



Landowner participation in forest conservation programs: A revealed approach using register, spatial and contract data



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ABSTRACT

Incentive based voluntary conservation programs have gained prominence as a regulation mechanism to protect ecosystem services on private land either through the set-aside of land for reserves or by altering land management practices. A crucial challenge for voluntary approaches is however to ensure private landowner involvement and get the ecosystem services delivered where they are most demanded by society. To promote participation and ensure an instrumental design of voluntary initiatives that is coherent with this, there is a need to understand the motivations of the landowners and determinants of their participation choice. We investigate landowners' willingness to participate in protecting oak scrub sites in Denmark. Combining contract data of the landowners' actual choices, GIS information on area specific characteristics and detailed individual level register data, we develop and implement a framework for analysing revealed choice of private landowners' in voluntary conservation programs. We find that both the physical characteristics of the property and the sociodemographic characteristics of landowner in question matter, along with the information flow provided from the regulator. Results provide impetus into the design of future conservation policies, in terms of how, to whom and where to target efforts.

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1 Introduction

In many parts of the world habitats, critical to the provision of biodiversity and ecosystem services, are becoming increasingly scarce. In addition, a large proportion of agricultural and forested land which hosts the habitats is privately-owned. The management of private lands therefore has significant implications for biodiversity and ecosystem services. Landowners seldom receive rewards for enhancing them on their land, and economic theory suggests that since ecosystem services constitute a public good, the amount supplied on private land will be lower than optimal. With habitat loss and degradation thought to be a main cause for the decline of biodiversity this poses a potential major threat to biodiversity if unregulated. As an alternative to regulating the provision of ecosystem services through land acquisition schemes or command and control, voluntary conservation programs are gaining

prominence as a regulation mechanism that can deliver ecosystem services on private land by altering land management practices. Numerous countries are allocating considerable large funds for voluntary mechanisms to safeguard environmental benefits such as water services and erosion control, carbon sequestration, afforestation, and biodiversity conservation (Gren and Carlsson, 2012). One example is the EU expenditure on agri-environment measures from 2014–2020 which is predicted to be nearly 25 billion EUR (European Commission, 2015).

Crucial requirements for the success of voluntary incentive mechanisms are to get the ecosystem service delivered in the locations where it is most demanded by society, and to get it delivered at the least cost. Voluntary conservation will only be effective if private forest owners can be persuaded to participate in the offered programs and are able and willing to supply the demanded level of ecosystem services. To promote participation and ensure an instrumental design of voluntary initiatives that is coherent with this, there is a need to understand the motivations of the forest owners and determinants of their participation choice (Hanley et al., 2012). Linking information on owner participation and characteristics to the spatial distribution and quality of ecosystem services

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provides insight into where conservation initiatives may be successfully and effectively implemented (Knight et al., 2011). Further, these insights may reveal the potential policy limitations of voluntary conservation programs on private land. In this regard, crucial questions are: do registered participation data reveal specific characteristics of the forest owners who chose to engage in voluntary conservation? Are the programs attracting owners of land with high conservation value? And what are the consequences for the optimal design of the conservation contracts (de Vries and Hanley, 2016)

Mitani and Lindhjem (2015) group the literature on participation into two different methodological approaches. The first applies information about forest owners' actual or stated participation in existing programs and investigate the link between participation choice and forest and owner characteristics. The second method applies stated participation in a hypothetical program. Several studies have applied stated choice methods to analyse land owners motivations for entering into existing voluntary environmental payment contracts (Broch et al., 2013; Langpap, 2004; Layton and Siikamäki, 2009; Matta et al., 2009; Nagubadi et al., 1996; Vedel et al., 2015). While showing promise in analysing the underlying forest owner motivations, the hypothetical nature of these surveys can result in responses that are strategic or in some way significantly different from actual behaviour (Arrow et al., 1993; Bateman et al., 2002; Champ and Bishop, 2001). This also includes that self-selection may be an issue, in that some potential participants would never answer to surveys. Mäntymaa et al. (2009) partially circumvent the hypothetical issue by combining survey information with revealed compensation claims and Gren and Carlsson (2012) explore determinants of actual payment information at the county-level in Sweden. They convincingly demonstrate the merits of applying revealed compared to stated choice methods. However, the error variance of stated and revealed data are often different, and stated choice models may be less noisy due to the more focused nature of the choice task (Adamowicz et al., 1994).

Following the same research direction, the aim of this study is to use data from one of the most prominent forest conservation schemes in Denmark, The Oak Scrub Conservation Scheme, to identify which land and forest owner attributes determine participation. High resolution spatial data on oak scrub provision, used by the regulator at the time of implementation, is merged with revealed contract data on participation in the conservation program, and with socioeconomic characteristics of the owner at parcel and individual forest owner level. The latter is based on extensive Danish Civil Registration System data on each forest owner, with unique information about each owner. Such data access to owner characteristics from credible official statistics combined with detailed spatial data on government reported qualitative characteristics of the oak scrub allows this study to directly link owner characteristics with the probability of participation in the voluntary conservation scheme and infer about the importance of how the regulator manages the program and provides information to the forest owners. We estimate the determinants of participation and analyse the role of forest owner, physical property characteristics and information flows, and find that all matter for the participation pattern. Since we do not rely on stated choice data, we can rule out any bias due to strategic or moral motivations for not answering in accordance with actual behaviour.

2 Forest owner participation

The literature on the adoption of conservation measures has mainly been limited to modelling the discrete participation choice of the landowner (Bell et al., 1994; Kauneckis and York, 2009; Kilgore et al., 2008; Langpap, 2004; Lynch and Lovell, 2003; Matta et al., 2009; Nagubadi et al., 1996). Siikamaki and Layton (2007) and

Layton and Siikamaki (2009) extends the prediction of potential participation to also include intensity of enrolment in a beta-binomial model of Finnish forest owners, while the compensation claim expressed as WTA is studied for Norwegian forest owners in (Lindhjem and Mitani, 2012) and US forest owners in Matta et al. (2009). The willingness to sell is explored for US forest owners in LeVert et al. (2009).

Studies on landowner motives for owning and managing forest find increasing evidence that not all forest management decisions are made to maximize the economic return of the forest. Financial versus non-pecuniary motivations seems to differ across owner and parcel characteristics (Koontz, 2001), with small scale and family forest owners relatively more motivated to own and manage forest for non-pecuniary benefits such as aesthetics, nature protection, bequest, and privacy (Creighton et al., 2002; Gregory et al., 2003; Maes et al., 2012; Petucco et al., 2015; Urquhart et al., 2010; Urquhart and Courtney, 2011), compared to large scale owners. Furthermore, hunting may impose a direct economic profit if not a motive itself for ownership (Meilby et al., 2006; Urquhart and Courtney, 2011). These results are supported by an examination of Danish forest owners. Boon (2003) finds that small-scale forest holders have a high emphasis on the aesthetic, recreational and nature values of their landholdings. Larger forest owner also ranked these as valuable, but placed more importance on the income and investment opportunities in owning forest. The bequest value of the forest within the family as well as possibilities for hunting either for recreational purpose or as a source of income is likewise of high interest for larger forest owners. Mitani and Lindhjem (2015) find in a related study that Norwegian nonindustrial private forest owners motivations to participate in a voluntary conservation program also depend on expectations about additional income opportunities, positive environmental attitude, but decreases if they find conservation regulations are too strict. Assumed hypotheses on how property as well as owner characteristics are expected to influence participation are further elaborated in Section 5.

Most studies have used data from questionnaires and mail surveys to the landowners asking them about their management objectives and preferences as well as property and sociodemographic characteristics to analyse their choice of whether or not to adopt conservation methods (Boon, 2003; Boon et al., 2004; Karppinen, 1998). Being able to couple survey data of motives to landowner and property attributes may leave the researcher relatively well informed about the property in question. On the downside such methodology is embedded with issues of self-selection, response rate, and probably most importantly, hypothetical bias (as also seen in the environmental valuation literature).

Two recent studies deviate from the path of using stated choice and instead focus on the revealed choices of landowners. Gren and Carlsson (2012) examine the determinants of payments accepted by Swedish forest owners in mandatory and voluntary biodiversity agreements. A county-level annual panel data set on payments and area of conserved land under the two agreements is combined with approximations for the ecological productivity, value of forest land, non-forest income, environmental preferences, climate, area of protected forest and forest land, as well as learning. Payments are found to increase in the size of the protected areas and decrease with spatial auto-correlation, indicating that there is a learning effect from cooperation between regions that may lead to lower cost of biodiversity management and ultimately lower payments. Mäntymaa et al. (2009) combines revealed choice with survey data to examine the participation choice and compensation claims for a fixed term forest conservation program in Finland. The study was based on pilot project data describing the physical characteristics of offered forest stands for protection, combined with survey data regarding forest owner attitudes, demographics,

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