OECD Environment Working Papers No. 85

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https://dx.doi.org/10.1787/5js4k0t30hvc-en

OECD

Unclassified **ENV/WKP(2015)6**

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development **16-Mar-2015**

English - Or. English

ENVIRONMENT DIRECTORATE

ENV/WKP(2015)6
Unclassified

TENDER INSTRUMENTS: PROGRAMME PARTICIPATION AND IMPACT IN AUSTRALIAN CONSERVATION TENDERS, GRANTS AND VOLUNTEER ORGANISATIONS - ENVIRONMENT WORKING PAPER No. 85

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Authorised for publication by Simon Upton, Environment Directorate.

Keywords: tender instruments, additionality, conservation grants

JEL classification: Q58, Q570, Q55

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JT03372423

Complete document available on OLIS in its original format

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ABSTRACT

A striking variety of policy instruments are used in Victoria, Australia to achieve conservation objectives. These include highly active voluntary programmes, a variety of conservation grants, and a reverse auction for the provision of ecosystem services, known as EcoTender. An open question regarding such payments for ecosystem services (i.e. grants and tenders) is whether they achieve 'additionality.' That is, do they lead to conservation above the status quo? Critics of these instruments allege that the majority of funds for such programmes are merely paying individuals for conservation work they are already doing. A related concern is that monetary incentives for conservation may skew landowners' motives more towards monetary concerns, and erode nature conservation values. The practical implication of this 'moral crowding out' is that, if funding is ever suspended for conservation grants or EcoTenders, then conservation may decline below its original, pre-programme level. To investigate both of these concerns, a telephone survey was conducted with 266 farmers in Victoria.

Analysis of the data suggests that there is a strong correlation between stated levels of own-property conservation effort and activity in local volunteer groups, as well as having received a conservation grant or tender. However, this does not address the additionality question, because landowners already engaged in such efforts may be more likely to be awarded grants or tenders. This presents an endogeneity problem. While panel data are ultimately necessary to answer this question definitively, application of instrumental variables methods provides some insight. The methods imply that grants and tenders may achieve 'additionality' only when they reach those otherwise uninvolved with conservation programmes, in particular those not volunteering. This suggests that conservation tenders can improve their cost-effectiveness by increasing participation among those not already volunteering in other conservation programmes.

Meanwhile, there is fairly strong evidence in the data for the potential for moral-crowding-out; tender or grant receipt appears to shift stated motivations towards more monetary concerns. However, the practical implications of this finding – that is, whether this erosion of attitudes translates in blunted conservation efforts – remain unknown.

***Keywords**:* tender instruments, additionality, conservation grants

JEL classification: Q58, Q570, Q55

RÉSUMÉ

Des instruments d'une étonnante diversité sont utilisés dans l'État de Victoria, en Australie, pour atteindre les objectifs de protection de l'environnement. Il existe ainsi des programmes volontaires très actifs, tout un éventail de subventions et un système d'enchères inversées appliqué à la fourniture de services écosystémiques, appelé EcoTender. Toutefois, une question se pose au sujet de ces mécanismes (subventions et appels d'offres) : répondent-ils au critère d'« additionnalité » ? Autrement dit, la protection qu'ils assurent est-elle supérieure à celle qui existe dans le *statu quo* ? D'après leurs détracteurs, les fonds versés en application de ces instruments ne font que rétribuer, dans leur majeure partie, des activités de protection de l'environnement que leurs bénéficiaires exercent déjà. De même, on peut craindre que les incitations pécuniaires ne faussent les motivations des propriétaires fonciers et que les mobiles financiers ne prennent le pas sur la portée morale de la sauvegarde de la nature. Concrètement, cette « éviction de la motivation morale » a pour effet que, si le financement des subventions ou d'EcoTender est interrompu à un moment ou un autre, la protection risque de descendre en dessous du niveau où elle s'établissait avant le recours à ces instruments. Pour évaluer le bien-fondé de ce scepticisme, une enquête téléphonique a été menée auprès de 266 agriculteurs du Victoria.

L'analyse des données indique qu'il existe une forte corrélation entre, d'une part, le niveau qu'un propriétaire attribue aux activités de protection qu'il mène sur sa propriété même et, d'autre part, ses activités bénévoles dans les associations locales et le fait qu'il ait bénéficié d'une subvention ou ait remporté un appel d'offres. Néanmoins, cela ne répond pas à la question de l'additionnalité, dans la mesure où les propriétaires fonciers qui protègent déjà le milieu sont peut-être plus susceptibles de recevoir des subventions ou de gagner un appel d'offres. Nous rencontrons ici un problème d'endogénéité. Des données de panel sont en dernière analyse nécessaires pour trancher la question, mais le recours à la méthode des variables instrumentales apporte un éclairage. Dans ce cas, on suppose que les subventions et les appels d'offres ne remplissent le critère d'additionnalité que s'ils bénéficient à ceux qui ne participent pas à des programmes de protection de l'environnement dans un autre cadre, en particulier à ceux qui ne font pas de bénévolat. Il en ressort que les appels d'offres écologiques peuvent présenter un meilleur rapport coût-efficacité si des candidats n'étant pas déjà bénévoles dans des programmes de protection de l'environnement sont plus nombreux à y participer.

Cependant, les données semblent attester assez nettement qu'il existe un risque d'éviction de la motivation morale : se voir attribuer un marché ou une subvention fait pencher les motivations déclarées du côté de l'intérêt pécuniaire. Les conséquences concrètes de cette observation (les activités spontanées de protection, sur le terrain, s'en trouvent-t-elles diminuées ?) restent toutefois inconnues.

Mots-clés : *instruments d'appel d'offres, additionalité , financement des subventions*

Classification JEL : Q58, Q570, Q55

FOREWORD

This draft paper, prepared by Zachary S. Brown (OECD), Bastien Alvarez (University of Toulouse) and Nick Johnstone (OECD), is a contribution to the OECD project on "Behavioural economics and environmental policy" (www.oecd.org/environment/behaviour.htm) that aims to improve our understanding of the implications of the insights from behavioural economics for environmental policy design.

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INTRODUCTION

A variety of market-based instruments (MBI) have been devised to cost-effectively achieve environmental objectives. The most well-known examples are tradable permits for carbon dioxide emissions or a per-ton tax on carbon emissions. Other examples include the use of individual transferable quotas to address overharvesting of common-pool resources such as fisheries, and fixed payments for various ecosystem services, such as biodiversity conservation. Tenders, also referred to as 'reverse auctions', are another type of MBI in which agents bid for contracts from a government to provide a service. In theory tenders should be more cost-effective for than fixed payments, because competition among bidders should lead to services being supplied at least cost to government.

Tenders for environmental services have been most utilized for biodiversity conservation (e.g. habitat restoration, wildlife protection, invasive species removal). In the USA the Conservation Reserve Program, in place since 1985, currently awards approximately $2 billion USD per year on a competitive basis to landowners to keep around 13 million hectares (ha) out of agricultural production, in order to provide environmental services such as soil erosion, wetland restoration, water quality provision, and the conservation of wildlife habitat (USDA, 2012). In Australia the EcoTender programme – a focus of this paper – awards funds for landowners to protect native vegetation and control invasive species.

However, there are important preconditions for these instruments to work efficiently. First, bidding must be competitive, meaning that bidders do not strategically collude or behave monopolistically (Latacz-Lohmann and Van der Hamsvoort, 1997). A high level of participation in tenders – with many bidders – is generally viewed as a prerequisite for inducing competition. Second, for tenders to provide a cost-saving advantage to the government compared to flat-rate grants (e.g. a fixed price per hectare of restored wetland or kilometre of riparian fence installed), bidders must be sufficiently diverse in terms of their true costs of conservation efforts. These costs typically hinge on the opportunity costs associated with foregone agricultural production on land set aside for conservation, which can vary greatly. However, the net costs of conservation efforts can also depend on the intrinsic motivations of landholders; for example some landowners may derive personal satisfaction from conserving biodiversity, and therefore require less compensation from government to engage in these activities.

Most crucially, the effectiveness of a tender – in terms of achieved objectives – is synonymous with its ability to induce more conservation effort relative to baseline conditions. In this regard, the effectiveness of conservation tenders is often investigated in terms of 'additionality' (Blackmore and Doole, 2013; Moon and Cocklin, 2011; Moon, Marshall and Cocklin, 2012), i.e. do tenders increase conservation activities relative to what would have prevailed in their absence? As discussed in the literature cited above, it is not clear that the answer to this question is 'yes'. There is concern, for example, that some conservation tenders mostly allocate funds to landowners who are predisposed to undertaking conservation activities, and who would have largely continued doing so had they never received the funds.

In assessing this policy question, it is important to distinguish additionality from the concept of 'information rents' used in the economic theory of contracts under asymmetric information, e.g. between the auctioneer and the bidders. Information rents arise, for example when a principal (in this case the government) does not know the true costs to potential agents or bidders of providing a service and thus does not know how low a price can be offered to contract that service. In conservation auctions such information asymmetry is thought to arise from the fact that the government does not really know the true costs to landowners of providing conservation services. Information rents are widely recognized in reverse auctions for conservation services. In a theoretical analysis, Latacz-Lohmann and Van der Hamsvoort

(1997) illustrated an example in which information rents equated to a 30% reduction in programme cost-effectiveness relative to a tender in which the government had full information on landowners' costs of service provision. On the other hand, compared to feasible alternatives (i.e. in the absence of full information), reverse auctions, with discriminatory prices, are economically attractive precisely because competition among bidders should reduce information rents compared, for example, to fixed-rate payments (Ferraro, 2008).

Additionality is a distinct concept from information rents. The former is a purely empirical trait; as mentioned above it characterizes policies which yield conservation levels above baseline levels (however those may be defined). Non-trivial baseline levels of conservation effort may exist for a variety of reasons. Nongovernmental conservation organizations may already be compensating landowners for their services, or there may be legal or contractual obligations for the landowner to provide conservation services. Another reason that private conservation activities may exist under baseline conditions is due to the private values of landowners, which may not depend purely on economic profitability. In the classical model analysed by Latacz-Lohmann and Van der Hamsvoort (1997), landowners never find it rational to engage in conservation activities without external compensation, in which case additionality is always achieved under such auctions. Since by assumption no conservation is assumed to take place before the auction, any auction which yields positive conservation levels has achieved additionality. However, there is the possibility that some landowners derive their own intrinsic value from conservation (e.g. leaving a legacy to their heirs). Whatever the explanation, reverse auction conservation tenders provide landowners already engaging in conservation activities an incentive to place bids which seek additional compensation for their pre-existing services. As with the costs of service provision, it is often safe to assume that government has little (maybe even less) information on landowners' private benefits derived from their own conservation efforts. Thus, conservation tenders likely pay information rents for any such benefits as well. The two concepts are related in that measures taken to reduce information rents – such baseline landowner assessments by the government (which carries their own costs) – can enhance the chances a policy achieves additionality.

Both the additionality concern and necessity of heterogeneous opportunity costs applies generally to most positive incentive schemes, including conservation grants. It could be expected that many landowners would apply for financial support for conservation activities that they were already undertaking freely, representing 'dead weight' in terms of programme impact. Thus, landowner motivations also play a prominent role in determining the effectiveness of MBIs for biodiversity conservation. An MBI could be expected to achieve maximal impact in situations where landowners are self-interested and motivated predominantly by financial concerns. In other settings, where landowners may be motivated by their own conservation values, the legacy they leave, or esteem from their peers or neighbours, then MBIs may be an inefficient means of achieving some conservation objectives, relative to other measures (e.g. volunteer groups and cooperatives).

In terms of analysing the performance of different MBIs, research in behavioural economics has highlighted certain areas where individuals systematically deviate from the predictions of traditional economic theory, in ways that can affect the cost-effectiveness of these instruments. Examples include the distinction that individuals tend to make between economic losses versus gains (manifesting in so-called "loss aversion"), the skewed weighting of risks in decision-making, as well as tendencies towards cooperation and altruism which evidently contradict the portrayal of economic agents as purely self-interested (Shogren, 2012). Importantly, these deviations can affect the cost-effectiveness of MBIs in both positive and negative ways. For example, Fryer Jr, Levitt et al. (2012) demonstrate how loss aversion can be used to enhance the cost-effectiveness of a teacher performance incentive programme.

Within the class of behavioural phenomena focused on cooperation and altruism, the concept of "moral crowding out" (MCO) has been highlighted as one potentially negative side-effect of MBIs,

particularly instruments which use monetary incentives. The concept refers to the potential for MBIs to erode altruistic pro-social behaviours, by monetizing these behaviours. Thus, in the worst case scenario, MBIs 'spoil' altruistic individuals, leading them to demand compensation for publically beneficial actions that would previously have been undertaken freely.

While alleged MCO examples have been highlighted in diverse policy areas, including childcare (Gneezy and Rustichini, 2000) and the siting of hazardous waste storage facilities (Frey and Oberholzer-Gee, 1997), there has been a particular concern about MCO in the context of positive incentives for land conservation, frequently expressed with regard to conservation tenders in Australia (Blackmore and Doole, 2013; Moon and Cocklin, 2011; Moon, Marshall and Cocklin, 2012; Whitten et al., 2007). MCO implies that MBIs skew motivations more towards financial concerns, and thus potentially eliminate or reduce intrinsically motivated conservation effort.

From the perspective of conservation policymaking, MCO is most relevant if future conservation budgets are uncertain. Suppose a conservation tender or grant programme is created, but later the programme is eliminated due to budget constraints. Then the MCO hypothesis would imply that conservation effort after cessation of the programme is less than what prevailed prior to programme implementation. If the MCO hypothesis is true, then *ex post* – under the scenario described above – it may have been more cost-effective in the long run if the tender or grant had never been introduced. Identifying such a 'smoking gun' for MCO would require panel data, i.e. observing landowners' conservation efforts before, during, and after implementation of the tender or grant, ideally with an appropriate control group of landowners not subject to the programme.

While lacking such a panel, this study uses rich cross-sectional survey data to analyse how landowner conservation motives and actions relate to their participation in conservation programmes, including tenders, grants, and voluntary measures. The analysis consists of a quantitative case study of Australian landowners and conservation programmes. The data come from a 2013 survey of 266 landowners in the Australian region of Victoria, over half of whom correspond to a random sub-sample of landowners in the region, with the remainder corresponding to an oversampling of conservation programme participants, using lists from the Department of Environment and Primary Industries (DEPI, formerly the Department of Sustainability and Environment). While other studies have used survey data to analyse similar questions with respect to Australian conservation tender and grant programmes, the present data add value by including a random subsample of landowners in Victoria.

The following key findings emerge from the analysis. On the one hand, landholders' stated conservation effort on their own property is evidently higher among participants in conservation tenders and grants programmes and among those who also volunteer with local conservation groups. But after controlling for potential reverse causality via econometric techniques, we find evidence that tenders and grants increase conservation effort beyond the status quo only among those who are less active in other conservation programmes, specifically those who do not volunteer with local conservation groups. Furthermore, levels of volunteerism in local conservation groups appears to correlate spatially, with the likelihood of any given landowner volunteering in such a group increasing as more of her neighbours also volunteer. Finally, whereas the conservation impacts of positive MBIs are mixed, they evidently skew landowners' motivations towards financial concerns and away from nature conservation values, which is consistent with (but does not definitively prove) the MCO hypothesis.

Before presenting the survey data collection and econometric analysis, we summarize the main conservation programmes of interest in Victoria. Potential policy implications of the econometric results are discussed at the end of the paper.

1 Conservation programmes for private landowners in Victoria

The various conservation programmes in Victoria can be best characterized in terms of how the public and private benefits and costs of the programmes are distributed among the different stakeholders – primarily landowners, government, and the public.

1.1 EcoTender

EcoTender is a reverse auction for environmental services open to landholders in Victoria. Interested parties work with a government official to assess the environmental significance of their land, and to form a management plan for protecting native plants and wildlife habitat. The management plan can include actions for controlling pests and invasive species, protecting and restoring native vegetation and wetlands, and mitigating the impact of livestock on ecosystems. In deciding which actions to include in their management plan, landholders also specify the costs of these actions, which comprise the landholder's bid in the auction. The Department of Environment and Primary Industries then assesses bids in terms of "value for money," and awards available funds to the most competitive bids. The environmental benefits of each bid are assessed by computing an index which aggregates the benefits of each proposed action. EcoTender is a discriminatory price auction and thus should reduce the potential for information rents (Stoneham et al., 2003).

Approximately 1,700 ha of land in Victoria are subject to site management plans developed through EcoTender. The programme has been phased in with a series of regional pilot demonstrations. The most recent demonstration, in the Victorian region of West Gippsland, contracted $2.4 million USD worth of conservation work during 2010-2011 among 80 landholders, involving 1,160 hectares of land (Victoria State Government, 2013).

1.2 Conservation grants

In addition to EcoTender, the Victoria state government funds the Landcare Grants programme. These grants take a variety of forms, and their administration is devolved to regional Catchment Management Authorities and local chapters of Landcare, a network of volunteer-based conservation groups discussed below. Grants can take a variety forms, but DEPI's stated objectives include influencing the conservation practices of private landholders, and grants can be used to support these activities. In 2008 Landcare Grants provided $71 thousand USD specifically for the development of 72 individual property management plans throughout Victoria, including pest and erosion control and re-vegetation and involving over 800 ha of individuals' property (Landcare Victoria, 2008). Non-governmental organizations in Victoria, such as the Trust for Nature, also evidently provide some financial support for conservation activities on private lands, though it is unclear how much funding is mobilized in this manner.

1.3 Landcare

Landcare is a government-sponsored umbrella organization for volunteer-based community groups engaging in land conservation. It provides informational and dissemination resources for over 700 local conservation groups throughout Victoria. In addition to support for private landholders (discussed above), the programme also provides funds for community conservation projects such as tree-planting as well as educational workshops. In 2008 Landcare's budget totalled $3.7 million USD, with $469 thousand supporting community weed removal projects, $408 thousand funding salaries of 70 support staff-members and $51 thousand directed towards "group maintenance grants." Landcare-funded group action plans involved about 566 ha, or 2.5% of the land surface area in the state (Landcare Victoria, 2008).

While Landcare is used in this paper as the primary indicator of volunteerism, it is important to note that Landcare members, particularly those who are landowners, often enjoy direct, private benefits from

their membership. For example, landowners belonging to Landcare are – for obvious reasons – more likely to receive volunteer projects such as tree-planting on their property than non-member landowners. Moreover, as implied above, there can be economically meaningful sums of money provided by local governments for such projects. Thus, belonging to a Landcare group is not synonymous with altruistic commitments of time and effort, but it can provide some indication of altruism. In this paper membership in Landcare is as an imperfect proxy for volunteerism as well as community engagement. Furthermore, in terms of the programmatic question of additionality, discerning whether altruistic or selfish motivations guide Landcare membership is less important than seeing how Landcare, in conjunction with the other programmes, appears to influence conservation outcomes.

1.4 Other programmes

Non-governmental organizations also provide voluntary mechanisms for individuals to protect their land. The Trust for Nature, a Victorian land trust, engages with private landowners to develop covenants which permanently set aside land for conservation. Over 42,000 ha in Victoria are subject to such covenants.

2 Research questions and data collection

A survey was designed and administered to 266 private Victorian landowners, with the aim of investigating the following questions:

1. What determines participation in the various conservation programmes described above?
2. What determines the likelihood of being awarded a conservation grant or tendered contract, conditional on having applied for a grant or submitted a bid (or bids) in a tender?
3. Is there any evidence of tenders or grants or volunteer activity having an effect on landowners' conservation efforts on their own property?
4. Is there any evidence for MCO? That is, does the use of financial incentives for conservation erode altruistic conservation efforts? If such evidence exists, what are its practical implications, in terms of cost-effectiveness for example?

Landholders across Victoria were targeted for surveying via computer assisted telephone interviews (CATI) conducted by Sweeney Research, an ISO-accredited survey research firm. The eligibility criteria for participation were that the respondent was landholder involved in some type of farming activity and was personally responsible for making conservation decisions about their property.

Anticipating a potentially low level of participation in some of the conservation programmes, particularly grants and EcoTender, a split-sample design was used to oversample programme participants, while at the same time permitting estimation of overall programme participation rates within the relevant population (Victorian farmers). One sampling list, provided by DEPI, consisted of current and former Landcare participants. Naturally, sampling from this list resulted in oversampling participants in all of the conservation programmes described above. The other list was obtained from a marketing list broker, and was intended to serve as a frame from which to obtain a representative sample of landowners and thereby estimate population-level frequencies.

A total of 266 completed surveys were obtained, with 154 coming from the list broker (presumptuously referred to hereafter as the random sample) and 112 coming from the DEPI list. The refusal rate for telephoned respondents was 31% for the random sample and 16% for the DEPI list.

In the econometric analysis of the data, we apply maximum likelihood methods, with sample weights used to account for the split sample design. The sample weights are proportional to the inverse probability that a landowner participates only in a voluntary programme such as local Landcare group, an incentive-based programme such as EcoTender or a Landcare Grant, both a voluntary and incentive-based programme, or neither of these programmes. These probabilities are estimated using the corresponding frequencies observed in the random subsample (see below).

RESULTS

We first summarize key sample statistics in terms of the subsample from the DEPI lists and the independent subsample, the latter being more representative of the general population of landowners. The goal is to first appreciate the structure of the dataset and the relevant differences between each subsample (motivating the use of sampling weights), before turning to the main questions for analysis. **Table 1** presents key summary statistics for each of the subsamples.

Of the 266 respondents interviewed, 46 (17%) submitted at least one bid for a conservation tender in the last 5 years, with 28 of these respondents (61% of bidders) having submitted at least one successful bid. As designed, the DEPI sample shows much higher participation levels in conservation tenders (33% versus 6% of respondents bidding), conservation grants (63% applying for grants in the DEPI sample versus 42% in the independent sample), and volunteerism, with 42% of the DEPI sample volunteering their time with local conservation projects compared to an estimated 19% for the general population. Thus, the landowners on the DEPI lists are much more likely to participate in conservation programmes than the general population. Of those landowners who declared membership in a conservation group (36% in the general population, and 67% in the DEPI list), the majority belong to Landcare (described above)).

There are also significant differences in landowner characteristics between the two samples. In particular, the *success rate* of tender bids on the DEPI list is 20% greater than the general population (of bidders), controlling for the *number* of bids submitted by each landowner (in the last 5 years). This contrasts with the success rate of conservation grant applications, which is 85%, and does not vary appreciably between the samples.

Additionally, parcels represented by the DEPI subsample appear much smaller than the general population, and landowners on the DEPI lists are less likely than the general population to be working a 'family farm,' i.e. land that was previously owned by a family member of the current owner. The distribution of parcel sizes shows concentrations of large parcels (33% over 450 ha in size) and small parcels (33% under 50 ha). There is little difference between the samples with regard to the nature of land use with 67% of farms being dedicated to livestock rearing, in the pooled, unweighted sample, and whether the land served as the owner's primary residence (92% in the pooled, unweighted sample).

In terms of overlap between voluntary and MBI-based conservation programmes, we can see from **Figure 1** that there is strong a positive correlation between belonging to any (usually local) conservation group and financial support via either a conservation grant or tendered contract. As the figure shows, some of this correlation comes from volunteers being more likely to apply for such financing, but the largest component comes from having actually been awarded money. This suggests that conservation-oriented landowners are both more likely to both participate in voluntary conservation programmes and apply or bid for grants or tenders. The grant applications or tender bids are also more likely to be awarded to such individuals, conditional on having applied. The regression analysis that follows examines landowner/property/enterprise characteristics that predict participation voluntary programmes and grants or tenders, as well as predict the outcomes of grant applications and tender bids.

To consistently utilize the split sample design of the data – i.e. to take advantage of the DEPI subsample while maintaining the representativity of the random subsample – we compute simple sampling weights to be applied to subsequent estimation using the pooled sample, by using the frequencies presented in Figure 1. In practical terms, this ensures that voluntary and MBI programme participants are not overrepresented in the analysis, relative to non-participants.

Of primary concern for policy is the question of how participation in conservation programmes relates to landowners' conservation efforts, and ultimately biophysical outcomes (e.g. hectares of habitat protected and restored). The data analysed here permit some analysis of the determinants of conservation effort, but they do not permit investigation of biophysical outcomes.[1] A binary conservation effort indicator is created from a survey question asking whether conservation projects – such as fencing off wildlife habitat from livestock, replanting native vegetation, or eliminating invasive species – are carried out on the landowner's property "on a regular basis." The other two alternative responses to this question were either "do [such projects] occasionally as required" or "don't really do conservation work at all."

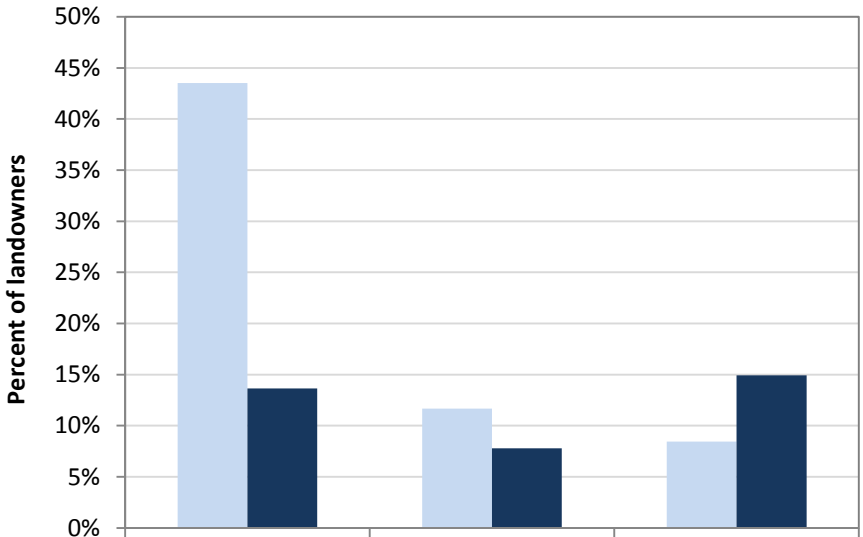
[1] Though there is the possibility of additional analysis using merged GIS-based land cover discussed in the conclusion of this report.

Table 1. Summary statistics of the samples

	General pop.	*DEPI list*
Total respondents interviewed	154	112
Female respondents	21%	43%
Respondent age (mean years)	59	60
Standard deviation (years)	12	8
Time farming on property		
<5 years	1%	4%
5-10 years	9%	6%
>10 years	90%	90%
Family farm	51%	32%
Primary residence	95%	88%
Parcel size (mean hectares)	808	378
Standard deviation (hectares)	1,365	670
<50 hectares	25%	45%
50-450 hectares	35%	31%
>450 hectares	40%	24%
Landuse		
Livestock (cattle, sheep, pigs, or alpacas)	71%	62%
Cultivation (crops, timber, horticulture, vineyards)	4%	7%
Livestock and cultivation	17%	10%
Other activities	8%	21%
Bid for conservation tender in last 5 years?	6%	33%
Yes, and some bids successful	2%	22%
Yes, but unsuccessful	4%	11%
Applied for conservation grant in last 5 years?	42%	63%
Yes, and some applications successful	23%	35%
Yes, but unsuccessful	18%	28%
Member of conservation group(s)	36%	67%
Volunteering on local conservation projects		
Once a week or more	1%	3%
Every couple of weeks	2%	4%
Once a month	1%	6%
Once every few months	5%	12%
Once or twice a year	10%	14%
Less often	1%	4%
None	81%	58%

Figure 1. Overlap between voluntary and MBI-based conservation programmes.

Figures calculated based only on the random subsample, excluding the DEPI subsample.



	Did not apply for a conservation grant or tender	Applied for but not awarded a grant or tender	Applied for and awarded a grant or tender
Not a member of a conservation group	44%	12%	8%
Member of a conservation group	14%	8%	15%

Figure 2 shows the statistical relationship between declared levels of conservation effort exerted on a respondent's own property and whether or not the respondent participates in the focal conservation programmes. The most obvious relationship in the figure is the degree of positive correlation between volunteerism (i.e. membership in conservation groups) and the level of conservation effort exerted on one's own property. There is between 15% and 33% difference in own-property conservation effort between conservation group members and non-members. Possible explanations for this correlation are (a) that belonging to a conservation group positively affects environmental awareness, (b) that more conservation-minded landowners are both more likely to join conservation groups as well as engage in more conservation efforts on their own property, or (c) some combination of (a) and (b).

Applying for a grant or bidding for a tender also appears correlated with levels of conservation effort exerted on one's own property, with this correlation being much more pronounced (and statistically significant) among those belonging to a conservation group. Whether the grant and tender programmes *cause* more conservation effort is, of course, a more difficult question to answer. Bearing in mind the prior literature's concern about additionality with respect to positive monetary incentives for conservation (discussed in the Introduction), it would be expected – at least in the case of tenders – that more competitive bidders (i.e. those providing more conservation at less cost) would potentially be more likely to bid in the first place, and would certainly be more likely to be awarded a contract. Still, it would be more problematic (from a policy perspective) if those who were awarded tenders or grants were engaging in *less* conservation activity. In any case, econometric analysis of these correlations is therefore necessary to investigate the additionality question further.

To facilitate the econometric analysis, we examine one final descriptive relationship – that between participation in conservation programmes and landowners' stated motives for conservation work. **Figure 3**

presents the summary statistics for this relationship for non-volunteers (panel a) and volunteers (panel b). Careful examination reveals a couple of key points. First, unsurprisingly, volunteers express higher levels of motivations for carrying out conservation work, across all of the motives considered (comparing each bar in panel a to its counterpart in panel b). Second, motivations related to nature conservation values, aesthetics, and legacy appear, in general, most prominent, with motives related to social standing and community recognition (as well as legal obligations) being relatively less important.

A relationship suggestive of the MCO hypothesis can be seen by focusing on the monetary motives, specifically the 'availability of funding' motive. Intuitively, landowners applying for grants or tenders appear more motivated by funding availability. However, this motivation becomes in even more extreme among those who have been awarded a grant or tendered contract, suggesting that the receipt of funding may articulate financial motivations relative to others.

Figure 2. Percent of landowners declaring that they engage in conservation projects on their own property on a "regular basis."

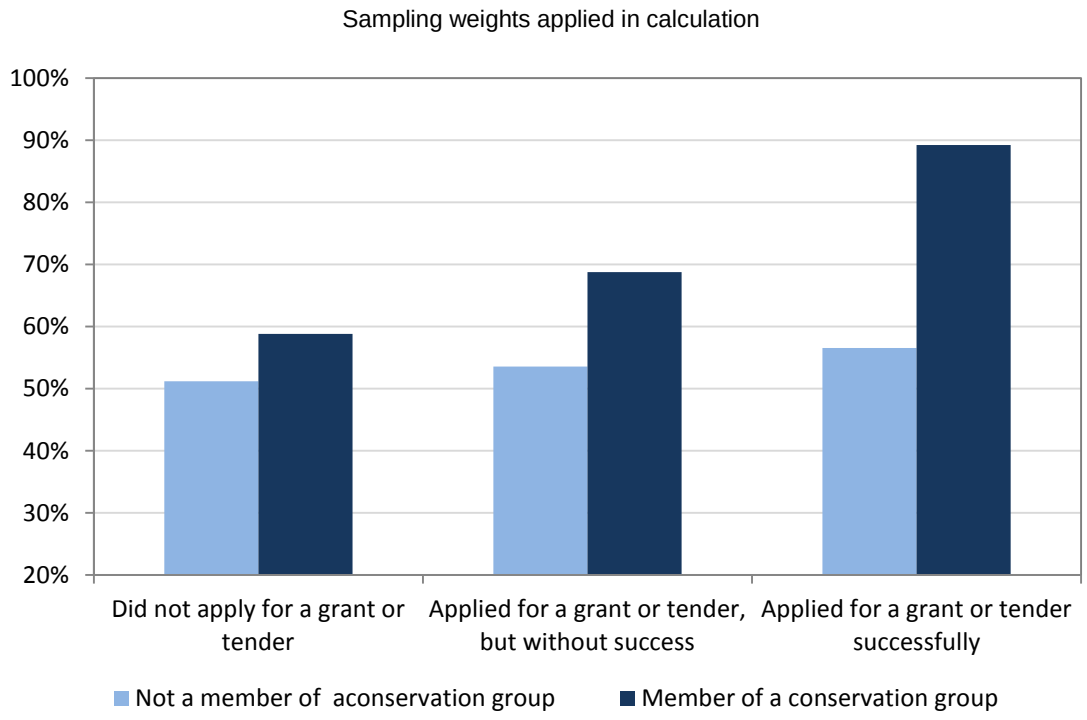
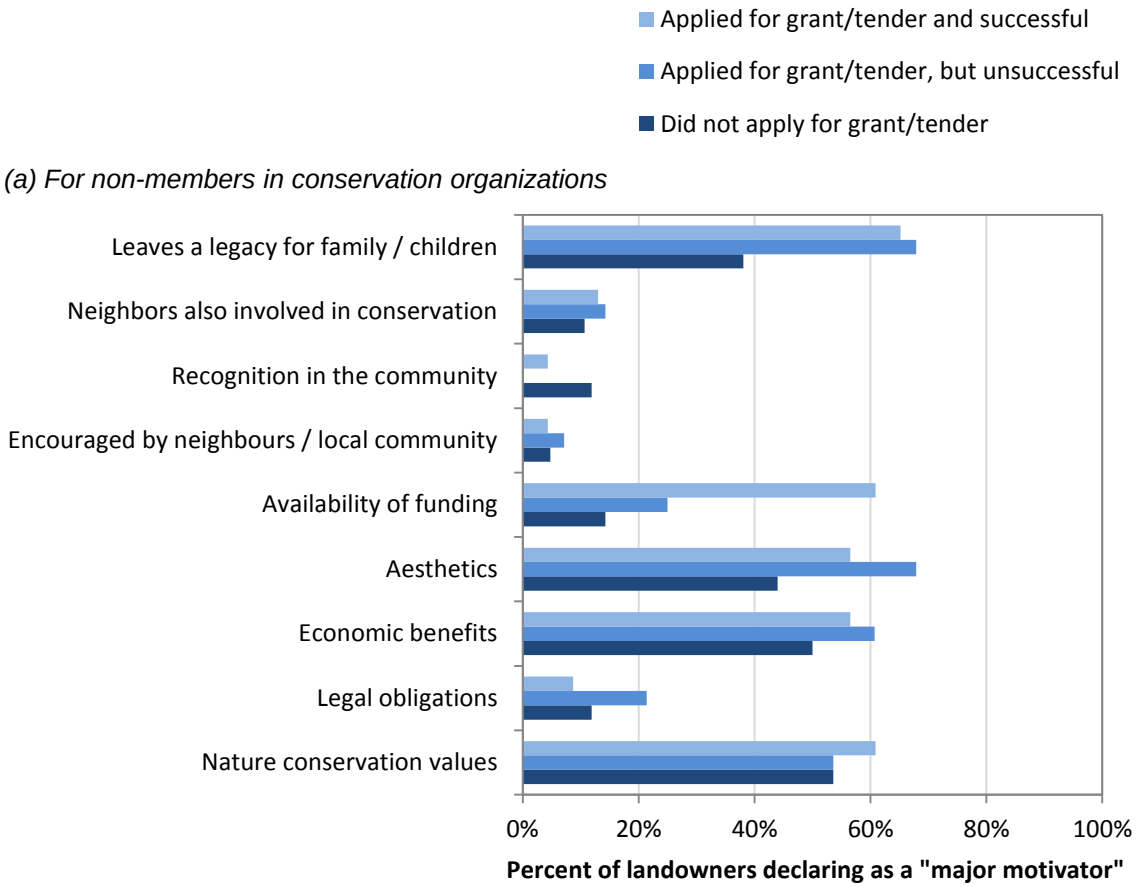
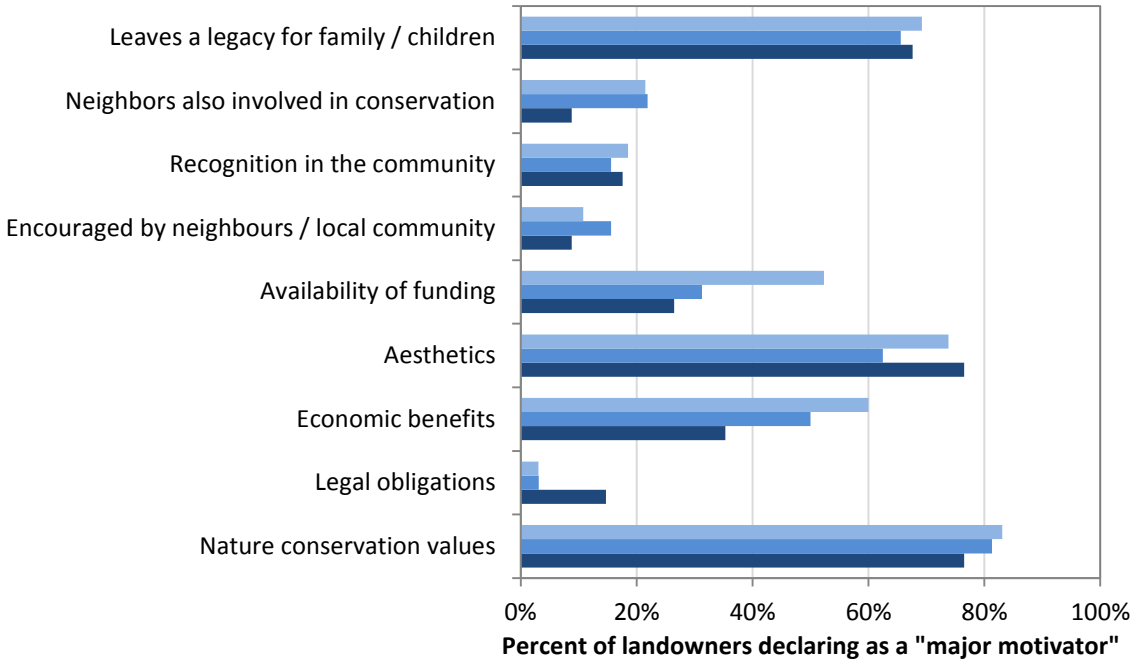


Figure 3. Motives for conservation, by programme participation.

Sampling weights applied in calculations.



(b) For members in conservation organizations



3 Regression analysis

We investigate four specific questions in the econometric analysis. The first is an exploratory question: What types of landowners apply for grants or tenders and/or volunteer with conservation groups, and how are these decisions interrelated? Second, conditional on having submitted a tender bid or grant application, which types of landowners tend to be successful in their submission? Third, do we find any evidence of additionality with respect to tenders and grants (and what are the econometric problems presented by the data with respect to this question)? Finally, is there any evidence in the data to support the MCO hypothesis? To investigate these questions, we perform a series of regressions, all of which were implemented using the *cmp* package for the Stata software platform (Roodman, 2011).

3.1 Determinants of programme participation

To investigate the first query – the determinants of participation in grants, tenders and volunteer programmes – we evaluate a seemingly unrelated probit regression model consisting of three equations:

$$
\begin{aligned}
T_i^* &= \boldsymbol{\beta_T X_i} + \gamma_1 Constrained_i + \sum_k \rho_k^T r_i^k + \epsilon_i \\
G_i^* &= \boldsymbol{\beta_G X_i} + \gamma_3 Constrained_i + \sum_k \rho_k^G r_i^k + \nu_i \\
V_i^* &= \boldsymbol{\beta_V X_i} + \gamma_5 NeighbourV_i + \sum_k \rho_k^V r_i^k + \eta_i
\end{aligned}
\qquad (1)
$$

The variables $T_i^*, G_i^*,$ and V_i^* are latent (i.e. unobserved) variables indicating the propensity for landowner i to apply for respectively tenders, grants, or volunteer. They correspond to observed variables T_i , G_i , and V_i , which are binary indicators for whether the landowner applied for grants or tenders, or volunteered. When $T_i^* > 0$, then $T_i = 1$; otherwise $T_i = 0$, and so on for the other of the participation variables. The error terms in the regression are ϵ_i, ν_i, and η_i.

The seemingly unrelated probit model posits that the vector $(\epsilon_i, \nu_i, \eta_i)$ is distributed multivariate normal, with mean zero and covariance matrix $\mathbf{\Sigma}$, which is to be estimated subject to scale restrictions. It is a generalization of running a simple probit model on each of the above equations, by relaxing the assumption that the error terms are independent across equations. That is, the model accounts for correlations in participation decisions across programmes which are not evidently due to any observable explanatory variables (which are summarized in the next paragraph). This model is consistent (i.e. asymptotically unbiased) and – by using information about cross-equation correlation – is more efficient (i.e. provides greater asymptotic precision) than single-equation probit regressions.

Turning to the explanatory variables in the regression, the vector $\boldsymbol{X_i}$ contains a set of characteristics of landowner i and her property (i.e. those characteristics summarized in **Table 1**). The r_i^k variables are region-level fixed effects. The remaining Greek symbols in the above equations comprise the parameters to be estimated.

The variable $Constrained_i$ is an index for different types of constraints landowners' cited as reasons which prevent them from carrying out more conservation activity on their property. The possible constraints which the landowner could cite were lack of financial resources, time, or labour, as well as inconvenience and a lack of interest. To reduce dimensionality in light of the relatively small dataset, principal components analysis (PCA) was applied to this set of six survey questions. The first component produced by the PCA, which encompassed 36% of the variation across the six questions and loaded most heavily on the time, labour, and financial constraint indicators, was used as the index in all regressions. Higher values of the index indicate higher resource constraints on the landowner in their conservation activities.

The last explanatory variable in the above equations – $NeighbourV_i$ – measures the level of volunteerism among landowner i's neighbours. The motivation for including this variable in the regression is that a landowner may be more likely to participate in a local conservation group (e.g. local LandCare chapter) if her neighbours are doing the same. This may either be because landowners 'get more' (in terms of enjoyment, knowledge, or recognition) out of more active groups, or because a more active local group is more likely to have approached the landowner about volunteering. The variable is calculated as a weighted sum of other landowners' indicator variables for volunteer participation:

$$NeighbourV_i = \sum_{j \neq i} \exp(-\tau d_{ij}) V_j \qquad (2)$$

where d_{ij} is the estimated distance between landowner i and j in the dataset (calculated by geocoding landowners' reported postal codes, and applying the Haversine formula to calculate the distance between the two geocoded points for every possible landowner pair in the dataset). The parameter τ controls how close neighbors have to be in order to be relevant for the analysis. The parameter was chosen so as to maximize the observed variance of the resulting $NeighbourV_i$ variable (a criterion which is analogous to the principle used in PCA); this was done prior to estimation of the regression models. The practical result

of this procedure is that only landowners within approximately 10km of each other were modelled as having any meaningful effect on their neighbours' volunteer decisions (and vice versa).

The regression results, shown in **Table 2**, reveal two broad facts: First, volunteering and tender bidding appear to be highly correlated, whereas applications for conservation grants appears to be an independent process, explained by other factors. Second, only a relatively small number of factors were found to be significant determinants of programme participation, which is likely in part due to the relatively small sample size and consequently low statistical power. For tenders, the only statistically significant factor related to bidding was whether the landowner volunteered or not. Whereas the estimated likelihood of a non-volunteer bidding in a conservation tender is 9%, these odds climb to 27% for volunteers (these values are calculated using the estimated correlation between the tender bidding and volunteer equations, shown near the bottom of the table).

Factors found to be important in determining the likelihood of applying for a conservation grant include the degree to which the landowner feels resource-constrained in their ability to engage in conservation activities. Based on marginal effects computations using the estimates in Table 2, landowners in the 75^{th} percentile of the resource constraint index are 16% more likely to have applied for a conservation grant than landowners in the 25^{th} percentile. "Family farms" are 12% more likely to have applied for a conservation grant, and landowners engaged in a livestock enterprise are 26% more likely to have applied for such grants. Also, male respondents to the survey are 16% less likely to have reported applying for a conservation grant, though it is difficult to know whether this reflects a relevant finding for programme administrators or merely a survey artefact (i.e. measurement error induced by differences in the way men and women survey).

Table 2. Programme participation (seemingly unrelated probit model).

Variables	*Bid for tender*	*Apply for grant*	*Volunteer*
Resource constrained	0.00447	0.178**	
	(0.0797)	(0.0728)	
Neighbour volunteerism			0.167*
			(0.0907)
Male	-0.255	-0.538***	0.0717
	(0.239)	(0.206)	(0.209)
Age (years)	-0.00482	-0.00118	0.0105
	(0.00912)	(0.00907)	(0.00869)
Owned farm for over 10 years	-0.317	-0.0462	0.113
	(0.341)	(0.352)	(0.308)
Family farm	-0.376	0.428**	-0.261
	(0.243)	(0.204)	(0.206)
Primary	-0.499	-0.292	0.171
	(0.333)	(0.315)	(0.304)
Parcel size			
Parcel between 50 & 450 ha	0.0863	-0.00924	-0.0162
	(0.287)	(0.237)	(0.244)
Parcel > 450 ha	0.606	0.0980	-0.185
	(0.369)	(0.293)	(0.288)
Type of enterprise			
Livestock	-0.268	0.794***	0.381
	(0.308)	(0.276)	(0.250)
Cultivation	0.293	-0.155	0.321
	(0.292)	(0.256)	(0.258)
Correlation of regression errors			
Applied for grant	0.028		
Volunteer	0.43***	-0.03	
Log-likelihood		-2824	
Log-likelihood of null model		-3189	
Degrees of freedom		68	
Observations		266	

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Sampling weights applied in estimation, and regional fixed effects included in regression but not shown.

Lastly, the only significant direct determinant of landowners' volunteer activity was found to be the level of volunteerism in their local community (although this effect is only significant at the 10% level, with a p-value of 0.065). In terms of magnitude, it appears that those living 'near' neighbours who are active in local conservation groups are themselves about 9% more likely to volunteer. In addition, because the cross-equation correlations in the seemingly unrelated probit model do not reflect any assumption about causation, it is equally valid to consider the likelihood of a landowner volunteering, conditional on whether she has also bid in a conservation tender or not. Such an exercise implies that those bidding in tenders are 9% more likely to also volunteer than non-bidders (whose marginal probability of volunteering is 73%).

3.2 Determinants of successful applications to conservation grants and tenders

The next regression explores the factors determining the *success* of tender bids and grant applications (obviously, conditional on those who have applied or bid). There are some econometric challenges in consistently estimating such a regression due to important factors determining success or failure which are not observable with the present data. In the case of tender bids, this includes the attributes of the bids themselves – *i.e.* the proposed price of the contract and the scale of the conservation work involved. In particular, landowners already engaged in conservation work for little or no monetary compensation, may underbid competitors unwilling to do such work for 'free.' We hypothesize that one factor potentially determining the propensity to engage in uncompensated conservation activity is whether or not the landowner volunteers with a local conservation group. This hypothesis motivates a probit regression of the following form:

$$TGs_i^* = \boldsymbol{\beta}_{\boldsymbol{X}}^{\boldsymbol{TGs}}\boldsymbol{X_i} + \beta_V^{TGs}V_i \ + \beta_A^{TGs}A_i^{TG} + \sum_k \rho_k^{TGs} r_i^k \ + \epsilon_i \text{ for } i \text{ with } TG_i \ > 0 \qquad (3)$$

The asterisked left-hand-side variable is latent, with its binary counterpart $TGs_i > 0$ indicating that landowner i was awarded a grant or tendered contract. As before $V_i > 0$ indicates that the landowner volunteers. The variable A_i^{TG} is the number of applications or bids that landowner i reports submitting. We aggregate bids and tenders in the success equation because of the fact that there are only 28 landholders in the data who succeeded in their tender bid, and 75 landowners with successful grant applications. Also as before, the error terms (ϵ_i, η_i) are assumed to follow a multivariate normal distribution, and are permitted to be correlated. Finally, note that the TGs_i^* regression equation is restricted only to those observations in which a bid or application was submitted ($TG_i > 0$).

In addition, we apply an instrumental variables (IV) probit model to equation (3), using a transformation of $NeighbourV_i$ as the instrumental variable for V_i . This is a robustness check to allow for endogeneity, e.g. for the possibility that an unobserved process simultaneously affects the probability of volunteering and the success of a landowner's bid or application. To maintain as much statistical power as power, the first-stage IV regression is run on the entire dataset (i.e. all 266 landowners), while the second-stage (equation 3 above) is run only with the 148 landowners who submitted a bid or grant application.

As seen in **Table 3**, in both the single equation probit and the IV probit, there appears to be a common set of factors affecting tender and grant receipt, conditional on having applied/bid. (Note that the magnitudes of the estimates in Table 3 cannot be compared across columns due to different scaling used in the separate models; however, the signs, significance, and relative magnitude *within* columns can be compared.) Based on calculations of the marginal effects from the IV probit regression, property owners' with over 10 years of tenure on their land are approximately 19% less likely to succeed in their applications or bids. Landowners' with larger parcels tend to be more successful, with those commanding parcels over 450 ha in area 16% more likely to succeed in their applications than those with parcels under 50 ha. Having livestock enterprises on the property appears to be associated with an 18% loss in the likelihood of succeeding in grant application or tender bid. Unsurprisingly, submitting more applications or bids increases one's chance of success. Submitting a second application or bid is tied to a 17% increase in the cumulative probability of any success.

Table 3. Factors affecting receipt of tenders and grants (probit and IV probit).

	Tender/grant awarded	
Variables	Probit	IV Probit
Number of bids/applications submitted	1.228***	0.607*
	(0.351)	(0.354)
Neighbour volunteerism	-0.398	1.676***
	(0.271)	(0.363)
Male	0.659**	0.314
	(0.314)	(0.259)
Age (years)	0.00808	-0.00147
	(0.0126)	(0.0100)
Owned farm for over 10 years	-1.138*	-0.778*
	(0.621)	(0.439)
Family farm	-0.0643	0.144
	(0.295)	(0.204)
Primary	-0.303	-0.240
	(0.486)	(0.341)
Parcel size		
Parcel between 50 & 450 ha	0.845**	0.387
	(0.355)	(0.287)
Parcel > 450 ha	1.075***	0.619*
	(0.417)	(0.350)
Type of enterprise		
Livestock	-1.233***	-0.790**
	(0.466)	(0.336)
Cultivation	0.128	-0.117
	(0.360)	(0.240)
Correlation between first and second stage errors		-0.88**
		(0.12)
Log-likelihood	-382	#
Observations	148	148

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Region-level fixed-effects include in regression but not shown. # Likelihood not comparable to single equation probit because of joint estmation. Sampling weights applied in estimation.

The obvious difference between the two models in Table 3 is the change in significance and sign of the volunteer variable, which becomes positive and highly significant in the IV regression. In concert with this result, the estimated correlation between the first and second stage error terms is highly negative. The interpretation of this result, which would require further data to confirm, is that volunteering enhances one's chances (by 43%) of being awarded a grant or tendered contract following submission. At the same time, based on the highly negative estimated correlation between the error terms (which suggests that endogeneity is indeed a relevant concern, assuming the instrument is valid), the results suggest that there is some unobserved process which positively affects the chances of being awarded a contract or grant, but also is tied to less volunteer activity. Such a process could emerge from landowner time constraints, for example, where there may be a tradeoff in investing time with volunteer groups or engaging in conservation activity on one's own property.

3.3 The effects of conservation programmes on own-property conservation effort

1. Next, we examine whether we can assess any type of programme impact using these data, in terms of increased conservation. The basic regression of interest is again a probit equation, this time of the following form:

$$C_i^* = \boldsymbol{\beta_X^C X_i} + \beta_V^C V_i \ + \beta_{TGs}^C TGs_i + \beta_{V\times TGs}^C V_i \ \times TGs_i + \sum_k \rho_k^C r_i^k \ + \epsilon_i \qquad (4)$$

The latent variable C_i^* represents conservation effort and corresponds now to an ordinal variable with three levels (paraphrasing: "lots of conservation effort," "some," and "none"). Consequently, we apply an ordered probit regression model. Of principle interest in this equation are the estimated effects of the volunteer and MBI programmes, captured in the estimates of β_{TGs}^C, β_V^C, and $\beta_{V\times TGs}^C$. Naïve estimates of equation (4), obtained from a simple ordered probit regression model, are shown in **Table 4**.

Obviously, given the debate in the literature regarding the 'additionality' of conservation tenders (and positive conservation incentives in general, including grants), endogeneity is highly likely here. Conservation group volunteers may engage in more own-property conservation efforts simply because that's 'who they are,' not because volunteering *causes* any increase in own-property conservation effort. Similar considerations may lead us to suspect endogeneity between conservation effort and the success of a landowner's tender bid or grant application. Those submitting successful bids (e.g. lots of conservation at low cost to the government) may be pre-disposed to engaging in such work. An additional concern is sample selection with respect to *applying* for support from grants/tenders. Applicants may exert more (or less) own-property conservation effort than non-applicants.

To address these concerns, we run an additional ordered probit model, presented in the last column of Table 4, which contains a combined IV and selection first-stage. The IV and selection equations correspond to equations (1) and (3) above, with the only exceptions being that the IV equations (for volunteering and for grant/tender *success*) are linear for this model (rather than probits) and the tenders and grant receipt equation in (3) are aggregated together (which forms the selection equation). Using linear IV equations facilitates model convergence and is still consistent. The selection equation, as per the Heckman model, retains its probit specification.

Aside from the estimated program effects, the signs and significance of the estimates are similar across both models (again, scale differences prevent a comparison of the absolute magnitudes). The only factors which stand out as having any relation to levels of own-property conservation effort are the gender dummy, and whether the property supports some type of cultivation enterprise. Male respondents express less conservation effort, and the presence of a cultivation enterprise is associated with more conservation effort.

The most striking difference between the two models pertains to the program effects. The naïve regression mirrors the trend shown in Figure 2. Volunteer activity and participation and award receipt in tender or grant programmes are all associated with increasing levels of own-property conservation effort, with the greatest "impact" seen among landholders who both volunteer and are recipients of a grant or tender. In contrast, the model accounting for endogeneity and sample selection only identifies statistically significant effects of tenders and grants on landowners who are not involved with any volunteer programmes.

One possible interpretation of this result is that positive incentive schemes for conservation achieve additionality only when they reach those otherwise uninvolved with conservation programmes, and the extent to which they involve existing volunteers represents 'deadweight' at least in terms of the direct impact of the programme. Of course, the findings from this regression are merely suggestive of such an explanation, and much richer data (including observations before and after programme introduction) would be needed to better identify programme impact.

Table 4. Programme impact on levels of stated own-property conservation effort (ordered probit, with combined IV and selection first-stage)

Variables	Ordered probit	Ordered probit with Heckman selection & IV first stage
Programme participation		
Volunteer only	0.438	-0.162
	(0.345)	(1.123)
Tender/grant award only	0.299	1.590***
	(0.388)	(0.439)
Tender/grant award & volunteer	1.265***	1.685
	(0.365)	(1.310)
Male	-0.917***	-0.846***
	(0.264)	(0.326)
Age (years)	0.0125	0.0148
	(0.0126)	(0.0111)
Owned farm for over 10 years	-0.482	0.202
	(0.496)	(0.358)
Family farm	0.190	0.128
	(0.297)	(0.296)
Primary	-0.0272	0.0940
	(0.503)	(0.486)
Parcel size		
Parcel between 50 & 450 ha	0.550*	0.205
	(0.306)	(0.280)
Parcel > 450 ha	-0.00371	-0.313
	(0.395)	(0.390)
Type of enterprise		
Livestock	0.249	0.391
	(0.468)	(0.379)
Cultivation	0.857**	0.607*
	(0.384)	(0.360)
Log-likelihood	-787	#
Total observations in regression	148	266
Censored observations	148	148

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Region-level fixed-effects include in regression but not shown. # Likelihood not comparable to single equation ordered probit because of joint estmation. Sampling weights applied in estimation.

3.4 Testing for evidence of moral-crowding-out

The last question analysed concerns the MCO hypothesis. Given the nature of the data, the testable aspect of this hypothesis is whether landowners' motivations for engaging in own-property conservation work are affected by exposure to different types of conservation programmes, in particular incentive-based instruments such as grants or tenders. The regression of interest is a seemingly unrelated ordered probit regression equation system:

$$Nature_i^* = \boldsymbol{\beta_X^N X_i} + \beta_V^N V_i \quad + \beta_{TGs}^N TGs_i + \beta_{V\times TGs}^N V_i \quad \times TGs_i + \beta_A^{TGs} A_i^{TG} + \sum_k \rho_k^N r_i^k \; + \epsilon_i$$

$$Money_i^* = \boldsymbol{\beta_X^M X_i} + \beta_V^M V_i \quad + \beta_{TGs}^M TGs_i + \beta_{V\times TGs}^M V_i \quad \times TGs_i + \beta_A^{TGs} A_i^{TG} + \sum_k \rho_k^M r_i^k \; + \nu_i \qquad (5)$$

The latent variables $Nature_i^*$ and $Money_i^*$ reflects how much landowner i is motivated by "nature conservation values" and the "availability of funding to undertake the work" , respectively, in own-property conservation efforts. The observed counterparts are two ordinal, three-point Likert variables designating "nature" and "money" as either a major or minor motivator, or not a motivator at all. As before, the regression error terms (ϵ_i, ν_i) are distributed via a bivariate normal distribution, permitting cross-equation correlation. The hypothesis that MBIs skew motivations towards monetary concerns equates here to the statistical hypothesis that β_{TGs}^M and $\beta_{V\times TGs}^M$ are positive, whereas β_{TGs}^N and $\beta_{V\times TGs}^N$ are hypothesized to be negative or zero. Receipt of grants or tenders enhances financial motivations for doing conservation work, and diminishes motivations related to landowners' intrinsic nature conservation values.

As with the above regression analysis of stated conservation effort, there is potential for endogeneity between the dependent variables (stated motivations in terms of nature values and monetary incentives) and the main explanatory variable of interest (receipt of a grants or tendered contracts). The most obvious sources of such endogeneity involve three types of reverse causality. First, more altruistic (or conservation-oriented) landowners may be more (or less) likely to submit grant applications or bids in conservation tenders. There is some evidence that such an effect exists given the regression results in Table 2, in which those volunteering in land conservation groups are significantly more likely to submit bids in conservation tenders. This is a potential source of positive feedback, in that naïve estimates not accounting for this source of endogeneity would in theory be biased upward. On the other hand, landowners motivated primarily by money may be particularly determined to win a conservation grant or tendered contract, which could be a source of downward bias in the estimates. Second, such landowners may also submit more favourable grants applications or bids in tenders, by offering more work for less cost to the government, and thus be more likely to have their applications or bids accepted. This type of endogeneity clearly implies a negative feedback which would be a source of downward bias on the estimates. Those with more *a priori* altruistic motivations might be more likely to succeed in their applications or bids.

Obviously, as previously stated, the best solution for dealing with this endogeneity is via panel data (observing stated motivations for the same landowner before and after programme exposure). Nevertheless, these endogeneity concerns can be addressed to some extent with the present data, by restricting the estimation sample to those landowners who have applied for monetary support for the conservation efforts, via either grants or tenders. That is, we examine whether funding awards affects landowners' conservation motivations only among those who have applied for such funding. It is important to note that no sample selection problem exists in this case if we are content in identifying conditional effects, rather than mean effects within the population. In addition, to control for the possibility that money-oriented landowners 'try harder' to win a grant or tender, we include the number of submitted applications or bids (A_i^{TG}) as an explanatory variable.

Table 5. Determinants of motivations for own-property conservation efforts (seemingly unrelated ordered probit).

Variables	Own-property conservation work motivated by:	
	Nature conservation values	*Availability of funding to undertake work*
Programme participation		
Volunteer only	0.802**	0.502
	(0.368)	(0.323)
Tender/grant award only	-0.0929	1.039***
	(0.499)	(0.395)
Tender/grant award & volunteer	0.414	1.105***
	(0.422)	(0.339)
Num. of applications/bids submitted	0.161*	-0.0195
	(0.0941)	(0.0737)
Male	-0.557**	-0.150
	(0.283)	(0.239)
Age (years)	0.0166	-0.0160
	(0.0128)	(0.0108)
Owned farm for over 10 years	-0.0968	-0.322
	(0.440)	(0.369)
Family farm	-0.251	0.00191
	(0.339)	(0.280)
Primary		
	-0.971*	-0.187
Parcel size	(0.522)	(0.302)
Parcel between 50 & 450 ha	-0.726*	0.162
	(0.428)	(0.293)
Parcel > 450 ha	-0.630	0.742*
	(0.506)	(0.406)
Type of enterprise		
Livestock	-0.306	-0.0200
	(0.427)	(0.314)
Cultivation	0.262	-0.171
	(0.375)	(0.291)
Cross-equation correlation of regression errors	0.195	
	(0.151)	
Log-likelihood	-1909	
Observations	144	

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Region-level fixed-effects include in regression but not shown. Sampling weights applied in estimation. Restricted to subsample of landowners stating that they had applied for a conservation grant or bid in a conservation tender. Estimation restricted to landowners having applied for a conservation grant or tender.

The remaining source of bias (altruistic landowners being more likely to succeed in their applications) is downward. Estimates from standard regressions can therefore be interpreted as conservative, but

nonetheless qualitatively valid in the presence of a positive, statistically significant effect of funding awards on increasing money-related motivations. Additionally, to control for respondents' altruism (which likely affects the likelihood of success in applications or bids), we also include the volunteerism variable V_i in the regression. Here, this variable proxies for landowners' altruism, rather than being used to measure the impacts of programme exposure (as in equation 4). Thus no instrumental variables are required here, in contrast to the equation (4) regressions.

The regression estimates imply that receipt of a conservation grant or tendered contract inclines landowners towards financial motivations. This finding applies equally to non-volunteers and volunteers in local conservation groups. Evidence that MBIs erode nature conservation values, however, is less conclusive, and seems to have only a second order effect in terms of dampening volunteers' intrinsic motivations. While volunteers in conservation groups are a priori more motivated by their nature conservation values compared to non-volunteers (unsurprisingly), this motivation appears to be at least partially eroded by the award of a conservation grant or tendered contract.

DISCUSSION

Based on the econometric analysis above, the factors determining tender bidding and volunteer behaviour appear much more uncertain than those determining decisions to apply for conservation grants, the latter being closely related to parcel characteristics such as the land, being a family farm and the presence of livestock enterprises. In addition, landowners who express a greater sense of resource constraints (in terms of time, labour, money) with respect to conservation activities are more likely to apply conservation grants.

Without making a statement about causality, volunteers are 17% more likely to bid for conservation tenders than non-volunteers, but there is no difference in the application rates for conservation grants between these two groups. Conversely, those bidding in tenders are 9% more likely to volunteer than non-bidders.

There is some evidence of peer or neighbourhood effects on landowners' volunteer activity in local conservation groups. Landowners' are more likely to volunteer with local conservation groups if their neighbours are similarly active.

Conditional on having applied for grants or tenders, volunteering increases the likelihood of being awarded conservation grants or tendered contracts. This is a causal statement, in that we control for endogeneity, which appears to be a relevant concern in this case.

There is a strong correlation between stated levels of own-property conservation effort and activity in local volunteer groups, as well as having received a conservation grant or tender. However, this does not address the additionality question, because landowners already engaged in such efforts may be more likely to be awarded grants or tenders. This presents an endogeneity problem. While panel data are ultimately necessary to answer this question definitively, instrumental variables methods are applied here to provide an exploratory analysis of the question. The analysis provides some evidence that grants and tenders my achieve 'additionality' (conservation effort beyond the status quo) only when they reach those otherwise uninvolved with conservation programmes, in particular those not volunteering. The extent to which they involve existing volunteers thus represents 'deadweight,' at least in terms of the direct impact of the programme.

There is fairly strong evidence in the data for the potential for moral-crowding-out: Tender or grant receipt appears to shift stated motivations towards more monetary concerns. But the practical implications of this finding (in terms of eroding voluntary conservation efforts on the ground) remain unknown.

A number of caveats in this analysis are warranted. First, this paper is only able to present analysis with stated levels of own-property conservation effort, whereas it would be preferable to have data on landowners' actual conservation actions. Nevertheless, the analysis here provides a unique -- if if exploratory – perspective on the impact of incentive-based conservation programmes and how these programmes can interact with volunteer-based initiatives. Related to this point is the use of neighbours' participation in conservation programmes as a factor explaining landowners' own participation. Manski (1993) highlights this so-called 'reflection problem' in inferring causality in behavioural spill-overs between different nodes in social networks. In the present application, however, we make the assumption that one's own participation in conservation programme only incrementally nudges on the overall neighbourhood's propensity to participate, that the bulk of the influence flows from the neighbourhood to the individual, and thus that neighbourhood participation can safely be used as an instrument for preliminary causal analysis.

Clearly, many questions remain about the impacts of conservation programs using positive financial incentives directed at private landowners. Much more insight could be gained in this regard through a closer examination of DEPI's bid assessment protocols, perhaps linking the survey data analysed here to bid records, and to GIS data on parcel characteristics or the biophysical characteristics of the local catchment.

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