



Are foresters really risk-averse? A multi-method analysis and a cross-occupational comparison

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ABSTRACT

Foresters often find themselves facing economic decisions that are characterized by risk. For understanding and modelling their decisions, as well as tailored policy-making, detailed knowledge on risk attitudes is of utmost importance. However, evidence on foresters' risk attitudes is rare. Therefore, this study aims to provide in-depth knowledge on foresters' risk attitudes. For robust results, we apply two different incentivised online experiments including a Holt and Laury task (HL) and an Eckel and Grossman (EG) task as well as a self-assessment question (SA). The multi-method comparison additionally allows for testing on the consistency of these established risk measurement tasks. Furthermore, we compare foresters' risk attitudes with the well-analysed risk attitudes of farmers. Our results show that foresters are predominantly risk-averse. Self-employed foresters are more risk-averse than self-employed farmers, which should be accounted for when designing adequate policy measures. The analysis of risk attitude measurement methods reveal that the EG values correlate with the HL values across both groups, although risk-aversion coefficients differ in their magnitude. Thus, the two experimental methods are consistent in relative terms, and across occupational groups.

1. Introduction

Most economic decisions must be made in the presence of risk. This is especially true for foresters, who are exposed to several types of risks that go beyond ordinary business risks, such as price volatility and demand variability. Weather risks, as well as other specific types of production risks, for instance plant diseases (Lönnstedt and Svensson, 2000), affect a wide range of decisions, including those related to investments and insurance. Decisions under such risks are influenced by the risk attitude of the decision-maker. In the case of decisions on future resource allocation, environmental preservation and climate change, knowledge about risk attitudes becomes highly important for effective policy measures (cf. Botzen and van den Bergh, 2014; Vollmer et al., 2016). Especially in the light of increased application of models for policy and market scenario analysis, risk attitudes and their interaction with other parameters is a key determinant.

To date, it is hardly possible to meet coherent statements and assumptions on foresters' risk attitudes, since there is only a limited number of studies analysing foresters' risk attitudes (cf. Brunette et al., 2015). Authors tend to use different methods, which makes a direct comparison difficult. Furthermore, the analysed subjects vary from purely private forest owners, to the general sample of forestry decision makers. Previous studies mostly analysed risk attitude as an input

determinant, without in-depth analysis of the distribution or the potential correlations with other parameters (Musshoff and Maart-Noelck, 2014; Sauter et al., 2016b).

Therefore, this paper will provide evidence on foresters' risk attitudes by measuring the individual risk attitudes of a wide variety of forestry decision makers. This includes private forest owners, foresters of public forests as well as forest service providers. In addition, we classify foresters' risk behaviour in the context of comparable occupations. Therefore, we directly compare the risk attitude of foresters with the risk attitude of farmers in the same methodological setting. As with foresters, farmers face comparable risks, which do not only involve price and demand risks, but also production risks from weather and plant diseases. In contrast to foresters, risk attitudes of farmers have been analysed intensively (Reynaud and Couture, 2012; Roe, 2015). Furthermore, a direct comparison allows for potential inferences from results in agricultural economics. Such knowledge on occupation-specific risk attitudes provides the basis for the fine-tuning of common policy measures, such as bioenergy support schemes or contractual nature conservation.

In order to reflect the bandwidth of risk attitudes and to analyse for correlating parameters, we analyse risk attitudes individually. Methods for eliciting individual risk attitudes typically involves economic experiments or questionnaires. Consequently, this study draws on three

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different methods, including two experimental tasks: the Holt and Laury (HL) task (2002) and the Eckel and Grossman (EG) task (2002) as well as one self-assessment (SA) question according to Dohmen et al. (2011). The variety of applied methods facilitates higher robustness in the results, and furthermore, allows for testing on the comparability of methods.

Altogether, this study is an extension of the existing literature regarding three main aspects. Firstly, by carrying out an in-depth analysis of foresters' risk attitudes with various methods and consideration of correlating parameters. Secondly, by comparing the risk attitudes of foresters with those of farmers using the same experimental setting; we are the first to provide insights into potential differences between these two occupation-related groups. So far, comparisons of the risk attitude of foresters and farmers are only possible among different experimental designs and studies. As both occupational groups belong to the primary sector it might be possible to transfer scientific results and policy recommendations from one group to the other. Thirdly, we provide evidence as to whether the results from the HL task are consistent with those from the EG task, as well as the SA question, when measuring the risk attitude of foresters. Therefore, we are the first to compare the elicited risk attitudes of foresters in the incentivised tasks according to Holt and Laury (2002) and Eckel and Grossman (2002). Furthermore, to our knowledge, we are the first to compare two occupational groups, i.e. foresters and farmers, regarding the comparability of these two risk elicitation tasks. In addition, we contribute to the literature by comparing the HL task elicited risk attitude of foresters and their SA. We provide a novel insight by comparing two occupational groups regarding the comparison of HL and SA.

2. Derivation of research hypotheses

2.1. Comparing risk attitudes of foresters and farmers

This study is the first study that directly compares risk attitudes of foresters with other occupational groups – especially farmers – in identical experiments. Therefore, we cannot benefit from previous direct comparisons, and instead we draw on comparable studies for the derivation of the hypothesis. The studies of Musshoff and Maart-Noelck (2014) and Maart-Noelck and Musshoff (2014) applied the HL task once with foresters and once with farmers under comparable conditions. Musshoff and Maart-Noelck (2014) consider foresters, and found an average HL value¹ of 5.9 (constant relative risk aversion (CRRA) value of 0.52) from ten decision situations, which represents a risk-averse attitude. This finding was confirmed by an HL task with German foresters by Sauter et al. (2016b). Maart-Noelck and Musshoff (2014) examined risk attitudes of German farmers and revealed an HL value of 4.4 on average (CRRA value of 0.11), indicating that they are nearly risk neutral. Brunette et al., 2017 analysed the risk attitude of French foresters with the EG task, where they obtained an average CRRA value of 1.15. Applying the EG task to French farmers in a non-incentivised experiment, Reynaud and Couture (2012) revealed an average CRRA value of 0.62 when using low hypothetical payoffs and 1.02 when using high hypothetical payoffs. Additionally, the study of Brunette et al. (2015) provides a literature overview on risk attitude measurements in resource economics. By means of a meta-analysis, they did not find significant differences in risk attitudes of farmers and foresters.

So far, comparisons of the risk attitude of foresters and farmers are only possible among different experimental designs and studies. As both occupational groups belong to the primary sector it might be possible to transfer scientific results and policy recommendations from one group to the other. We stress such an assumption for risk attitudes by comparing both groups. We expect significant differences between farmers'

and foresters' risk attitudes. This is driven by the expected influence from the contrasting conditions of farmers' and foresters' working environments, (cf. Gregg and Rolfe, 2016) and the observed differences from recent studies. Therefore, we hypothesise that:

H1 : Measured risk attitudes do considerably differ between foresters and farmers.

2.2. Comparison of risk attitude measurement methods

For the elicitation of risk attitudes, economic experiments have become the most applied methodology due to several advantages (Lönnqvist et al., 2015). Experimental methods typically draw on lotteries in a multiple price list (MPL) or ordered lottery selection (OLS) format. MPLs and OLSs have the advantage of reflecting the participants' inherent choices and in providing an incentive-compatible design. When using MPLs or OLSs, risk attitude can be quantified in terms of the CRRA coefficient. The HL task has been established as a “gold standard” in determining participants' individual CRRA coefficient (Anderson and Mellor, 2009) because it comprises several decision situations, each of which presents a choice between two lotteries: one being a rather safe option and the other a rather risky option.

However, experimental methods can reveal method-biased results (Reynaud and Couture, 2012; Maart-Noelck and Musshoff, 2014; Lönnqvist et al., 2015). In the HL task, the lottery values are held constant throughout all decision situations, while probabilities for winning the higher and the lower value are systematically varied. This approach allows for the risk attitude measurement to take place within one task, and has the advantage that elicited decisions can be transferred into a power utility function (Abdellaoui et al., 2011). Due to the varying probabilities in the HL task, the results may suffer from probability weighting (Abdellaoui et al., 2011). Additionally, the HL task may demand that participants have high cognitive math abilities in order to reveal meaningful results (Eckel and Grossman, 2002; Dave et al., 2010). Alternatively, the EG task is designed in an OLS format and thus allow for the derivation of CRRA values as the HL task. The EG task is less cognitively demanding on the participants, in comparison to the structure of the HL task (Dave et al., 2010). In contrast to the HL task, the EG task is comprised of constant probabilities, while lottery values change throughout the task. Thus, probability weighting is equal for all lotteries; however, changing values might introduce stake size effects (Holt and Laury, 2002).

Although there are some differences between the HL and the EG tasks, both methods comply with an incentive system which can be comparably designed. Therefore, one might expect equal results. Indeed, Harrison and Rutström (2008) conducted the HL task, as well as the lottery of Binswanger (1980), which is comparable to the EG task, and concluded that both methods reveal roughly the same results in terms of CRRA coefficients for student participants. Dave et al. (2010) worked with Canadian residents, and found that comparable results between the HL and EG tasks held only when participants had high cognitive math abilities. Loomes and Pogrebná (2014) conducted their experiments with student participants, and found highly significant rank correlations between the HL and the EG tasks. However, they also discovered that the transferability of precise estimates of the CRRA coefficient between these two tasks is limited. Generally, the considered studies found correlated results, while actual CRRA coefficients mostly differed in their magnitude. However, none of these studies focused on foresters, or compared risk attitudes measured across occupational groups, for testing the stability of results and potential group differences. Therefore, we are the first to compare the elicited risk attitudes of foresters in the incentivised tasks according to Holt and Laury (2002) and Eckel and Grossman (2002). Furthermore, to our knowledge, we are the first to compare two occupational groups, i.e. foresters and farmers, regarding the comparability of these two risk elicitation tasks. Condensing the findings from the literature, we reach the following hypothesis:

¹ We use the term HL value for the number of safe choices (lottery A) in the HL task (cf. Holt and Laury, 2002).

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