to achieving the EPT is less straightforward to evaluate under the combined tender and incentive scheme than in the NT case alone.

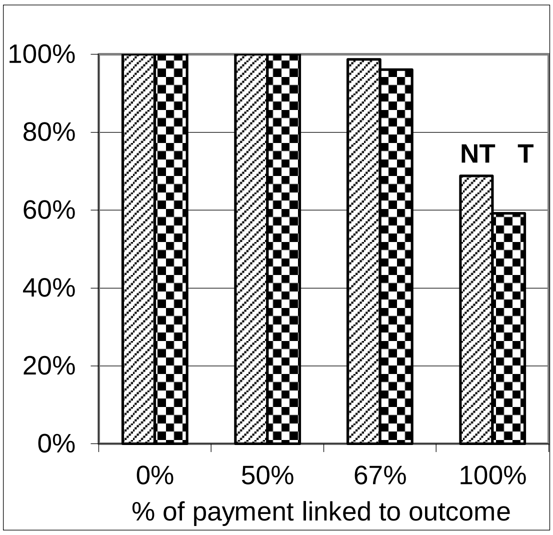


FIGURE 6

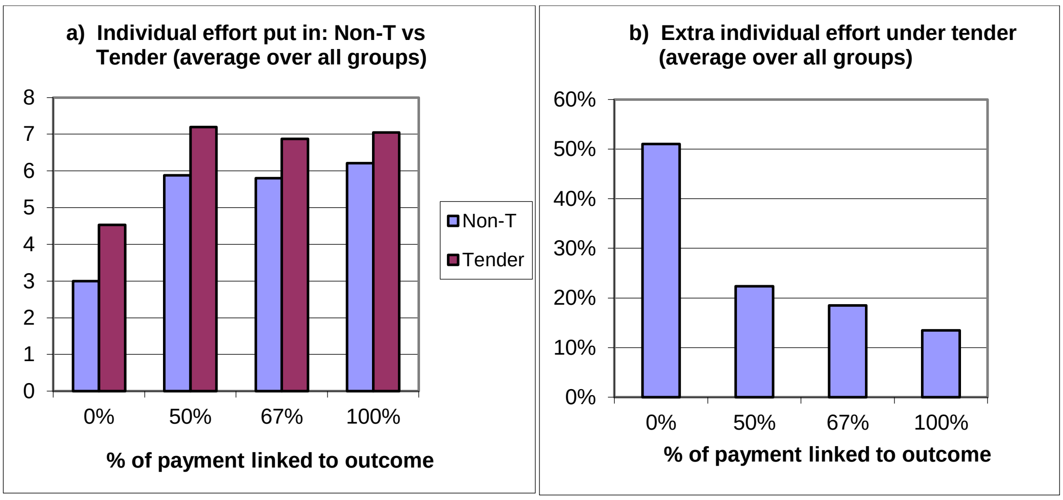
IMPACT OF TENDERING ON PARTICIPATION RATES

(DIFFERENCE BETWEEN LEFT = NT AND RIGHT = T BAR PAIRS)

Supply of individual effort. The hypothesis here is that tendering increases the supply of individual effort of those who have ‘selected themselves in’, i.e. have decided to put in a bid. This is because tendering adds a second layer of uncertainty, that of not being selected, over and above the risk of not achieving the EPT. A higher level of effort would thus reduce the risk of not being selected as well as that of not achieving the EPT.

This extra individual effort obtained by tendering is visible over the whole range of performance payments, from 0%PP to 100%PP (Figure 7a). A paired t-test shows a level of significance for these results with a p-value less than 0.001 for 50%PP and 67%PP and of 0.01 for the 100%PP case. However, as Figure 7b shows, a second-order effect also emerges from our experiments: consistently across all four experimental groups, the rate at which tendering extracts additional effort falls (at an exponential rate) as %PP rises. For non-incentive 0%PP contracts, tendering extracts about 50% more effort, but this figure drops to about 20% for 50%PP and further to 15% for 100%PP.

In addition, it is clear from Figure 7a that, on average, tendering does extract more effort, but, like in the NT case, there is no advantage in increasing %PP beyond a certain point, in this case at around 50%: beyond this point, effort levels off whether contracts are tendered or not.



FIGURES 7 a,b

IMPACT OF TENDERING ON INDIVIDUAL EFFORT OFFERED

(BARS ON THE RIGHT REPRESENT THE DIFFERENCES BETWEEN T AND NT)

Effect of risk attitudes on supply of individual effort under tender. The hypothesis here is that more risk-averse bidders should offer higher levels of effort in order to reduce the risk of not being awarded a contract (in addition to reducing the risk of not achieving the EPT). This conjecture is however not borne out by our results. An analysis of variance and a Tukey-Kramer test show that risk attitudes have no observable effect on the supply of individual effort under tender. When averaged across the three scenarios 50%PP, 67%PP and 100%PP, the extra effort extracted by tendering remains unchanged at around 18% across the three risk attitudes.

Differences in behavior between productivity types L and H. In the tendered setting, bidders were told which productivity type they were, high (H) or low (L). The H types knew that, for an equal expenditure of effort, they had higher chances of achieving the EPT than the L types, against which they were competing for contracts. We can therefore hypothesize that tendering will have a greater deterring effect on L types than on H types. In terms of participation, Table 6 confirms this only under the extreme scenario of 100%PP (columns 2 and 3), where the H types are 14% more likely to participate than the L types. In addition, as per columns 4 and 5, tendering does not affect the differences in participation between L and H types, except in the extreme 100%PP scenario (–13%). In terms of individual effort, Figure 8 shows that, here too, the two types behave similarly, the differences in induced effort not being statistically significant (unpaired two-sample t-test with equal variances). This is true even for 100%PP, because of the small number of participants in this case.

TABLE 6

DIFFERENCES IN PARTICIPATION BY PRODUCTIVITY TYPE UNDER TENDER

	Participation under tender		Difference in participation T – NT	
%PP	L	H	L	H
50%	**100%**	**100%**	**0%**	**0%**
67%	**94%**	**97%**	**-3%**	**1%**
100%	**46%**	**60%**	**-13%**	**0%**

Note: L = Low, H = High

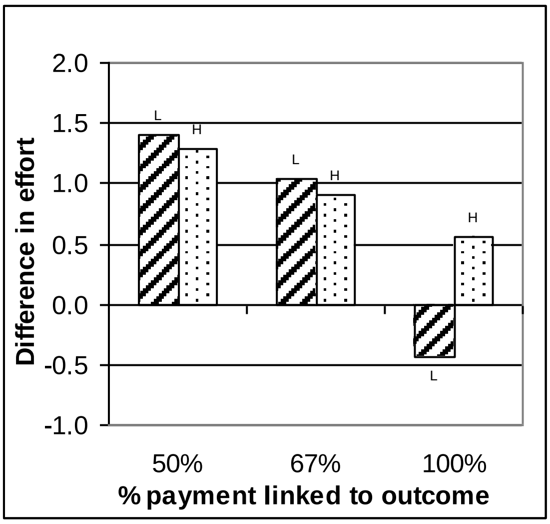


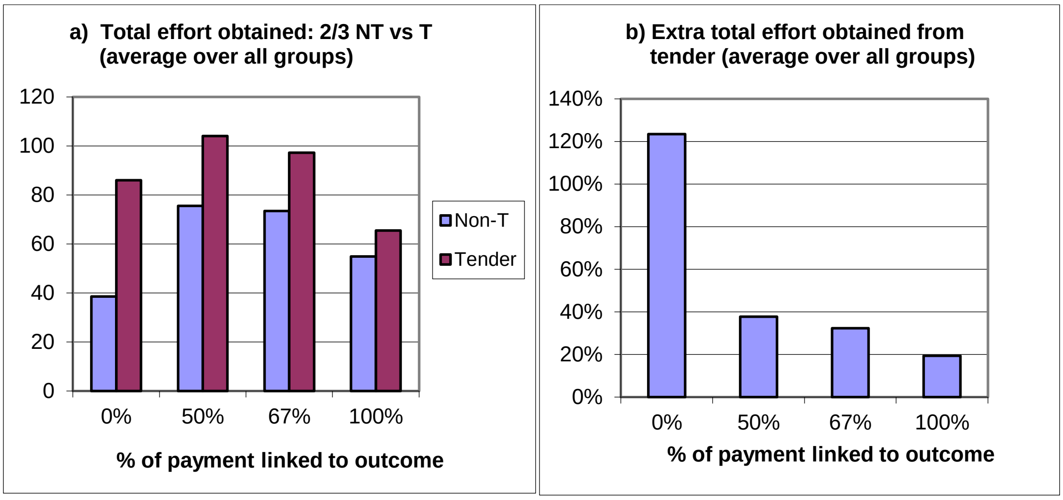
FIGURE 8

IMPACT OF TENDERING ON AVERAGE INDIVIDUAL EFFORT LEVELS,

BY PRODUCTIVITY TYPE (LOW AND HIGH)

Policy performance implications: environmental outcomes and cost-effectiveness

Total effort and environmental outcome obtained. Participation rates and individual supply of effort combine with the selection rate (see cell 4 in Table 3) to yield total effort obtained, and so too the expected level of environmental outcome, as per Figure 1. For the NT and T scenarios to be directly comparable, one must apply the same selection ratio to both. In the experiment, two thirds of bidders were accepted in the T scenarios, whereas all applicants were accepted in the NT scenarios. Figures 9a and 9b present the comparison of the T and NT scenarios on an equal footing, where the two third selection ratio was also applied to the NT scenarios. This was done by multiplying total effort offered in the NT scenarios by 2/3, which is equivalent to randomly selecting two third of NT participants.



FIGURES 9A,B: IMPACT OF TENDERING ON TOTAL EFFORT OBTAINED WITH IDENTICAL SELECTION RATIOS

Figures 9a and 9b show that tendering does not modify the pattern observed in the NT case, namely, that there exists an optimal %PP (between 50% and 67% in our case), which yields maximum total effort. Although the results shown in Figure 9b appear similar to the individual effort case of Figure 7b, the incremental second-order effect from tendering falls more rapidly as payments linked to uncertain outcomes are introduced (between 0%PP and 50%PP, the fall is from about 50% to 20% in 7b but from 120% to 40% in 9b, or nearly three times as much).

Since effort and expected environmental outcome are functionally related as per Figure 1, a very similar pattern to that shown in Figures 9a and 9b emerges for the expected outcome. Again, the highest level of environmental outcome is obtained at intermediate %PP, and the incremental effect of auctions erodes quickly as the %PP is raised.

Cost-effectiveness. Figure 10 shows that under both T and NT scenarios, the higher the %PP, the lower the budgetary outlay per unit of total effort or expected environmental outcome. The *marginal* value of running a tender is however greatest in cost-effectiveness terms for contracts that do link a portion of the payment to outcome, but only if that portion is moderate (in our experiments, around 50%PP).

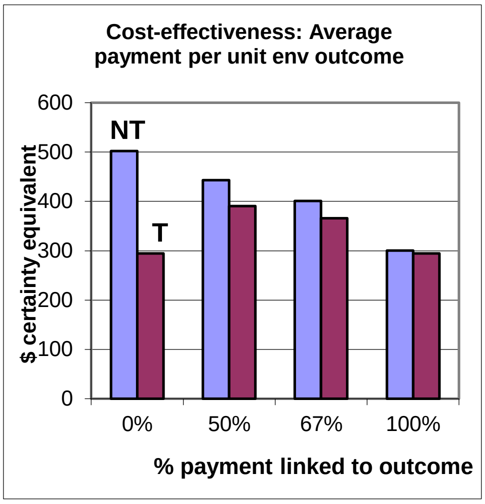


FIGURE 10:

IMPACT OF TENDERING ON COST-EFFECTIVENESS

V. CONCLUSIONS

To the extent that target environmental outcomes are subject to uncontrolled factors, it is unlikely that government schemes would implement conservation contracts with the totality of the payment to landholders contingent on achieving the environmental target. We must therefore assume that conservation contracts would include at least some fixed payment dependent only on some minimum work undertaken by the landholder; that is, dependent on his actions and not on an uncertain outcome.

This lies well with the key conclusion we can derive from our experimental study. If the procurement agency puts all the weight on the achievement of an environmental target, without consideration for budgetary cost-effectiveness, then some of the payment should be linked to the achievement of the target. If on the other hand the procurement agency puts all the weight on budgetary cost-effectiveness, without any consideration for the actual level of environmental outcome achieved, then it is always best to make the totality of the payment contingent on achieving the (uncertain) environmental outcome. The price the policy maker might then have to pay is achieving a low level of environmental outcome, mostly because only a small proportion of eligible participants would have accepted to put in a bid.

In either case, it is advisable to combine tendering the contracts and linking contractual payments to the achievement of the environmental outcomes sought. Tendering increases the level of total effort extracted and thus expected environmental outcomes, while at the same time enhancing cost-effectiveness. However, the advantages of tendering are not non-linear in the %PP: tendering the contracts yields the greatest benefits when only a moderate proportion of contract payments are linked to the achievement of environmental outcomes. High shares of performance payments tend to erode the auction's performance advantages both in terms of effort extraction and budgetary cost-effectiveness.

The individual behavior underlying these aggregate performance results can be described in terms of participation versus effort input which reflect, respectively, a risk aversion effect and an incentive effect. Previous theoretical work by Laffont and Tirole (1987) had already analyzed the underlying fundamentals, but our experiments yielded insights into 'second-order effects': e.g. that most of the theoretical predictions were realized only when the totality of the contract payment was made contingent on an uncertain outcome. This may to some extent reflect the specific parameterization of our experiments, in particular the degree of control, i.e. reduction in uncertainty, that a greater input of effort achieves. But unless maximum effort achieves a sure outcome, we believe these additional insights hold. And in environmental matters, not many outcomes come as a sure thing devoid of any uncertainty.

In conclusion, the decision to tender an incentive contract, or to make a tendered contract non-trivially dependent on an uncertain outcome, comes down in this context to a tradeoff between achieving a high level of environmental outcome versus achieving a high degree of cost-effectiveness per dollar outlay. The first goal is typically recommended by ecologists, whereas the second is typically recommended by economists. Clearly, some compromise appears desirable.

Acknowledgments

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References

Branco, F. 1995. “Auctioning Incentive Contracts: the Common Cost, Independent types Case.” *Journal of Regulatory Economics* 7(3): 277-292.

Burton, R.J.F. and Schwarz, G., 2013.”Result-oriented agri-environmental schemes in Europe and their potential for promoting behavioural change.“ *Land Use Policy* 30: 628-641.

Connor, J.D., Ward, J.R. and Bryan, B., 2008. “Exploring the cost-effectiveness of land conservation auctions and payment policies.” *Agricultural & Resource Economics* 51: 303-319.

Costello, C., and Polasky, S. 2004. “Dynamic reserve site selection.” *Resource and Energy Economics* 26: 157-174.

Davis, F.W., Costello, C. and Stoms, D.M. 2006. “Efficient conservation in a utility-maximization framework.” *Ecology and Society* 11: article 33.

Ferraro, P.J. 2008. “Asymmetric information and contract design for payment for environmental services.” *Ecological Economics* 65: 810-821.

Fraser, R. 2002. “Moral Hazard and Risk Management in Agri-environmental Policy”. *Journal of Agricultural Economics* 53: 475-487.

Gole, C., M. Burton, K. Williams, H. Clayton, D. P. Faith, B. White, A. Huggett, and C. Margules. 2005. “Auction for Landscape Recovery: Final Report.” WWF-Australia, Perth.

Gorddard, R., Whitten S. and Reeson A. 2008. “When should biodiversity tenders contract on outcomes?” Paper presented at the 52nd Annual conference of the Australian Agricultural and Resource Economics Society. Canberra 6-8 February 2008.

Grafton, R. Q. 2005. “Evaluation of round one of the market based instrument pilot program.” Report to the National Market Based Instrument Working Group, Canberra, Australia.

Green, J. R. 1979. *Incentives in public decision-making*. Amsterdam; New York: North-Holland.

Groth, M. 2009. “The transferability and performance of payment-by-results biodiversity conservation procurement auctions: empirical evidence from northernmost Germany.” WP Series #119, University of Lüneburg, Germany.

Hart, R. and Latacz-Lohmann, U. 2005. “Combating moral hazard in agri-environmental schemes: a multiple-agent approach”. *European Review of Agricultural Economics* 32: 75-91.

Hajkowicz, S., A. Higgins, K. Williams, D. P. Faith, and M. Burton. 2007. “Optimization and the selection of conservation contracts.” *Australian Journal of Agricultural and Resource Economics* 51: 39-56.

Kleijn, D., Berendse, F., Smit, R., Gilissen, N., 2001. „Agri-environment schemes do not effectively protect biodiversity in Dutch agricultural landscapes.” *Nature* 413: 723–725.

Kleijn, D., Berendse, F., Smit, R., Gilissen, N., Smit, J., Brak, B., et al., 2004. „Ecological effectiveness of agri-environment schemes in different agricultural landscapes in the Netherlands.” *Conservation Biology* 18 (3): 775–786.

Kleijn, D., Sutherland, W.J., 2003. “How effective are European agri-environment schemes in conserving and promoting biodiversity?” *Journal of Applied Ecology* 40 (6): 947–969.

Laffont J-J. and Tirole, J. 1987. “Auctioning incentive contracts.” *Journal of Political Economy* 95(5): 921-37.

Laffont, J.-J. and Tirole J. 1993. *A theory of incentives in procurement and regulation*. Mass: MIT Press.

Laffont & Tirole, 1988. “The dynamics of incentive contracts.” *Econometrica* 56(5): 1153-1175.

Leitzel J. and Tirole J.(eds), 1993. *Incentives in procurement contracting*. Boulder: Westview Press.

Laffont, J.-J. and Martimort, D. 2002. *The Theory of Incentives: The Principal-Agent Model*. Princeton and Oxford, Princeton University Press.

Latacz-Lohmann, U. and Van der Hamsvoort, C. 1997. "Auctioning Conservation Contracts: A Theoretical Analysis and an Application." *American Journal of Agricultural Economics* 79: 407-718.

Latacz-Lohmann, U. and Schilizzi, S. 2005. “Auctions for Conservation Contracts: A Review of the Theoretical and Empirical Literature.” Report to the Scottish Executive Environment and Rural Affairs Department: Project No: UKL/001/05.

McAfee, R.P. and J. McMillan, 1986. "Bidding for contracts: a principal-agent analysis." *Rand Journal of Economics* 17: 326-338.

Moxey, A., B. White, R. A. Sanderson, and S. Rushton. 1995. “An Approach to Linking an Ecological Vegetation Model to an Agricultural Economic Model.” *Journal of Agricultural Economics* 46: 381-397.

Moxey, A., White, B. and A. Ozanne 1999. “Efficient contract design for agri-environmental policy.” *Journal of Agricultural Economics* 50: 187-202.

Ozanne, A. and White, B. 2007. "Equivalence of Input Quotas and Input Charges Under Asymmetric Information in Agri-Environmental Schemes." *Journal of Agricultural Economics* 58: 260-268.

Quillérou, E., Fraser, R., 2010. Adverse selection in the environmental stewardship scheme: does the higher level stewardship scheme design reduce adverse selection? *Journal of Agricultural Economics* 61: 369–380.

Quillérou, E., Fraser, R. and Fraser, I., 2011. Farmer compensation and its consequences for environmental benefit provision in the Higher Level Stewardship scheme. *Journal of Agricultural Economics*, 62: 330–339

Riechelderfer, K. and Boggess, J. 1988. Government decision making and program performance: the case of the conservation reserve program. *American Journal of Agricultural Economics* 70: 1-11.

Schilizzi S. and Latacz-Lohmann U. 2007. Assessing the performance of conservation auctions: an experimental study. *Land Economics*, 83 (4): 497-515.

Schilizzi S., Breustedt G. and Latacz-Lohmann U. 2010. Will tendering incentive contracts improve environmental outcomes? Paper presented at the *World Congress of Environmental and Resource Economists*, Montreal, Canada, 28 Jun – 2 Jul. 2010.

Stoneham, G., V. Chaudhri, A. Ha, and L. Strappazzon. 2003. “Auctions for conservation contracts: an empirical examination of victoria's BushTender trial.” *The Australian Journal of Agricultural and Resource Economics*, 47: 477-500.

Sun, Ching-jen, 2007. “A Note on the Dynamics of Incentive Contracts.” MPRA (Munich Personal RePEc Archive) Paper No. 9813, 26 p.

Van Teeffelen, A. and Moilanen, A. 2008. “Where and how to manage: optimal selection of conservation actions for multiple species.” *Biodiversity Informatics* 5: 1-13.

Vickrey, J.A., Bradbury, R.B., Henderson, I.G., Eaton, M.A., Grice, P.V., 2004. The role of agri-environment schemes and farm management practices in reversing the decline of farmland birds in England. Biological Conservation 119, 19–39.White, B. 2005. “An Economic Analysis of Ecological Monitoring.” *Ecological Modelling* 189: 241-250.

White, B., Sadler, R., Williams, K., Prober, S., Smith, P., Latacz-Lohmann, U., Schilizzi, S., Burton, M. and Curry, J. 2009. “Auction for Landscape Recovery Under Uncertainty (ALRUU) – Technical Report.” Department of Agriculture, Fisheries and Forestry, Round 2 National Market-Based Instruments Pilot Programme, Australian Government, Canberra. 40 p.

Whitten S., Goddard R., Knight A., Reeson A., and Stevens D. (2007) “Designing and testing an outcome-focused conservation auction: evidence from a field trial targeting ground nesting birds”. Discussion Paper, CSIRO Sustainable Ecosystems group.

Zabel, A. and Holm-Müller, K., 2008. “Conservation performance payments for carnivore conservation in Sweden.” *Conservation Biology* 22: 247-251.

Zechmeister, H.G., Schmitzberger, I., Steurer, B., Peterseil, J., Wrbka, T., 2003. „The influence of land-use practices and economics on plant species richness in meadows.” *Biological Conservation* 114, 165–177.

APPENDIX 1

EXPERIMENTAL PARAMETERS

- Two locations (Kiel and Perth): to control for robustness of results
- Number of groups (2 x 2) and group size (≈ 20)
- Participant types (L and H capability: random allocation, then fixed)
- States of nature, uncertain (0 and 1: unfavorable & favorable ex-post coin toss)
- Risk spread between 0 and 1: prob(ET) held constant in this study for given type
- Incentive contracts: 50%, 67% and 100% PP (The 0% case was computed)
- Tender type: target-constrained (as opposed to budget-constrained)
- Selection: 2/3 of those who do not 'opt out' (freedom not to participate)
- Type of bid: through supply of effort (e.g. amount of nitrogen abated)
- Decision variables: participation; individual effort input
- Policy parameters: fixed payment; performance payment
- Participation costs: equal for all = fixed transaction cost + cost per unit effort
- Initial wealth: 0; 50; 100 ECUs: to avoid net real final losses
- Information given after each round: none, to simulate one-off bid only and no learning

PP = Performance Payment, linked to achievement of outcome: it constitutes the incentive payment
EPT = Environmental Performance Threshold, which defines the achievement target

APPENDIX 2

EXPERIMENTAL DATA

Group	Type	CE	NON-TENDERED			TENDERED		
		100=RN	50%PP	67%PP	100%PP	50%PP	67%PP	100%PP
K1	H	4	4	6	3	5	7	6
P2	L	4	7	4	7	9	8	3
P2	H	10	3	6	6	8	7	6
P1	H	20	10	5	0	4	5	1
P2	H	20	10	10	10	7	7	10
K2	L	40	6	7	3	7	7	5
P1	L	40	7	5	0	6	5	0
P1	H	40	7	5	10	8	7	10
K2	H	49.8	7	6	9	9	7	9
K2	L	50	6	6	1	8	7	8
K2	H	50	5	5	4	7	5	4
P1	L	50	5	4	8	6	8	8
P1	H	50	7	7	6	7	8	7
P2	L	50	3	8	7	7	9	8
K1	L	60	5	5	0	7	6	0
K1	L	60	6	4	0	6	0	0
K2	H	60	3	8	9	6	4	0
P1	H	60	6	7	7	6	6	7
K1	L	70	4	6	8	7	8	8
K1	H	70	4	10	0	9	10	0
K1	H	70	5	5	0	8	5	0
K2	H	70	7	5	8	8	9	9
K2	H	70	5	6	5	5	6	8
P1	L	70	7	4	0	8	5	10
K1	L	80	7	7	0	10	10	0
K1	L	80	6	5	0	7	7	0
K1	H	80	7	8	0	10	0	0
K1	H	80	4	5	0	6	8	4
K1	H	80	6	5	0	6	7	0
K2	H	80	6	5	10	8	7	0
P1	H	80	6	3	0	8	5	5
P1	H	80	5	6	3	9	3	9
K1	H	90	5	6	10	8	9	10
K1	H	90	5	5	0	6	5	0
K2	L	90	7	5	1	7	7	6
K2	L	90	9	8	10	9	8	8
K2	H	90	8	4	0	8	8	0
K2	H	90	5	4	7	7	7	9
P2	L	90	5	7	6	7	7	7
P2	H	98	5	10	10	10	10	10
K1	L	100	6	5	0	7	5	0
K1	L	100	3	5	0	3	7	0
K1	L	100	6	5	2	8	7	0
K1	L	100	6	5	4	5	9	0

K1	H	100	5	5	0	8	7	0
K1	H	100	6	5	0	7	8	0
K1	H	100	5	5	0	8	5	0
K1	H	100	5	4	0	8	9	10
K2	L	100	6	7	7	6	7	0
P1	L	100	5	4	0	4	4	0
P1	L	100	7	0	10	7	3	0
P1	L	100	7	7	4	9	10	0
P1	L	100	4	7	8	9	5	8
P1	H	100	6	6	8	7	5	5
P2	L	100	5	5	7	8	8	8
P2	L	100	8	8	7			
P2	L	100	4	6	4	7	8	7
P2	L	100	5	5	3	4	5	7
P2	H	100	8	8	6	3	4	3
P2	H	100	6	3	4	8	8	6
P2	H	100	7	6	4	9	7	7
K1	L	100.2	5	7	0	8	10	0
P1	H	110	8	7	6	9	8	8
K2	L	120	7	6	8	9	8	9
K2	L	120	4	8	8	6	0	0
P1	L	120	6	4	10	3	3	0
P2	L	120	4	5	8	10	8	8
K1	H	130	10	8	6	10	9	0
K2	L	130	8	6	3	8	5	0
K1	L	140	6	6	4	6	7	0
K2	L	140	6	4	3	8	4	8
K1	L	144	5	5	5	8	6	*1*
K1	L	150	5	3	0	3	10	0
K2	H	175	5	6	4	8	8	9
K2	H	200	4	7	3	6	8	5
P2	H	200	10	5	7	9	5	6
P2	H	200	5	6	8	7	8	7