

# Do financial incentives motivate conservation on private land?

MAI YASUÉ and JAMES B. KIRKPATRICK

**Abstract** Financial incentives may aid in conservation if they broaden the numbers and types of landowners who engage in protection and conservation management on private land. We examined the hypotheses that financial incentives (1) encourage participation of people with lower autonomous motivation towards conservation and lower self-transcendence (i.e. benevolence and universalism) values compared to participants in similar programmes without such incentives; (2) enable more on-ground works and activities; and (3) enhance feelings of competence and autonomy with respect to conservation actions. We surveyed 193 landowners in private land conservation programmes in Tasmania, only some of whom had received financial incentives. All of these landowners had high self-transcendence values, and autonomous motivation towards the environment. Owners of large properties and participants with higher self-enhancement values, lower self-transcendence values and lower autonomous motivation towards the environment were slightly more likely to engage in incentive programmes. However, people who received funding did not report more conservation actions than people in programmes without incentives. Owners of larger properties receiving incentives reported fewer conservation actions. Thus financial incentives probably recruited a few into nature conservation who may not have otherwise engaged, but did not result in a more intensive level of conservation management. Our results caution against the blanket-use of incentives amongst landowners who may already have values and motivations consistent with environmental action, and point to the need for further research on the socio-psychological characteristics of landowners, to examine the contextual factors that influence the effects of conservation payments.

**Keywords** Agri-environment, conservation psychology, covenant, financial incentive, payments for ecosystem services, portrait values questionnaire, Tasmania

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## Introduction

Since the 1970s there has been growth in private landowner conservation schemes that aim to improve biodiversity and promote sustainable management on private land (Kleijn & Sutherland, 2003; Thompson et al., 2011; Wunder, 2013). The ecological impacts (Fitzsimons & Wescott, 2001; Kleijn & Sutherland, 2003; Hardy et al., 2016), economic efficiency (Dobbs & Pretty, 2008; Iftekhar et al., 2014), community perceptions and motivations for participation (Moon & Cocklin, 2011; Selinske et al., 2015) have been addressed. However, questions remain about how and in what context financial incentives, which are provided within some of these programmes, enhance conservation outcomes (Borner et al., 2017).

The rationale for financial incentives is to increase motivation (Wilson & Hart, 2000; Blackmore & Doole, 2013) and enhance participation rates among people who are not already autonomously motivated to engage in conservation (Sorice et al., 2013; Shaw & Miller, 2016) or who cannot cover the direct or opportunity costs of conservation (Ernst & Wallace, 2008). However, because participants often self-select into incentive programmes (Ferraro & Pattanayak, 2006), some participants who receive incentives may already engage in conservation management practices (Borner et al., 2017), reducing cost-effectiveness (Ferraro & Kiss, 2002; Borner et al., 2017).

Although randomized-control trials are the ideal method to assess the impacts of payments (Agrawal et al., 2015; Chervier et al., 2017), such experiments may not be ethically or logistically feasible (Butsic et al., 2017). One approach to understanding the effectiveness of incentives is to use a quasi-experimental approach (Ferraro & Pattanayak, 2006; Butsic et al., 2017) to examine the socio-psychological characteristics and management practices of people in incentive schemes and compare them to demographically similar conservationists who have not received financial support. Because values and motivations influence the tendency to undertake voluntary pro-environmental behaviours (de Groot & Steg, 2009; Agrawal et al., 2015; Cooke et al., 2016), we hypothesized that, if incentives are effective in broadening the pool of participants, then people in paid programmes may have values and motivations that are less consistent with conservation than people enrolled in non-incentive programmes.

Much of the research on values, motivations and pro-environmental behaviours (Pelletier et al., 1998; Schultz & Zelezny, 1999; de Groot & Steg, 2010; Sheldon et al., 2011; Evans et al., 2013; Cooke et al., 2016) draws on two major theories from cross-cultural and social psychology: the Theory of Basic Human Values (Schwartz, 2007; Schwartz et al., 2012, 2017) and Self-Determination Theory (Ryan & Deci, 2000, 2017). Questionnaires developed in these theoretical contexts have been empirically tested, validated, translated, and adapted to address applied problems in health, education, work environments and parenting (Williams et al., 1997; Deci et al., 2001a, b; Kasser, 2002). More recently, they have been applied to conservation (Hicks et al., 2015; Cetas & Yasué, 2016; Ramsdell et al., 2016). Research using validated instruments is important because it can help generate data on the socio-psychological characteristics of conservationists that can be used in later analyses. At present, much of the research on values, motivations and pro-environmental behaviour using validated instruments has been conducted predominately with psychology undergraduate students (Pelletier et al., 1998; Schultz & Zelezny, 1999; de Groot & Steg, 2010; Sheldon et al., 2011) rather than conservationists.

Values are trans-situational guiding principles that help people make behavioural decisions (Manfredo et al., 2017). The Theory of Basic Human Values (Schwartz, 2003; Schwartz et al., 2017) suggests that there are 10 human values that construct four higher-order values (self-enhancement,

self-transcendence, openness to change, and conservation; Table 1) that exist in at least 67 countries and 21 languages. To avoid confusion, 'conservation' is referred to as 'conservatism' here. The four higher-order values are structured so that values more similar to each other are closer together on a circumplex. Self-enhancement and self-transcendence are on opposite sides of the circumplex, as are openness to change and conservatism (Schwartz, 2003). People with more self-enhancement values may be less likely to engage in pro-environmental behaviour than people with more self-transcendence values (de Groot & Steg, 2010; Sheldon et al., 2011; Corner et al., 2014).

Self-Determination Theory differentiates between autonomous and controlled motivation (Ryan & Deci, 2002, 2017). Autonomous motivation includes intrinsic motivation (e.g. 'I plant trees because it is enjoyable to plant trees') as well as forms of extrinsic motivation that are consistent with personal beliefs and values (e.g. 'I plant trees because I am an environmentalist'). Non-autonomous motivation consists of extrinsic forms of motivation that are not fully personally endorsed, such as guilt, shame, reward attainment or punishment avoidance (e.g. 'I plant trees only so that I get paid'). Autonomous forms of motivation are correlated with creativity (Ryan & Deci, 2000), increased engagement (Taylor et al., 2014), persistence in carrying out a difficult task (Dweck, 2006), willingness to evince difficult pro-environmental behaviours (Cooke et al., 2016), conservation programme satisfaction (Sorice et al., 2013;

TABLE 1 Items used to measure values. The instructions indicated 'Here we briefly describe some people. Please read each description and think about how much each person is or is not like you.' People responded either 1, 'Not like me at all'; 2, 'Not like me'; 3, 'A little like me'; 4, 'Somewhat like me'; 5, 'Like me', or 6, 'Very much like me', to each of the items.

Broader constructs	Values	Item
Self-transcendence	Universalism-tolerance	It is important to her to listen to people who are different from her.
	Universalism-nature	She strongly believes that she should care for nature.
	Universalism-concern	She thinks it is important that every person in the world have equal opportunities in life.
Openness to change	Benevolence-dependability	It is important to her to be loyal to those who are close to her.
	Benevolence-caring	Caring for the well-being of people she is close to is important to her.
	Self-direction-thought	Learning things for herself & improving her abilities is important to her.
	Self-direction-action	Freedom to choose what she does is important to her.
Self-enhancement	Stimulation	Excitement in life is important to her.
	Hedonism*	Enjoying life's pleasures is important to her.
	Achievement	She wants people to admire her achievements.
	Power-dominance	She wants people to do what she says.
Conservatism	Power-resources	Being wealthy is important to her.
	Face*	It is important to her that no one should ever shame her.
	Security-personal	Her personal security is extremely important to her.
	Security-societal	Having order & stability in society is important to her.
	Tradition	It is important to her to maintain traditional values or beliefs.
	Conformity-rules	Obeying all laws is important to her.
	Conformity-interpersonal	Her personal security is extremely important to her.
	Humility*	It is important to her to be humble.

\*Although we have placed these items into one of the four broader constructs, the multi-dimensional-scaling plots place them in between two broader constructs. These items were taken from Schwartz et al. (2012).

Price & Leviston, 2014; Ramsdell et al., 2016) and better social and ecological outcomes for conservation projects (Cetas & Yasué, 2016). Past research on the social contexts that can foster autonomous motivation (Black & Deci, 2000; Baard et al., 2004; DeCaro & Stokes, 2008) suggests that programmes help fulfil the basic psychological needs of autonomy, competence and relatedness (Chen et al., 2015) by providing meaningful choices, conveying trust in the participants, fostering relationships between participants and programme implementers, and providing meaningful feedback (Cetas & Yasué, 2016; Ramsdell et al., 2016).

Research on the effects of payments and other external rewards on autonomous motivation has demonstrated variable impacts. Incentives have been shown to both crowd-in (i.e. enhance) motivation by helping to foster relationships of trust and mutual respect (Sommerville et al., 2010; Borner et al., 2017) and enhance a participant's feelings of competence or self-efficacy to carry out personally meaningful tasks (D'Adda, 2011; Rode et al., 2015). However, other studies have shown that external rewards can also crowd-out (i.e. thwart) autonomous motivation by thwarting feelings of autonomy (Deci et al., 2001a; Frey & Jegen, 2002; Burton & Paragahawewa, 2011), communicating a lack of trust between funders and participants (Gneezy & Rustichini, 2000; Reeson & Tisdell, 2008) or shifting attitudes away from more enduring self-transcendence motivations to short-term individual profit motivations (Hecken & Bastiaensen, 2010; Fisher, 2012; Agrawal et al., 2015).

Few studies (Agrawal et al., 2015; Chervier et al., 2017) have compared values, motivations or behaviours between people in programmes with and without financial incentives, to examine the impacts of financial incentives on conservation, and, as far as we know, no studies have used the previously validated instruments from the Theory of Basic Universal Values and Self-Determination Theory to examine the effectiveness of incentives in private land conservation. Here we examine the effectiveness of financial incentives for private land conservation by addressing three questions. (1) Do financial incentives help to broaden the types of landowners willing to engage in private land conservation by engaging people who have lower self-transcendence values and autonomous motivation towards the environment? (2) Do people in incentivized programmes report more engagement in greater conservation management? (3) Do people in incentivized programmes report higher feelings of autonomy and competence?

## Methods

Contexts of private land conservation programmes in Tasmania

With over 50% of land protected in conservation reserves, 843 conservation covenants, 1,541 registered participants of

strictly educational conservation schemes, and the first ever Green Party politicians (in the world, in 1972), the people of the island State of Tasmania (Australia) are known for their environmentalism (Schultz & Cica, 2013). During 1995–2010 there were several private-land conservation programmes that provided incentives to persuade landowners to covenant land or undertake stewardship activities, concurrently with several non-incentive educational programmes (Prager & Vanclay, 2010; Iftekhar et al., 2014).

The majority of our survey and interview participants were engaged in one of three broad types of conservation programmes (Supplementary Material 1): (1) covenant programmes that provided either no incentives or substantial incentives (Iftekhar et al., 2014), (2) stewardship programmes that provided small, targeted financial support for a particular management task (e.g. half the costs of planting trees), (3) educational programmes that provided only educational resources. We define non-incentive programmes as the two educational programmes and the non-incentive covenanting programme.

## Data collection

Prior to conducting this research, MY met with conservation organizations, government agencies, farming organizations, agricultural consultants and University of Tasmania academics who work in private land conservation in Tasmania. We sought support from these organizations to help recruit participants through newsletters and Facebook groups, identify a range of types of landowners to participate in interviews, and enhance the clarity of surveys and interviews. During 15 January–1 June 2017 the survey (Supplementary Material 2) was promoted by these organizations.

*Demographic and property characteristics* The first section of the survey requested information on the property (e.g. size, duration of ownership), demographics (e.g. age, gender, education) and participation in conservation programmes, to assess whether there were significant differences in these characteristics between participants of incentive or non-incentive programmes. Factors such as age, education, property size and gender may influence land management decisions and the willingness to engage in incentive programmes (Knowler & Bradshaw, 2007; Lastro-Braxo et al., 2015).

*Programme experience* The second section (Supplementary Material 2) consisted of items to measure perceptions of autonomy-support, autonomy and competence when engaging in a programme. Participants indicated how autonomy-supportive they perceived the conservation

programmes to be, on a 7-point Likert scale. These items were adapted from previously validated instruments that measured perceptions of autonomy-support from educators, supervisors and coaches. These items similarly had high reliabilities or internal consistencies (Cronbach's  $\alpha = 0.91$ ; Black & Deci, 2000; Pelletier et al., 2001; Baard et al., 2004). These measures examine the nature of the relationship between the programme participant and the programme administrator because in addition to the payments, programmes may also differ in terms of autonomy-supportive practices. The sections following the items for autonomy-supportive environments were items that assessed feelings of autonomy (Cronbach's  $\alpha = 0.73$ ) and competence ( $\alpha = 0.68$ ) when engaging in the programme activities. These two subscales were taken from the basic psychological needs at work questionnaires (Deci et al., 2001b). The items measuring autonomy and competence were used to assess whether participants in incentive programmes had higher levels of autonomy and competence than non-participants. In addition to these items from previously validated instruments, based on feedback from landowners we added 'I do not need the programme to achieve my conservation and stewardship goals'. These questions were used to assess whether participants in incentive programmes had higher levels of autonomy and competence than non-participants.

*Portrait values questionnaire* This section included 21 gender-matched items that provided verbal portraits of values (e.g. 'Being wealthy is important to her.') to measure the broader value aspirations of participants (Table 1; Schwartz et al., 2012). The reliability and validity of this instrument has been demonstrated elsewhere (Schwartz et al., 2012, 2017; McQuilkin et al., 2016). Our preliminary analyses using correlation analyses and multi-dimensional scaling analyses (with *Proxscal* in SPSS v. 24, IBM Corp, Armonk, USA) with Euclidian distance measures, were consistent with theorized structures and demonstrated broader dimensions of self-transcendence and self-enhancement on one dimension and openness to change and conservatism on the other dimension (Supplementary Material 3).

*Motivation towards the environment scale* These six items (Pelletier et al., 1998; Supplementary Material 2 & 4) measured autonomous or non-autonomous forms of motivation (Green-Demers et al., 1997). The reliability and validity has been demonstrated elsewhere (Green-Demers et al., 1997; Pelletier et al., 1998). For the sake of brevity we took one item per subscale.

*Impacts on conservation action* We asked respondents about their conservation management activities in the

previous 5 years. Based on preliminary conversations with researchers, conservation organizations and landowners, we included eight common conservation activities that were advocated by these conservation programmes (e.g. 'Fenced off area to restore native or threatened species', 'Planted native species to restore habitat for native and threatened species'). In addition, we asked 'To what extent do the programmes that you engage in influence how you manage your land?' (5-point Likert scale) as well as 'On average in the last year, how many hours a month did you spend doing activities consistent with the programme?'

### Data analysis

We centred the scores for the portrait values questionnaire and the motivations for engagement in the programmes by subtracting the mean score of all items for each individual (Schwartz, 2003). We calculated means for the items measuring autonomy-support and autonomy, self-enhancement, self-transcendence, conservatism, and openness to change, and calculated a measure of autonomous motivation and non-autonomous motivation following Green-Demers et al. (1997) and Cooke et al. (2016). In contrast to previous studies that subtracted the non-autonomous from the autonomous motivation to create a single index, we retained two variables for autonomous and controlled motivation because they were not correlated ( $R = 0.04$ ). Autonomous and controlled motivations can occur simultaneously (Cameron et al., 2001; Cerasoli et al., 2014). Because property size was positively skewed, we dichotomized the variable by splitting it at the median (7 ha). Given the small number of respondents with only a high-school degree or technical or trade school qualification, we pooled these responses and thus we had three groups based on education: secondary school, technical or trade school, graduate degree and postgraduate degree.

To determine whether there were differences in demographic characteristics, values or autonomous environmental motivation between people who participated in programmes with or without financial incentives, we used Kruskal–Wallis (continuous data) and  $\chi^2$  tests (categorical data). To examine the simultaneous effects of multiple variables, we fitted a binary logistic model. The response variable was the dichotomous variable indicating whether a participant had participated in at least one incentivized programme. Using hierarchical regression we first tested a demographic and property model (together termed 'demographic') in which we included property size, age of landowner, gender, whether they were retired or not, educational attainment, property type (commercial, lifestyle and residential) and all two-way and three-way interaction terms (for continuous variables). In the next step we added all significant variables and interactions from the

demographic/property model and the four higher order values and interaction terms. Similarly, we added autonomous motivation and controlled motivation from the motivation towards the environment scale to test whether autonomous motivation towards the environment predicted participation in an incentivized programme (de Groot & Steg, 2010). All interaction terms were examined visually by dichotomizing the variables at the median. Model saturation precluded more interaction terms. Likelihood ratio tests ( $\alpha < 0.05$ ) informed model optimization via backwards elimination (Crawley, 2007; Zuur et al., 2009), and Spearman correlations were calculated and tests for multi-collinearity conducted.

Using the same modelling procedure, we used hierarchical linear regression to examine the factors that influenced the number of conservation actions. We used ANOVAs to compare the residual sum of squares between different models. In the final step, we assessed whether the number of conservation actions depended on participation in an incentivized programme.

**Results**

The survey respondents were 50:50 female:male, and mean age was  $58 \pm SE 0.8$  years (range 30–85). The percentages of people with secondary school diplomas, technical degrees, graduate and postgraduate degrees were 10, 22, 29

and 39%, respectively. Within Tasmania only 10% of the adult population has an undergraduate degree and 2% a postgraduate degree (Australian Bureau of Statistics, 2016). Owners of larger and commercial properties were more likely to engage in programmes with financial incentives (Table 2). Commercial properties tended to be larger than non-commercial properties.

Respondents indicated high levels of autonomy (mean  $5.9 \pm SE 0.07$ ; 4 = ‘Neutral’, 5 = ‘Agree somewhat’ and 6 = ‘Mostly agree’) and competence ( $5.3 \pm SE 0.07$ ) when engaging in the programmes, as well as moderate levels of perceived autonomy-support ( $S_2 4.7 \pm SE 0.09$ ). A large number of respondents (70%) were neutral or agreed somewhat that they did not need the programme to achieve conservation or stewardship goals. There were no significant differences between those in programmes with and without incentives in autonomy-support, autonomy, competence and need for the programme to achieve conservation or stewardship goals (Table 2).

All respondents indicated high self-transcendence (universalism and benevolence), high openness to change (self-direction, hedonism and stimulation), low self-enhancement (power and achievement) and low conservatism (tradition, conformity and security; Supplementary Material 3 & 4, Table 2). The top-ranked items from the portrait values questionnaire were universalism (care for nature), benevolence (care and loyalty for people close to

TABLE 2 Comparison of demographic and property characteristics, programme experiences, values, motivations and behaviours between participants of incentive and non-incentive private land conservation programmes (values are % or mean  $\pm$  SE; test statistic is Kruskal–Wallis for continuous data and  $\chi^2$  for categorical data).

	Incentive	No incentive	Test statistic
<b>Demographic &amp; property characteristics</b>			
% female	48	55	0.4
Mean age (years)	$60 \pm 1.2$	$58 \pm 0.9$	1.6
Education (% postgraduate degree/% graduate degree/% other)	30/40/30	47/23/29	5.5
Year of possession	$1998 \pm 1.9$	$2001 \pm 1.0$	2.2
Property size (ha)	$710 \pm 415$	$53 \pm 17$	31.8**
% commercial property	41	20	5.9**
<b>Programme experiences</b> (Supplementary Material 2)			
Autonomy-supported	$4.9 \pm 0.2$	$4.6 \pm 0.1$	2.9
Autonomy	$5.8 \pm 0.16$	$6.0 \pm 0.09$	2.2
Competent	$5.3 \pm 0.12$	$5.2 \pm 0.08$	0.09
Do not need programme to achieve goals	$4.2 \pm 0.31$	$4.7 \pm 0.15$	2.2
<b>Values</b> (portrait values questionnaire; Table 1, Supplementary Material 3 & 4)			
Self-transcendence	$0.91 \pm 0.08$	$0.88 \pm 0.04$	0.1
Self-enhancement	$-1.4 \pm 0.13$	$-1.3 \pm 0.07$	0.62
Conservatism	$-0.44 \pm 0.10$	$-0.34 \pm 0.06$	0.22
Open to change	$0.50 \pm 0.08$	$0.36 \pm 0.05$	0.82
<b>Motivation towards environment</b> (Supplementary Material 2 & 4)			
Autonomous motivation	$27.9 \pm 1$	$29.1 \pm 0.6$	0.77
Controlled motivation	$10.5 \pm 0.1$	$11.1 \pm 0.5$	0.85
<b>Behaviours—management action</b>			
Number of management activities	$3.1 \pm 0.3$	$3.6 \pm 0.1$	2.8
Hours engagement/month	$19 \pm 4.6$	$31 \pm 5.6$	0.17

\*\*P < 0.01.

you) and self-direction (freedom in thinking and action; Table 1). Preliminary investigation of a correlation matrix (Supplementary Material 3) also indicated relationships between values, motivations and behaviour that were consistent with past research and theoretical predictions of Self-Determination Theory (Ryan & Deci, 2017) and the Theory of Basic Values (Schwartz et al., 2012; Baur et al., 2016).

Participants were motivated to engage in these programmes because they felt that it was consistent with their personal values. Although intrinsic motivation is also a part of autonomous motivation, it appeared that the pleasure of engagement was only moderately important. Non-autonomous motivation tended to be least important (Supplementary Material 4). There was also no evidence that the perceived influence of programmes on land management, the number of conservation actions undertaken, or the hours of engagement in the programme were higher for respondents in incentive programmes (Table 2).

When we restricted the data to only the covenants, there were still no indications of differences in values, motivations and behaviours amongst people who did or did not receive financial incentives. Further preliminary exploratory multivariate analysis (Supplementary Material 5) also suggested respondents could be divided into different types of landowners (in terms of values and motivations) but that respondents did not separate into groups based on

whether they participated in a programme with or without incentives.

Owners of larger properties, men with graduate degrees and women with secondary or technical diplomas were more likely to be in incentive programmes (Table 3, Fig. 1). None of property type (commercial, residential or lifestyle), age or retirement status had significant effects. People with higher self-enhancement and lower self-transcendence motivations were more likely to engage in paid programmes. Adding autonomous motivation and non-autonomous motivation to the model resulted in a significant reduction in deviance compared to the demographic and values model. People with higher self-enhancement, lower self-transcendence and lower autonomous motivation were more likely to be part of paid programmes. For people on small properties, higher autonomous motivation increased their likelihood of participating in incentive programmes compared to owners of small properties with less autonomous motivation. On large properties, more autonomously motivated landowners were less likely to participate in incentive programmes (Table 3, Fig. 2).

People with larger properties engaged in fewer conservation actions on their property (Table 4, Fig. 3). Furthermore, although participants in incentive programmes did not report more conservation actions, on larger properties higher autonomous motivation led to an increase in the number of conservation actions. On smaller properties, regardless of

TABLE 3 Regression coefficients ( $\pm$  SE) for each of the independent variables in a hierarchical logistic regression predicting participation in programmes with financial incentives for 162 landowners. The three progressively complex models are listed from left to right and accounted for an increasing proportion of the variability, based on the Nagelkerke  $R^2$  (Model 1 = 0.28, Model 2 = 0.33, Model 3 = 0.47). The reference category for gender is male (i.e. men are more likely to participate in incentivized programmes) and the reference category for education is people who do not have a graduate degree (i.e. people with graduate degrees are more likely to enrol in incentivized programmes than people without graduate degrees).

Model <sup>1</sup>	1. Demographic/property	2. Values	3. Motivation
Intercept	1.9 $\pm$ 0.5***	2.1 $\pm$ 0.5***	10.2 $\pm$ 3**
Gender	1.9 $\pm$ 0.8*	1.7 $\pm$ 0.8*	1.8 $\pm$ 0.9
Education (graduate)	1.5 $\pm$ 0.7*	1.6 $\pm$ 0.8*	1.8 $\pm$ 0.8*
Education (post-graduate)	-0.1 $\pm$ 0.9	-0.3 $\pm$ 0.9	-0.3 $\pm$ 1.0
Gender $\times$ Education (graduate)	-3.3 $\pm$ 1.1**	-3.7 $\pm$ 1.2**	-3.5 $\pm$ 1.3**
Gender $\times$ Education (post-graduate)	-1.0 $\pm$ 1.0	-0.8 $\pm$ 1.1	-1.0 $\pm$ 1.3
SEV		0.9 $\pm$ 0.5	8.8 $\pm$ 3.5*
STV		-1.1 $\pm$ 0.9	-16.3 $\pm$ 6.1**
SEV $\times$ STV		-1.2 $\pm$ 0.6*	-11.85 $\pm$ 3.8**
AM			0.2 $\pm$ 0.2
NAM			-0.3 $\pm$ 0.1*
Property size $\times$ AM			-0.3 $\pm$ 0.10**
SEV			-0.2 $\pm$ 0.07*
STV $\times$ AM			0.4 $\pm$ 0.2*
SEV $\times$ AM			-0.2 $\pm$ 0.1
STV $\times$ SEV $\times$ AM			0.3 $\pm$ 0.1*
$\Delta$ deviance/ $\chi^2$	33/32.7***	7/7.1	20/20.0**

<sup>1</sup>SEV, self-enhancement values; STV, self-transcendence values; AM, autonomous motivations; NAM, non-autonomous motivations. SEV and STV were taken from the portrait values questionnaire and AM and NAM were based on the motivation towards the environment scale.

\*P < 0.05, \*\*P < 0.01, \*\*\*P < 0.001.

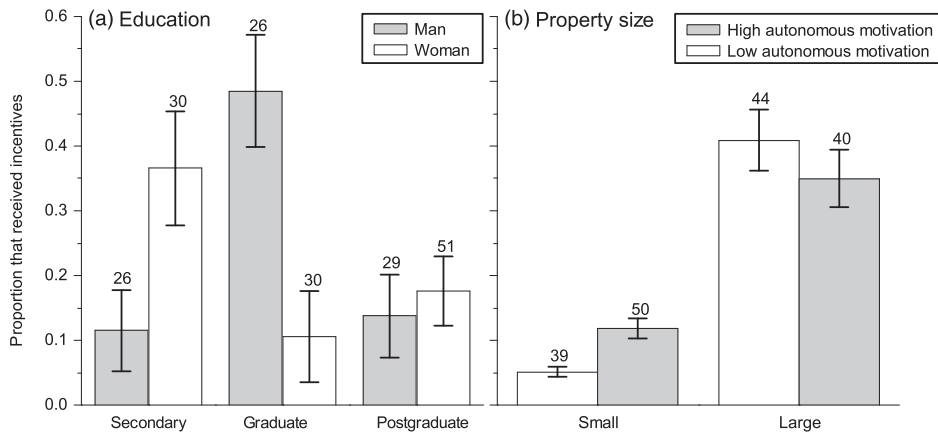


FIG. 1 The proportion (with binomial errors) of landowners who participated in a programme with financial incentives, by (a) education (secondary education includes landowners who also attended technical college programmes) and (b) property characteristics (median values were used to dichotomize property size). Numbers above bars indicate sample size.

the level of autonomous motivation, landowners engaged in a larger number of conservation actions.

## Discussion

Incentives marginally added to the types of landowners engaging in conservation on private land but did not appear to lead to increased conservation action, or to changes in feelings of autonomy or competence with respect to conservation. In addition to enhancing participation of owners of larger properties, there were also some indications that people with lower self-transcendence values, higher self-enhancement values and lower autonomous motivation towards the environment were more likely to engage in incentive programmes. As property size did not influence values or motivations, incentives may have helped to encourage participation of owners of larger properties who may have higher costs in implementing conservation action.

The differences in values and autonomous motivation between participants of the two types of programmes were small. Participants had values and motivations that are consistent with other types of pro-environmental behaviour (Pelletier et al., 1998; Schultz & Zelezny, 1999; de Groot & Steg, 2010; Sheldon et al., 2011). High self-transcendence values have been observed in other studies (Baur et al., 2016; McQuilkin et al., 2016; Schwartz et al., 2017), especially in older (c.f. Robinson, 2013) and well-educated populations (Sheldon, 2005).

Our results indicated that autonomous motivation was particularly important in promoting conservation action on large properties. In contrast, participation of owners of large properties in an incentive programme did not influence conservation action. These results are consistent with the generalization that autonomous motivation is associated with more challenging and enduring pro-environmental behaviours (de Groot & Steg, 2009; Burton & Paragahawewa, 2011; Agrawal et al., 2015; Cooke et al., 2016). The design of resilient conservation interventions that lead to action on the ground requires that

programmes not only persuade otherwise uninvolved landowners to participate (DeCaro & Stokes, 2008; Burton & Paragahawewa, 2011; Greiner & Gregg, 2011), but also promote autonomous motivation (Greiner & Gregg, 2011; Borner et al., 2017). Increased autonomous motivation may result from promoting moral reasons for programme participation; an emphasis on communal benefits (rather than private benefits); the fostering of social capital between programme participants, or between programme participants and programme officers through face-to-face engagement; and the creation of opportunities for greater self-determination and self-efficacy through the provision of comprehensive and meaningful information exchange and feedback between participants (Curtis & Lockwood, 2000; Reeve, 2006; Crompton & Kasser, 2010; Bowles & Polania-Reyes, 2012; Agrawal et al., 2015; Selinske et al., 2015). Given that autonomous motivation had marginally positive effects on owners of small properties, unlike incentives, these types of approaches are likely to have positive impacts for owners of both small and large properties. Although we only had small sample sizes for owners of smaller properties who received incentives, our results indicate that incentives for this group may have led to a positive impact on conservation action.

## Limitations

As with all surveys, except compulsory censuses, there may be participation bias, making relational analyses more valuable than normative statements. In comparison to previous surveys that had higher response rates (Morrison & Lockwood, 2014), the participants may have been that subsection of the population who are particularly autonomously motivated to engage in conservation (and even fill out a survey on conservation). Moreover, within Tasmania, as a result of the extensive history of environmentalism, it is likely that environmental values and a stewardship ethic are more socially accepted than elsewhere. Thus the results of

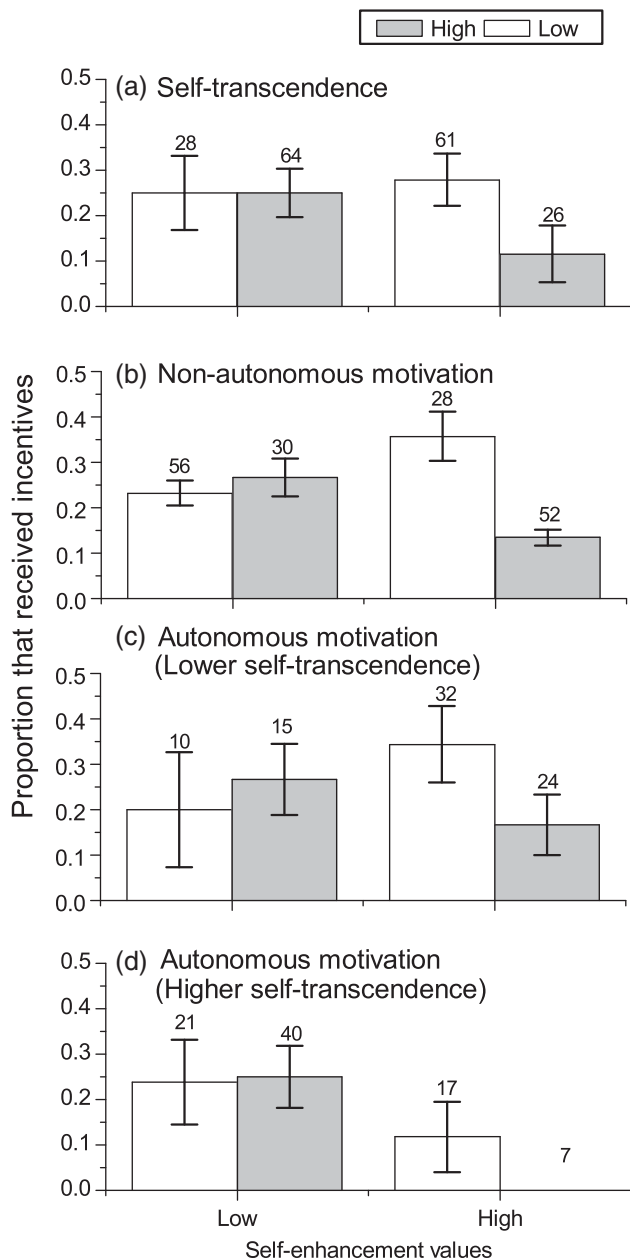


FIG. 2 The proportion (with binomial errors) of landowners who received financial incentives, by self-enhancement values and (a) self-transcendence values, (b) non-autonomous motivation, (c) autonomous motivation among people with lower self-transcendence values, and (d) autonomous motivation among people with higher self-transcendence values. Median values were used to dichotomize continuous variables. Numbers above bars indicate sample size.

this study cannot be extrapolated to other regions without investigation of prevailing values and motivations.

We focused on three potential benefits of incentives (enhanced pool of participants, increased conservation action, and enhanced feelings of competence and autonomy). However, there could be other important reasons for providing financial benefits. For example, payments

may be a subsidy to retain or support family farms that support more conservation action, they may be an opportunity to begin building relationships between landowners for future conservation projects or they may simply help to shift landowners' perspectives about conservation or conservationists (Rode et al., 2015; Ramsdell et al., 2016). These are all outcomes that were not measured in our study.

We have also assumed that any differences in values and motivations between those who participated in programmes with or without incentives reflect preferences for types of programmes. There could be other differences between programmes, such as experiences with individual stewardship officers, that could lead to different types of people participating (Moon & Cocklin, 2011; Selinske et al., 2015). Despite these differences, given the significant costs of incentive schemes in comparison to the overall budgets of private land conservation programmes, it is reasonable to expect differences in conservation actions and feelings of competence between programmes with and without incentives (Armsworth et al., 2012; Iftekhar et al., 2014).

One important source of variation in our data that was not accounted for in our survey was the presence of threatened species or ecosystems on properties. For participation in several of the paid covenant and stewardship programmes, landowners needed to demonstrate the presence of threatened ecosystems or species. Thus, irrespective of the values and attitudes of the landowners, requirements of the funding agency may lead to differential levels of economic support for particular properties and therefore reduce the differences in property or landowner characteristics between incentive or non-incentive programmes.

The significance of several interaction terms and the large number of variables that appear to have significant (but small) effects, indicate that the impacts of financial incentives on conservation are highly context-dependent and influenced by a wider range of factors than we have been able to investigate in this quantitative analysis. To gain a finer-grained and more nuanced perspective on the psychological impacts of incentives and how payments, as well as other programme features such as extension officers and educational opportunities, can enhance or thwart autonomous motivation for the environment and conservation action, we suggest further studies using in-depth interviews.

## Conclusion

Each year billions of dollars are spent on various forms of payments for ecosystem services (Armsworth et al., 2012). Effective use of conservation funds requires that financial incentives not only increase programme participation, but actually lead to changes on the ground (Kleijn & Sutherland, 2003; Morris, 2004). Although financial



TABLE 4 Regression coefficients ( $\pm$  SE) for hierarchical linear regressions predicting the number of conservation actions by 162 landowners. The four progressively complex models are listed from left to right and accounted for an increasing proportion of the variability (Model 1 = 0.07, Model 2 = 0.11, Model 3 = 0.17, Model 4 = 0.21).

Model <sup>1</sup>	1. Demographic/property	2. Values	3. Motivation	4. Incentive
Property size	$-0.8 \pm 0.3^{***}$	$-3.5 \pm 0.5^{***}$	$-3.8 \pm 1.2^{**}$	$-3.7 \pm 1.2^{**}$
STV		$-0.8 \pm 0.4^*$	$-1.0 \pm 0.3^{**}$	$-1.0 \pm 0.3^{**}$
Openness		$-1.1 \pm 0.5^*$	$-1.1 \pm 0.5^*$	$-1.0 \pm 0.5^*$
STV $\times$ Openness		$0.9 \pm 0.5^*$	$0.9 \pm 0.5$	$0.8 \pm 0.5$
AM			$-0.1 \pm 0.06$	$-0.1 \pm 0.06^*$
Property size $\times$ AM			$0.1 \pm 0.04^*$	$0.1 \pm 0.04^{**}$
Incentive				$3.4 \pm 1.4^*$
Property size $\times$ Incentive				$-1.9 \pm 0.8^*$
$\Delta$ Residual Sum of Squares/ $\chi^2$	23/9.9**	17/2.4	20/4.8**	13/3.1*

<sup>1</sup>STV, self-transcendence values; AM, autonomous motivations.

\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

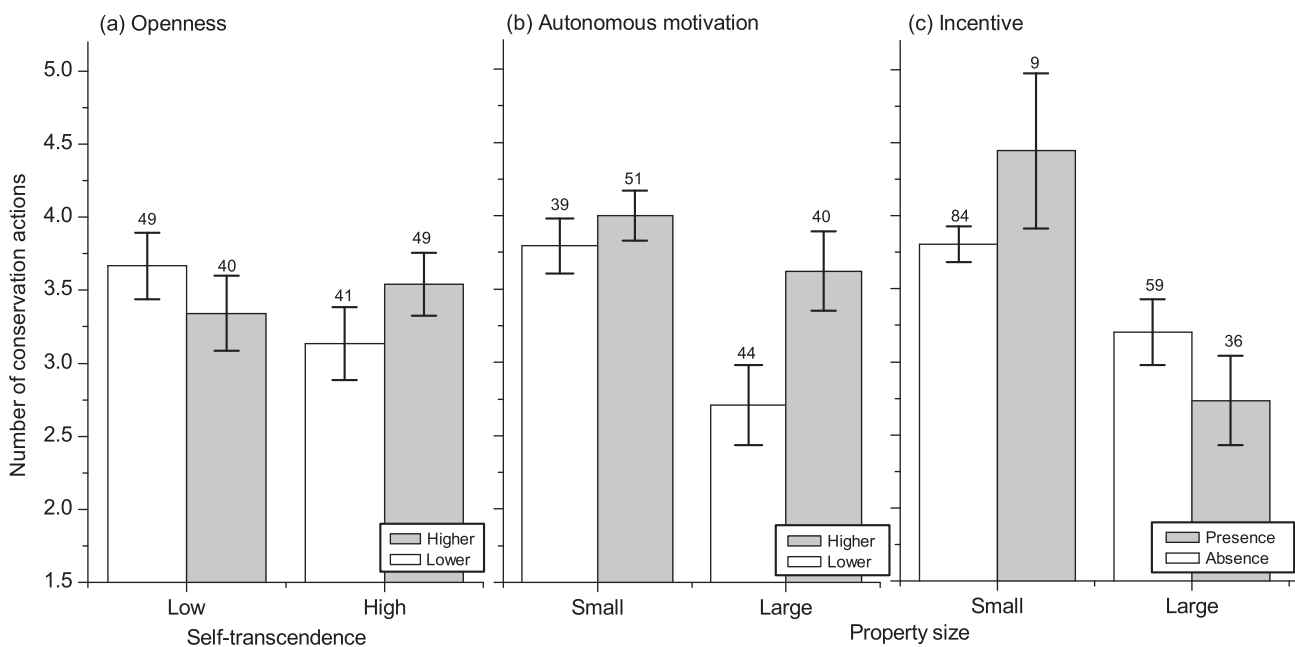


FIG. 3 The number of conservation actions (with standard errors) implemented by landowners, by (a) their openness to change and self-transcendence, and by (b) autonomous motivation and (c) the presence or absence of incentive and property size. All significant interaction terms from the model are shown. Numbers above bars indicate sample size.

incentives may, in certain contexts, efficiently use conservation funds and enhance autonomous motivation (Ferraro & Kiss, 2002; Rode et al., 2015), the blanket-use of financial incentives for conservation needs to be approached cautiously, especially if participants may already be autonomously motivated to engage in conservation. Understanding longer-term impacts of these programmes requires socio-psychological investigation (DeCaro & Stokes, 2008) because it is human values and motivations that mediate the relationship between incentives and conservation outcomes.

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