Risk Preferences and the Adoption of Subsidised Crop Insurance: Evidence from Lithuania

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Abstract

Crop insurance adoption remains low among small and medium farms – despite financial public support in the form of premium subsidies. A better understanding of smaller farmers' insurance decisions and contract attribute preferences is thus needed to encourage insurance solutions. Moreover, previous research has primarily examined risk preferences and insurance adoption among Western European farmers, while little is known about insurance markets and risk preferences in Central and Eastern European countries. We contribute to the literature by i) contrasting the current status of insurance adoption by Lithuanian farmers by farm size, ii) assessing farmers' risk preferences and attitudes towards crop insurance, and iii) investigating small and medium farmers' preferences for the characteristics of a new (hypothetical) subsidised multiple peril crop insurance (MPCI) product. Therefore, we conduct a socio-economic survey in Lithuania that features a risk preference elicitation task and a discrete choice experiment (DCE). Findings show that, on average, sampled farmers are risk-neutral to slightly risk-seeking and that insurance adoption is lowest among smaller farms (<50 hectares). Moreover, insurance adoption was associated with higher risk exposure, higher trust in insurance services, and higher willingness to take farming-specific risks on all farms. For small and medium farms, the DCE results suggest preference heterogeneity for contract attributes and higher adoption rates when contract design reduces the risks and efforts associated with subsidised insurance.

Keywords

multiple peril crop insurance; small farms; European agriculture; contract attribute preferences; discrete choice experiment

1 Introduction

Small and medium farms are important food producers in Europe. European farmers, however, are increasingly facing economic challenges due to yield losses caused by extreme and unfavourable weather events. One objective of the European Union's Common Agricultural Policy (EU CAP) beyond 2020 is therefore to ensure viable farm incomes, especially for small and medium farms (EUROPEAN COMMISSION, 2018). European farmers in most cases rely on and favour direct payments for income support, even though other income stabilization tools, especially crop insurance, positively affect farm revenues and would be more efficient from a public policy perspective (BARDAJI et al., 2016; DI FALCO et al., 2014).

In Europe, agricultural insurance is widely available but insurance adoption is frequently discouraged by high insurance premiums (LIEBE et al., 2012; SANTERAMO et al., 2016). To increase insurance adoption and therefore support farm incomes, the European Union (EU) and its member states provide crop insurance premium subsidies as part of their rural development programme under the CAP (EUROPEAN PARLIAMENT AND COUNCIL OF THE EUROPEAN UNION, 2013; LIESIVAARA and MYYRÄ, 2017). Yet, SANTERAMO ET AL. (2016), in a study on the insurance adoption of Italian farms, find that usually, the larger and wealthier farms – in terms of capital, crop revenue, and return on equity – adopt insurance. Moreover, only a few countries have developed special programmes for small farms and those existing are usually in the form of subsidy top-ups. However, traditions in insurance, targeted outreach, and the customization of crop insurance products to individual farmers' needs are also influential (MAHUL and STUTLEY, 2010; SANTERAMO et al., 2016). Understanding smaller farmers' needs and preferences is thus crucial for the targeted design of multiple peril

DOI: 10.30430/gjae.2022.0125

crop insurance (MPCI) contracts and the efficient use of public money if countries subsidise insurance. Up till now, however, little is known about insurance contract attribute preferences of smaller farms. In addition, insurance markets in the EU are still largely under-investigated (SANTERAMO et al., 2016), especially those in the new member states in Central and Eastern Europe (CEE). Their eventful past (nationalization followed by restitution of land rights, failure of early insurance markets), however, sets the Post-communist countries apart and justifies their individual consideration.

Therefore, the objectives of this research, are i) to compare the current state of insurance adoption by Lithuanian farmers by farm size, ii) to assess Lithuanian farmers' risk preferences and attitudes towards crop insurance, and iii) to explore small and medium farmers' preferences for MPCI contract characteristics. The study was conducted in the form of a survey, with data collected through tablet-assisted face-to-face interviews among farmers attending an agricultural exhibition. The analysis draws from socio-economic variables, a risk preference elicitation task, and a discrete choice experiment (DCE). For the DCE and to elicit farmers' willingness to purchase subsidised insurance, we design a hypothetical new insurance product for smaller farms that covers the weather risks of hail, storm and heavy rain. We focus on loss-based insurance, because index-based solutions for hail, storm, and heavy rain are unable to make potential yield losses appear sufficiently correlated with the respective risks and small-scale (data) infrastructure for measuring trigger values of index solutions is lacking. For the choice analysis, we follow a finite mixture latent class approach to identify heterogeneity in contract attribute preferences and potential insurance adopters.

Our paper contributes to the existing literature in several ways. First, Lithuania is a CEE country where relatively little arable land is insured against weather risks, despite an existing insurance market and a history of national subsidies (RITTERSHAUS, 2017). In addition, the vast majority of Lithuanian farms is smaller than 100 hectares (HARTVIGSEN, 2014; EUROSTAT, 2020). This allows us to examine risk preferences and the insurance decision in an emerging insurance market with relatively small-scale agriculture. Moreover, risk preferences and how they shape the adoption of crop insurance have been more extensively studied for old EU member states than new ones (IYER et al., 2020; KOBUS and WĄS, 2017; SULEWSKI and KŁOCZKO-GAJEWSKA, 2014). Second, few works have studied farmers' preferences for crop insurance contract attributes (examples include LIEBE et al., 2012; YE et al., 2017). Most research has considered heterogeneity in the adoption decision in general, enquiring about risk preferences and individual characteristics and using these measures to explain the likelihood of purchasing insurance (e.g., ABDULAI et al., 2018; SIBIKO et al., 2018). Yet, this approach leaves little information about how preferences for contract attributes differ across groups of farmers. Finally, few studies have considered attributes beyond the insurance service itself. One example is CEBALLOS et al. (2019), who report positive effects on the insurance decision if the effort in reporting and claiming damages is reduced. To our knowledge, how farmers' insurance decisions are influenced by different contracting options, payment formalities, as well as administrative efforts associated with subsidised insurance contracts has received little attention.

In what follows, we first provide information on Lithuanian agriculture and insurance markets and state our research hypotheses. Section three presents our empirical setup and the data collection. Section four first presents the results regarding the effect of farm and farmer characteristics on the insurance decision by farm size and then sheds light on smaller farmers' preferences for subsidised MPCI contracts. The final section concludes.

2 Thematic Background and Research Hypotheses

2.1 Agriculture and Insurance Markets in Lithuania

Lithuania's agricultural sector has an eventful past. When Lithuania declared its independence from the Russian authorities in 1918, agriculture was the most important economic sector. But while 75% of the population worked in agriculture, they only owned a quarter of the land. After the independence struggles, a radical land reform gave thousands of former small tenants and landless farmers a piece of land of their own, increasing the number of private landowners significantly (ZIEGLER, 2009). From 1940 onwards, when the communists came to power, private agricultural land was nationalised and collectively farmed. In 1990, Lithuania declared its independence from the Soviet Union again, broke up the collectivised holdings, and returned the land rights to the former owners. This restitution reduced the average farm size from 4,000 hectares in 1989 to 11.5 hectares in 2000, after which small and subsistence farms accounted for 89% of total agricultural production (HARTVIGSEN, 2014; KNAPPE et al., 2002).

Significant structural change has taken place since Lithuania joined the EU in 2004. The share of agricultural holdings has decreased, and consolidation has taken place. From 2005 to 2016, the number of holdings fell by about 41% to 150,320 farms. Restructuring had the number of small-sized farms decrease the most, while the number of farms above 50 hectares increased. Today's farm structure, thus, is heterogeneous and characterised by a mix of large-sized farms, medium-sized farms, and small-sized and subsistence farms (Hartvigsen, 2014). In 2016, 50% of farms still farmed less than 5 hectares, and 96.5% of farms were smaller than 100 hectares (EUROSTAT, 2020; MELNIKIENĖ and BALEŽENTIS, 2017). In 2018, the average farm size was 22.7 ha, and the average annual net income for farms below 20 ha was approximately €4,000 (annually, without subsidies) (FI-COMPASS, 2020). A significant share of small-sized farms, thus, is engaged in off-farm activities (EUROSTAT, 2020; DABKIENĖ, 2020).

Early agricultural insurance markets struggled. Agricultural insurance companies were challenged by the small-scale structure and low productivity levels of Lithuanian agriculture. Moreover, insurers had difficulties quantifying the impact of crop damage on the final harvest due to the lack of historical yield data. That lowered the confidence in insurance services. As a result, the last private insurance company closed in 1999, leaving the bank-based *PZU Lithuania* as the only insurance company on the market. But high insurance premiums and a low utilization rate of 0.5% of the total arable land rendered this insurance unprofitable. 2006, in which a severe drought caused income losses for the majority of farmers, marks a turning point for agricultural insurance in Lithuania. A revisited national insurance strategy set out to achieve a higher adoption rate, which in turn should guarantee lower and thus more attractive insurance premiums (PELECKIS et al., 2015).

Backed by the new insurance strategy, *Vereinigte Hagel VVaG* entered the Lithuanian market in 2007. It remained the only insurance company in Lithuania until 2020 (FI-COMPASS, 2020). The mutual insurance company offers crop insurance through its branch *VH Lietuva* under a PPP with the Lithuanian state (PELECKIS et al., 2015; RITTERSHAUS, 2017; FI-COMPASS, 2020). The State and the European Union grant compensations of insurance premiums of up to 65% as outlined in regulation (EU) No 1305/2013 (EUROPEAN PARLIAMENT AND COUNCIL OF THE EUROPEAN UNION, 2013; RITTERSHAUS, 2017; VH LIETUVA, 2020). In 2017, the compensation of insurance premiums to Lithuanian farms amounted to €2.9 million (FI-COMPASS, 2020).

Despite public support, crop insurance is still not widespread in Lithuania (FI-COMPASS, 2020). In 2018, 197,000 hectares of agricultural land (9.4% of total arable land) were insured. One-third of the insured farms cultivated less than 100 hectares, and about 17% cultivated less than 50 hectares. They account for about 6% and 1% of the insured area, respectively. In 2019, farms could take out crop insurance for crops (cereals, oil crops, legumes, corn, potatoes, and beets), spun crops, and seeds. Special crops (vegetables and fruits) could not be insured. Cereals and oil fruits were the two most frequently insured crops, accounting for 69.8% and 20.2% of the total insured area, respectively (VEREINIGTE HAGEL, 2019). The typical summer weather risks covered by crop insurance are hail, storms, and heavy rain. The main weather-related risk in Lithuania is severe frost; against which insurance is available but at a correspondingly high premium. While insurance for drought and continuous rain is available, it is rarely used (PELECKIS et al., 2015).

2.2 Crop Insurance Adoption, Risk Preferences and Preferences for Contract Attributes

Crop insurance markets in Central and Eastern Europe (CEE) are still largely under-investigated (SANTERAMO et al., 2016; IYER et al., 2020; KOBUS and WĄS, 2017; SULEWSKI and KŁOCZKO-GAJEWSKA, 2014). Research in other countries has established that the adoption of crop insurance as a risk management tool is driven by farm and farmer characteristics (e.g., farm size, production risks, farmers' education and age, off-farm income, risk preferences, trust in insurance services). We consider it useful to explore whether findings are similar for our sample of Lithuanian farms.

On farm and farmer characteristics: An effect of farm size on insurance adoption has been reported frequently. For example, SANTERAMO et al. (2016) and FINGER and LEHMANN (2012) found in empirical studies in Italy and Switzerland, respectively, that large farms have higher adoption rates than small farms. Similar effects are reported for the U.S.

(SHERRICK et al, 2003), China (JIN et al., 2016), and Kenya (SIBIKO et al., 2018). We thus hypothesise,

H1 *"farm size": crop insurance adoption differs between large farms and small farms.*

It was also observed that farm size is inversely related to the farmer's participation in other gainful activities (DABKIENĖ, 2020). However, the use of crop insurance becomes less likely the higher the share of off-farm income (FINGER and LEHMANN, 2012; LIEN et al., 2006). This can be explained by the fact that part-time farmers earn low farm income and by the insurance-like, income-stabilizing effect of off-farm income (DABKIENĖ, 2020; FINGER and LEHMANN, 2012; LIEN et al., 2006). We, thus, hypothesise,

H2 *"off-farm income": crop insurance adoption differs between full-time and part-time farms.*

Some effects of socio-demographic characteristics are also reported, but these findings are inconclusive. For example, FINGER and LEHMANN (2012) show that older and better educated Swiss farmers are more likely to use insurance. While younger U.S. and Finnish farmers are more likely to insure, according to SHERRICK et al. (2003) and LIESIVAARA and MYRRÄ (2014); and the education level does not explain participation in the Italian (SANTERAMO et al., 2016) or Finnish insurance market (LIESIVAARA and MYRRÄ, 2014). ABDULAI et al. (2018) in Ghana and AKTER et al. (2016) in Bangladesh find no effect of age on insurance adoption, but either positive (Ghana) or negative (Bangladesh) effects of educational attainment on the willingness to adopt insurance. Thus, it seems that these findings are due to country or sample-specific issues. In Lithuania, due to the failure of early insurance markets (see section 2.1.), it seems likely that older farmers had poor experiences with insurance companies. We thus hypothesise:

H3 *"Age": crop insurance adoption differs between older and younger farmers.*

H4 *"Education": crop insurance adoption differs between farmers with different levels of education.*

Regarding gender effects, lower participation of female farmers in insurance programs in developing countries have been reported (AKTER et al., 2016; ABDULAI et al. (2018). This has been explained by differences in risk preferences and trust (AKTER et al., 2016). Gender aspects have received little attention in studies among European farmers. We, thus, hypothesise:

H5 *"Gender": female farmers differ from male farmers in their insurance decisions.*

Risk attitudes have a decisive influence on insurance decisions (IYER et al., 2020). Several studies have examined the relationship between risk attitudes and crop insurance use. As theory suggests, risk-averse farmers are often more likely to purchase crop insurance than risk-neutral or risk-seeking farmers (e.g., JIN et al., 2016; LIEBE et al., 2012; ABDULAI et al., 2018; MENAPACE et al., 2016). However, HELLERSTEIN et al. (2013) and MERANER and FINGER (2018) find that risk-averse farmers are less likely to be insured. HELLERSTEIN et al. (2013) attribute this unexpected finding to the use of lottery-choice measures to capture risk attitude; while the risk-averse farmers in MERANER and FINGER (2018) prefer on-farm risk management strategies over market-based strategies such as insurance. We hypothesise,

H6 *"Risk preferences": crop insurance adoption differs between risk-averse and risk-seeking farmers.*

Furthermore, the use of insurance depends on the risk exposure and risk perception of the farmer (LIEBE et al., 2012; FINGER and LEHMANN, 2012; MERANER and FINGER, 2018). Risk exposure could be approximated by the farmer's perceived relevance of weather-related risks to the farm. We, thus, hypothesise,

H7 *"Risk exposure": perceived relevance of weather-related risks differs between insured and uninsured farmers.*

Another prerequisite for purchasing insurance is trust in insurance companies and their services (e.g., reasonable premiums, fair payouts) (e.g., PAI et al., 2019). In Lithuania, the market for crop insurance is just emerging, we thus hypothesise:

H8 *"Trust": trust in insurance services differs between insured and uninsured farmers.*

On the characteristics of the insurance contract: The benefit a farmer receives from purchasing crop insurance is a market-based risk transfer. However, the perceived benefit is affected by the design of an insurance contract. For example, the greater the risk-reducing effect and the lower the insurance premium, the greater the benefit of crop insurance - and thus the likelihood of purchasing it. In addition, the level of the deductible affects the basic risk and thus the insurance decision (e.g., LIEBE et al., 2012; LIESIVAARA and MYRRÄ, 2014). Few studies have considered how the characteristics of an insurance contract affect its purchase; in particular, there are few studies that go beyond the insurance premium, deductible, and payment received. Little is known about the effects of the effort (an exception is CEBALLOS et al., 2019) and risks associated with obtaining and complying with subsidised insurance (e.g., different contracting options, payment formalities, documentation requirements). However, we anticipate that these risks and effort may significantly influence farmers' insurance decisions.

First, *contract duration* affects the effort required to enter into the contract. Short (e.g., one-year) contracts without automatic renewal require reinsurance and thus initiative by the insured at short intervals. Multi-year contracts or contracts that automatically renew at contract expiration are less burdensome for both the insurance company and the farmer. Second, payment options that allow *instalment payments* and defer payment until the end of the growing season postpone and mitigate the (perceived) loss from contracting. Third, both *contracting and the administrative requirements* for receiving premium subsidies involve risks and effort. To enter into an insurance contract, the hectare value of the insured crop must be calculated, as this determines the premium rate. Prospective policyholders can either rely on experts to determine the value per hectare or do the calculation themselves. The latter would be less costly than using the services of an intermediary who charges commissions (VELTHUIS, 2003), yet is tedious and potentially risky. Professional advice regarding contract features and insurance products available may also reduce the perceived complexity of the insurance decision. Finally, a prerequisite for receiving financial support is that farmers i) submit their insurance contract plus invoice and ii) declare their cultivation register to the regional office (i.e., the Lithuanian administrative body that monitors applications for EU direct payments and, therefore, has farmer's area data based on the EU's *Integrated Administration and Control System* (IACS) (EUROPEAN COMMISSION, 2019)). Earlier involvement of the regional office could facilitate reporting and ensure that the information submitted to the insurance company is identical to that in the application for direct payments.

Since there are differences in farm and farmer characteristics, there will be heterogeneity in the preferences for these contract characteristics, such as the premium, the risks, and effort involved. We thus hypothesise:

H9 *"Contract attribute preferences": crop insurance contract attribute preferences differ across distinct groups of farmers.*

3 Data and Empirical Strategy

3.1 Survey and Sampling

A total of 143 valid responses[1] were collected in April 2019 among farmers participating in the agricultural exhibition "Ką pasėsi… 2019" in Kaunas, Lithuania. The survey took place at the stand of the insurance company Vereinigte Hagelversicherung VVaG – "VH Lietuva". We have actively approached visitors who passed by the stand and invited him or her to participate in the survey, which we then conducted via tablet-assisted face-to-face interviews. Survey participants received a small gift for their participation.

Visitors qualified for the survey if they were registered farmers in Lithuania or workers on such a farm. We applied no further screening criteria. The sample is thus driven by the visitor structure of the agricultural exhibition, participant's willingness to devote time to fill in the survey, and interest in insurance-related issues in general. Thus, the survey data were obtained from a non-probability convenience sample and exhibit a potential selection bias. Therefore, our analysis is exploratory in nature (HIRSCHAUER et al., 2020; IMBENS, 2021). While prone to self-selection bias, sampling at the exhibition and the stand of the local insurance company was nevertheless essential to access the farmers. In addition, we are confident that the company's involvement increased farmer's perceived consequentiality of the survey (e.g., ability to influence the insurance company's product range). Accordingly, because the company's decisions are relevant to the participating farmers, the hypothetical bias for which stated preference surveys are frequently criticised is reduced, resulting in more truthful responses (CARSON and GROVES, 2007; VOSSLER et al., 2012; ZAWOJSKA et al., 2019).

3.2 Questionnaire, Measures and Exploratory Analysis

The questionnaire, which was pilot tested with farmers in order to eliminate ambiguities and errors, consisted of four parts. First, respondents should state the size of their farm and rate the relevance of weather risks for their businesses on five-point interval scales ranging from "not at all" to "very much". They were asked whether they are currently insured or not, regardless of the type of crop insurance or crops insured

[1] Two respondents lacked answers to one item each; these were imputed by averaging over the outcome of multiple imputations by chained equations.

("Do you currently have crop insurance?" Yes/No). Moreover, they should indicate their trust in the insurance company (i) calculating the insurance premium on a needs-based basis and (ii) compensating incurred damages quickly and fairly on an interval scale ranging from 0 (= no trust) to 10 (= complete trust). These measures were based on a study on stated institutional trust (CARLSSON et al., 2018).

Second, respondent's preferences for crop insurance contract attributes were assessed in a DCE. Not all participants, but only those from small and medium farms (≤100 hectares) participated in the DCE, as insurance products for larger farms would differ in their terms and conditions. Details on the DCE are presented in the following section. In general, DCEs are preference elicitation methods that are well-grounded in economic theory. Their central assumption is the deduction of a utility function from observed choices between product alternatives (LOUVIERE et al., 2000; TRAIN, 2012). DCEs are common in consumer choice settings and environmental valuation studies and have also been used to study farmer preferences (AKTER et al., 2016; CASTELLANI et al., 2014; LIEBE et al., 2012; LIESIVAARA and MYYRÄ, 2014; SIBIKO et al., 2018).

Third, respondent's risk preferences were assessed. We used the staircase risk procedure by FALK et al. (2018, 2016) and their subjective self-assessment measure. The staircase risk measure consisted of five binary choices between a fixed lottery and a varying amount as a sure payment. Depending on whether the lottery or the sure payment is chosen, the amount of the sure payment increases or decreases in the next question. The measure thereby circles in around the individual's certainty equivalent. The subjective self-assessment measure captured the respondent's willingness to take risks in general ("In general, how willing are you to take risks") on an interval scale ranging from 0 (= completely unwilling) to 10 (= very willing). We combine both measures into a single risk preference measure using weights (FALK et al., 2018: 1653). Finally, as previous studies suggest that risk preferences are context-specific (EWALD et al., 2012; MERANER and FINGER, 2019), we assessed respondent's willingness to take risks on their farms on an interval scale ranging from 0 (= completely unwilling) to 10 (= very willing). Similar measures were applied by DOHMEN et al. (2011) and EWALD et al. (2012). While DOHMEN et al. (2011) argue that self-assessments are potentially biased, they also stress their reliability as a relative risk measure. Hence, for later analysis, we centred the measure on the sample mean so that it takes positive values for relatively risk-loving individuals and negative values for relatively risk-averse individuals.

Fourth, farm and socio-demographic information were collected. The survey measures were used to assess the correlations postulated in the simple hypotheses detailed in Section 2.2. Because the survey data were obtained from a convenience sample, and there is a potential selection bias, we are not assessing causal effects. Instead, we explore differences between insured and non-insured farms with respect to the variables of interest (e.g., risk preferences). Therefore, we perform Kruskal-Wallis rank sum tests for (quasi-)metric data and Fisher's Exact Test for count data using the software R (R CORE TEAM, 2018).

3.3 The Discrete Choice Experiment

The DCE aimed to determine small and medium farm's preferences for MPCI contract attributes. Based on a literature review and together with the local insurance agents, an insurance product was designed that offers basic insurance against hail, storm, and heavy rain. The aim was to offer a "simple, inexpensive" product with a uniform tariff across all crops and regions. A total of eight attributes with either two or three levels were eventually chosen. Attribute levels were based on the currently available insurance contracts and introduced new contractual features. (Table 1).

The attribute "contract period" included two levels; reflecting either a one-year contract or a three-year contract. These contracts could either involve an "automatic extension" or not, i.e., contracts would be renewed automatically upon the expiry of the contract. "Deductible" refers to the monetary loss the policyholder has to bear before the insurance coverage is triggered and the insurance company incurs the loss. We distinguish between contracts without a deductible and contracts that offer compensation if the damage exceeds 20%. One-year contracts without automatically renewal and a deductible of 8% represent the status quo of available insurance contracts at the time of the study.

The three levels of the attribute "Contracting and calculation" relate to how insurance contracts are established and premium rates calculated. The first level reflects *intermediaries* (i.e., either independent insurance agents or insurance company representatives), who are currently the prevalent distribution channel. The second level offers farmers the option of signing

Table 1. Selection of MPCI contract attributes

Attribute	Levels		
Contract duration	One year	Three years	
Automatic extension	Yes	No	
Deductible	No retention	Compensation if damage exceeds 20%	
Contracting and calculation	Online	When applying for EU subsidies at the regional office	Intermediaries
Submission of the cultivation register	Online	When applying for EU direct payments at the regional office	Intermediaries
Invoice	Once a year (in July)	Instalment: 30% within 5 days after the contract is signed, 70% in July	Instalment: 50% within 5 days after the contract is signed, 50% in July
Premium adjustment	Bonus malus system	Constant rate over the contract period	
Premium rate (incl. subsidy) per €1,000 expected value of harvest per hectare	15€ (incl. up to 50% national funding)	20€ (incl. up to 50% national funding)	25€ (incl. up to 50% national funding)

Source: own diagram

an insurance policy online. The third level allows to take out crop insurance when applying for EU direct payments at the regional office of the Lithuanian agricultural department, which manages applications for EU direct payments and crop insurance. The attribute “submission of the cultivation register”, a prerequisite for contracting crop insurance and receiving financial support, is detailed by the same three levels. The standard for existing contracts is the submission by the intermediaries. The hypothetical new insurance product provides farmers with additional options: individual online submission or submission when applying for EU direct payments at the regional office.

Three attributes relate to the insurance premium. The attribute “invoice” reflects when the payment of the insurance premium is due. Contracts either offer a one-time payment in July, an instalment payment with 30% of the premium due within 5 days after the contract is signed and the remaining 70% due in July; or an instalment payment with a 50% payment within 5 days and 50% in July. The attribute “premium adjustment” describes if and how the insurance premium adapts. Two levels are considered: contracts either offer constant rates over the contract period or introduce a bonus-malus system. The attribute “premium rate” is the fee charged for insurance coverage. This is expressed in € per €1,000 expected value of harvest per hectare. Contracts are offered at premium rates of €15, €20 and €25 (including the premium subsidy). The currently available insurance contracts offer a 30:70 instalment payment and use a bonus-malus system. The average premium rate of existing insurance contracts against hail, storm, and heavy rain across all crops in 2019 was €20 (including the premium subsidy).

The experimental design was created in R (R CORE TEAM, 2018) using the package “DoE.wrapper” (GROEMPING and RUSS, 2019). A full factorial design, which consisted of all 2,096 possible attribute combinations, served as the candidate design. Using default-priors (“0s”), a D-optimal design with 24 runs was finally chosen based on D- and A-efficiency criteria (0.369 and 4.601, respectively). The design was divided into six blocks to reduce the burden placed on the individual respondent. Respondents were randomly assigned to one of the six blocks and answered four choice questions. They had to choose one out of two hypothetical insurance contracts, but could also decide against contracting by choosing the opt-out alternative (Figure 1). The following situational framing introduced the choice experiment: *VH Lietuva is developing a new insurance product for farms with less than 100 hectares. By participating in this survey you can influence the design of this product. The insurance product will cover the weather risks of hail, storm and heavy rain for the following crops: cereals, pulses, maize, potatoes and oil fruits.*

Figure 1. Sample choice set

	Option A	Option B
Contract duration	Three years	One year
Automatic extension	Yes	No
Deductible	Compensation if damage > 20%	Compensation if damage > 20%
Contracting and calculation	By the farmer when applying for EU subsidies at the regional office	By an intermediary
Submission of cultivation register	By the farmer when applying for EU subsidies at the regional office	By the farmer when applying for EU subsidies at the regional office
Invoice	Once a year (in July)	Instalment: 30% within 5 days after the contract is concluded, 70% in July
Premium adjustment	Bonus malus system	Bonus malus system
Premium rate (incl. subsidy) per €1,000 expected value of harvest per hectare	25€ (incl. up to 50% national funding)	20€ (incl. up to 50% national funding)

Which option would you choose?

- I choose Option A.
- I choose Option B.
- None of the above.

Source: own diagram

3.4 The Econometric Model

The choice data were analysed using a finite mixture approach developed by BOXALL and ADAMOWICZ (2002), which uses latent classes (LCs) to account for preference heterogeneity. Thus, utility jointly depends on stated preferences over product characteristics (i.e., observed choice of alternative *j* and its characteristics in choice situation *t* by individual *i*) and respondents' characteristics. BOXALL and ADAMOWICZ (2002) determine the probability of individual *i* to choose alternative *j* as

$$P_{ji} = \sum_{q=1}^{Q} \frac{\exp(\beta_q X_{jit})}{\sum_{j=1}^{J} \exp(\beta_q X_{jit})} P_{iq} \quad (1)$$

in which $\beta_q X_{jit}$ is the linear additive utility function, with $ß_q$ capturing the contribution (part-worth utilities) of contract attributes X_{jit} to total utility for a specific segment q. Q then reflects the number of LCs and P_{iq} describes the probability of individual i to belong to segment q. This second probability reflects the membership function to a LC q and is estimated as a separate multinomial logit model

$$P_{iq} = \frac{\exp(\theta_q Z_i)}{\sum_{c=1}^{C} \exp(\theta_q Z_i)} \quad (2)$$

in which θ_q captures the influence of respondents' characteristics Z_i on choice.

We apply this modelling approach and assess heterogeneity in farmers' insurance adoption based on socio-demographic and farm characteristics, perceived relevance of weather risks, measures for trust and risk preferences and their stated preferences for contract attributes. The econometric analyses was performed in R using the "gmnl" package (SARRIAS et al., 2018), which supports panel data and thus accounts for correlations over choice sets and learning effects due to repeated measures (CAMPBELL et al., 2015).

For the present study, we specify the observed part of utility *V* for an individual *i* belonging to a specific segment *q* is expressed as:

$$V_{ijt} = \alpha_q ASC_{jit} + \beta_q P_{jit} + \beta'_q X_{jit} \quad (3)$$

where the ASC is an alternative specific constant coded as a binary variable that takes a value of one if a farmer chooses the opt-out alternative, i.e. decides against insurance. Thus, the parameter α_q captures a farmer's general attitude towards insurance adoption. The insurance premium (P_{jit}) entered the utility specification as a continuous variable; all other contract attributes (X_{jit}) were dummy coded, thus taking a value of one if present in an insurance contract and zero otherwise. The influence of the insurance premium and all other contract attributes on utility were captured by the parameters β_q and β'_q, respectively. We specify the membership function to assess the probability of an individual to belong to a specific segment q based on farm and farmer characteristics (i.e. age, education, gender, farm size, insurance status, relevance of weather risks, insurance trust, and risk preferences). Qualitative information enters the model as dummy variables, and age enters the membership function as a continuous variable. Psychographic measures were standardised to account for their measurement on different scales.

4 Results and Discussion

4.1 Farm and Farmer Characteristics

In total, the analysis builds on 143 valid responses. As stated above, however, only farmers who farm less than 100 hectares (61 individuals) participated in the DCE. While a rule of thumb for minimum sample sizes for DCEs is that a sample of 50 individuals might be just acceptable for an unlabeled design, the reader is advised to proceed with caution because of the small sample size and the consequent limited statistical power of the analysis (HENSHER et al., 2005: 193f.).

Table 2 reports descriptive information and compares the sample to the 2016 agricultural census data. For the analysis, we divided farms into small-sized farms (≤50 hectares), medium-sized farms (51 to 100 hectares), and large-sized farms (>100 hectares). About 60% of the sampled individuals farm more than 100 hectares; the remaining 40% are divided equally between small and medium-sized farms. As reported in the census, however, the vast majority of farms in Lithuania farm less than 20 hectares (EUROSTAT, 2020). Their underrepresentation in the present sample could result from the visitor structure of the agricultural exhibition. Exhibitions showcasing new farm equipment are possibly more attractive to holders of larger farms, who undertake significantly larger investments than small and medium farms, which invest limited amounts due to their low annual farm income (FEI COMPASS, 2020).

On average, respondents were 43 years old. The sample thus corresponds well to the average age of market-oriented Lithuanian farmers (46 years; EUROPEAN UNION, 2017). Looking at age classes reported in the census, however, it is evident that farmers below the age of 44 years are overrepresented at the expense of older individuals (>65 years) working beyond the retirement age. The sample was also better educated. Approximately 70% of the respondents have full agricultural training, while the census reports that most Lithuanian farmers learned the profession through practical experience only. Younger farmers have higher educational status throughout the EU (EUROPEAN UNION, 2017) – a higher education level thus is to be expected from a younger sample. Moreover, younger farmers invest more than older farmers (EUROPEAN UNION, 2017), suggesting they are more inclined to visit agricultural exhibitions. Age class distribution and educational status are comparable among large-sized, medium-sized, and small-sized farms.

More than 90% of respondents associated with large-sized farms and almost 80% associated with medium-sized farms report farming as their primary occupation. That holds for only 27% of respondents from small-sized farms and is in line with studies reporting that farm size is inversely related to the extent holders pursue other gainful off-farm activities (EUROSTAT, 2020; DABKIENĖ, 2020). Regarding farm types, crop farming is most dominant, with about 68% of medium farms and 77% of large farms specializing in crop farming. The sample of small farms is more diverse, as they also report livestock farming and the cultivation of specialty crops. Compared to the census data, crop farming is overrepresented at the expense of livestock farming (EUROSTAT, 2020). Crop farms and mixed farms, however, are the relevant target population for crop insurance. Looking at farm locations, most respondents are from the central lowlands, i.e., the arable farming regions of Kaunas and Mariampole.

4.2 Farmers' Risk Preferences and Attitudes towards Insurance

For our first and second objective, we assess socio-economic, farm and psychographic characteristics by farm size (Table 3). 46% of sampled farms are currently insured. We find that about half of the large farms use insurance while small farms have a lower adoption rate (i.e. 30%), thus confirming earlier findings for Western European farms (SANTERAMO et al., 2016; DI FALCO et al., 2014; MERANER and FINGER, 2019). We, thus, cannot reject H1. It is further noteworthy, that the share of farms who use crop insurance is similar between medium and large-sized farms. We find, however, little correspondence between farm size and factors influencing the adoption of crop insurance. On average, farmers show moderate levels of trust in insurance services with means of 7.8 and 7.9 for trust in fair premiums and fair payments. Both measures show high correlation (cor = 0.824, p = 2.070e-11), and we, thus, summed both items as a measure of 'Overall trust'.

Table 2. Descriptive statistics

Variables	Full sample	Agricultural census (2016)[1]	Large farms[L] (>100 ha)	Medium farms[m] (51-100 ha)	Small farms[s] (≤50 ha)
N	143	150,320	82	28	33
Age (Mean, SD; years)	43.14 (13.89)	46[2]	43.11 (13.52)	40.1 (12.2)	45.8 (15.9)
Age (Class; %)					
<25 years	7.7	1.0	6.1	14.3	6.1
25-44 years	43.4	18.9	43.9	46.4	39.4
45-64 years	44.8	49.4	45.1	39.3	48.5
>64 years	4.2	30.8	4.9	0.0	6.1
Female (%)	19.6	44.9	14.8	28.6	25.0
Agricultural education (%)					
None (practical experience only)	7.0	61.4	7.3	7.1	6.1
Basic training	19.6	22.2	19.5	17.9	21.2
Full agricultural training	72.7	16.4	73.2	75.0	69.7
Other/Not classified	0.7	0.0	0.0	0.0	3.0
Farming as primary occupation (%)	74.8	72.2	92.7	78.6	27.3
Farm size (%)					
≤20 hectares	13.3	84.7			57.6
21-50 hectares	9.8	8.1			42.4
51-100 hectares	19.6	3.7		100	
101-500 hectares	45.4	3.5 (>100)	79.3		
>500 hectares	11.9		20.7		
Farm type (%)					
Crop farming	69.9	40.4	76.8	67.9	54.5
Livestock farming	5.6	28.6	2.4	7.1	12.1
Special crops	5.6	5.1	0.0	0.0	24.2
Mixed cultivation	18.9	18.8	20.8	25.0	9.1
Not classified	-	7.1	-	-	-
Region (%)					
North (Siauliai, Panevedys)	22.4	no data	29.3	14.3	12.1
Central (Kaunas, Mariampole)	53.8		51.2	60.7	45.5
West (Klaipeda, Telsiai, Taurage)	14.7		9.8	17.9	24.2
South-East (Vilnius, Utena, Alytu)	9.1		6.1	7.1	18.2

[1]:EUROSTAT (2020); [2]:EUROPEAN UNION (2017)
Source: own calculations

Overall, we find no significant differences in trust by farm size. Similarly, while weather-related risks are perceived as relatively high, there are no statistically significant differences across farms. Moreover, farmers' general risk preferences do not differ by farm size. For farming-specific risk preferences, however, there is a significant difference between small and medium farms - with a higher stated willingness to take risks among individuals farming less than 50 hectares. In general, we find a significant positive correlation between the general risk measure and the normalised farming-specific risk measure (cor = 0.523, p = 2.07e-11).

The modal response to the 11-point self-assessment of respondent's willingness to take risks on their farms is 6 (with a mean of 5.87). Sampled farmers are thus on average risk-neutral to slightly risk-seeking. This finding contrasts previous literature on European farmers' risk preferences – as most studies suggest they are risk-averse (IYER et al., 2020). This conclusion, however, is drawn mainly from studies in Western Europe and without differentiating by farm size. More in line with our findings are KOBUS and WĄS (2017), who report that risk aversion and concern about severe weather risks have decreased among Polish farmers since the country's accession to the EU

Table 3. Farm and farmer characteristics by farm size

Variables	All farms (n = 143)	Large farms[L] (n = 82)	Medium farms[m] (n = 28)	Small farms[s] (n = 33)
Currently insured (%)[a]	45.5	54.9	55.6	30.3
Trust in fair premium[1]	7.77 (1.93)	7.72 (1.83)	7.54 (1.88)	8.09 (2.21)
Trust in fair payment[1]	7.87 (2.08)	7.79 (2.08)	7.89 (2.15)	8.06 (2.08)
Overall trust[2]	0 (1)	-0.03 (0.975)	-0.06 (0.97)	0.13 (1.10)
Relevance of …[3]				
Hail	4.02 (0.92)	4.13 (0.89)	4.07 (0.77)	3.70 (1.07)
Storm	3.94 (0.84)	3.88 (0.84)	4.21 (0.57)	3.88 (0.99)
Heavy rain	4.10 (0.85)	4.05 (0.87)	4.32 (0.55)	4.06 (0.97)
Relevance of weather risks[4]	0 (1)	-0.00 (0.982)	0.23 (0.68)	-0.19 (1.23)
General risk preferences[5]	0 (0.77)	-0.10 (0.83)	-0.04 (0.64)	0.27 (0.66)
Risk preferences farming[6]	5.87 (2.38)	5.73 (2.50)	5.43[s**] (2.27)	6.58[m**] (2.05)
Risk preferences farming (mean centred)	0 (1)	-0.06 (1.05)	-0.18[s**] (0.95)	0.30[m**] (0.86)

Notes: Values are means (standard deviations) or percentages. [1] Scale from 0 = no trust at all to 10 = complete trust. [2]:Summative scale; mean centred. [3]:Scale from 1 = not at all to 5 = very much. [4]:Summative scale; mean centred. [5]:Risk measure based on FALK et al. (2018, 2016); staircase and stated risk measures combined using weights. [6]:Scale from 0 = completely unwilling to take risks to 10 = very willing to take risks on the farm. ***, **, * indicate statistically significant differences in means between sub-samples at the 1, 5 and 10% level, respectively. [a]:Fisher's exact test (L-m-s): p=0.031
Source: own calculations

because of the income stabilization impact of EU CAP support (DABKIENĖ, 2020).

For further analysis, we split the sample into currently insured and non-insured farms (Table 4). These sub-samples do not significantly differ in terms of education and gender (H4 and H5 are rejected). We find, however, significant differences in age, the relevance of weather risks, and trust. First, looking at age, it is evident that older individuals are more likely insured. This finding is consistent with MERANER and FINGER (2019) and MENAPACE et al. (2016). We thus cannot reject H3. Moreover, individuals with higher trust in insurance services and perceived higher risk exposure are more likely insured. This conforms to expectations (H7 and H8 cannot be rejected), especially since farmers with higher risk exposure are more prone to economic risks from crop failure. Yet, as LIEBE ET AL. (2012) note, their higher demand for insurance points to issues of adverse selection.

Most medium-sized farms are insured and 78% report farming as their primary occupation, while few small-sized farms use insurance but over 70% report off-farm income. We thus cannot reject H2. Compared to small-sized farms, medium farms are slightly more risk averse in farm-related risk preferences. But among both groups of farms, farming-specific willingness to take risks is significantly higher for insurance adopters (H6 cannot be rejected). This finding is counterintuitive at first, but behavioural research provides possible explanations. Moral hazard could be one reason why insured farmers are more willing to engage in risky behaviour. Another explanation could be that the insurance decision itself is risky, either because of the uncertainty associated with pay-outs or insurance services not being well understood (HOLDEN and QUIGGIN, 2017; LIEBE et al., 2012). Therefore, relatively risk-loving individuals could be more willing to accept the 'insurance risk'.

Table 4. Farm and farmer characteristics of insured and non-insured farms

Variables	All farms		Small and medium farms	
	Currently insured (n=65)	Non-insured (n=78)	Currently insured (n=20)	Non-insured (n=41)
Age (years)	45.2 (13.5)	41.4* (14.0)	48.0 (13.1)	40.9* (14.7)
Full agricultural training (%)	40.91	49.09$^{n.s}$	12.1	24.9$^{n.s}$
Female (%)	12.9	15.1$^{n.s}$	5.3	10.7$^{n.s}$
Farming primary occupation (%)	48.6	58.4$^{n.s}$	10.2	20.8$^{n.s}$
Relevance of weather risks	0.30 (1.13)	-0.25*** (1.13)	0.53 (0.66)	-0.25*** (1.09)
Overall trust	0.27 (0.84)	-0.23*** (1.07)	0.45 (0.78)	-0.15** (1.10)
General risk preferences	0.03 (0.75)	-0.03$^{n.s.}$ (0.79)	0.21 (0.59)	0.09$^{n.s.}$ (0.07)
Risk preferences farming (mean centred)	0.17 (0.93)	-0.14$^{n.s.}$ (1.04)	0.52 (0.76)	-0.14*** (0.94)

Notes: Values are means (standard deviations) or percentages. ***, **, * indicate statistically significant differences in means between insured and non-insured sub-samples at the 1, 5 and 10% level, respectively.
Source: own calculations

4.3 Preferences for MPCI Contract Attributes of Small and Medium Farms

For our third objective, we obtain the results from the LC model. Table 5 reports small and medium-sized farmers' preferences for MPCI contract attributes and summarises the utility function parameters (β_q) and the segment membership parameters (θ_q). Considering the log likelihood values at convergence and the AIC and BIC statistics, a two segments model was chosen. 27% of the sampled farms belong to segment 1; the majority (73%) belong to segment 2 (H9 cannot be rejected).

In contrasting both groups of farms, segment 1 was labelled "Prospective small adopters". The segment membership coefficients suggest that small farms and farmers who feel more exposed to weather risks are significantly more likely to belong to this group. Also, individuals with relatively higher trust in insurance services were more likely to belong to segment 1. Moreover, the negative and significant ($p < 0.01$) ASC parameter for this segment indicates a negative attitude towards the "no insurance" option; i.e. a positive attitude towards the new insurance product. Overall, segment 1 thus reflects a market segment with a potential need for crop insurance that is not yet sufficiently covered. In segment 2, however, individuals are indifferent to the new insurance product (the ASC parameter is not statistically significant). Farmers are more likely to belong to this segment if they are currently insured, have off-farm income and have a below-average perception of weather risk exposure. They are either less dependent on farm income or financially less affected by severe weather events and were thus labelled "Less concerned policyholders". Age and education were no important determinants of segment membership.

Further results of the segmentation are the differences in the general and farming-specific risk preferences. While farmers who are more risk-seeking in general are more likely to be *less concerned policyholders*; but also those farmers who are relatively more risk-averse in farming decisions. This contrasts evidence of negative correlations between risk-aversion and insurance adoption (LIEBE et al., 2012; MENAPACE et al., 2016; MERANER and FINGER, 2019) but is in line with HELLERSTEIN et al. (2013). As argued earlier, adopting insurance itself is risky due to uncertainties in pay-outs or because insurance services are poorly understood (HOLDEN and QUIGGIN, 2017; LIEBE et al., 2012). Thus, our findings suggest that the willingness to take the 'insurance risk' correlates with the general risk attitude, while the farming-specific risk preference measure may better capture on-farm risk management strategies.

Turning to the utility parameter estimates for segment 1, the parameter on the insurance premium is negative and statistically significant ($p < 0.01$) and shows that prospective small insurance adopters prefer

Table 5. DCE model results for MPCI contracts

	segment 1: *Prospective small adopters*	**segment 2:** *Less concerned policyholders*
Preference (utility function) parameters (β_q from equation 1)		
Contract duration		
One year	-0.841‘ (0.506)	0.625* (0.291)
Automatic extension		
Yes	-1.971** (0.612)	0.285 (0.272)
Deductible		
No	0.448 (0.571)	-0.406 (0.327)
Contracting/calculation		
Farmer online	-1.985* (0.887)	0.672‘ (0.398)
Intermediaries	-1.374‘ (0.734)	0.774* (0.315)
Cultivation register		
Farmer online	-1.708* (0.757)	-0.326 (0.365)
Intermediaries	1.040 (0.715)	-0.929* (0.379)
Invoice		
Full payment in July (0:100)	3.567** (0.912)	-0.680’ (0.389)
Instalment 30:70	2.799** (0.844)	0.587 (0.516)
Premium adjustment		
Bonus/Malus	-1.161 (0.742)	0.065 (0.353)
Premium	-0.241** (0.112)	0.185** (0.070)
ASC	-6.867** (2.444)	0.519 (1.443)
Membership function parameters (θ_q from equation 2)		
Constant	-	2.548 (1.770)
Age	-	0.064 (0.042)
Female (1 = yes)	-	-9.072*** (1.833)
Full agricultural training (1 = yes)	-	-0.645 (0.972)
Farm ≤50 hectares (1 = yes)	-	-2.239* (0.932)
Currently insured (1 = yes)	-	3.877** (1.224)
Relevance of weather risks	-	-1.514** (0.518)
Overall trust	-	-1.063* (0.460)
Risk preferences farming (mean centred)	-	-1.977*** (0.547)
General risk preferences	-	1.440’ (0.766)
segment shares	27%	73%
Log likelihood	-174.57	
AIC/BIC values	417.147 / 535.488	

Notes: 240 observations. Coefficients are means (standard errors). Membership parameters are probabilistic and normalised to zero for segment 1. Variables are dummy-coded. Reference levels: three years, no automatic extension, 20% deductible, regional office for both contracting and submission of the cultivation register, instalment payment 50:50 and a constant premium. ***,**,*, ’ indicate statistical significance at the 0.1%, 1%, 5%, and 10%-level, respectively.
AIC/BIC values for 3 segments: 431.028/625.944; AIC/BIC values for 4 segments: 474.945/746.435
Source: own calculations

lower-priced insurance contracts. For segment 2, however, the parameter is positive and statistically significant and thus counterintuitive at first. This result is difficult to explain, but this segment of policy holders familiar with crop insurance may be loss averse. For example, LAMPE and WÜRTENBERGER (2020) show increased insurance demand with loss averse farmers because of a better understanding of the loss-hedging benefits of insurance. Moreover, this segment could associate a higher price for the insurance with fairer or higher pay-outs. Another explanation could be that existing (and potentially more expensive) insurance contracts with which the respondents were familiar influenced the hypothetical choices, especially as this segment is more likely insured. A third explanation relates to issues of consequentiality. Insured farms but also farms with lower exposure to weather risks tend to belong to segment 2. These farmers may perceive the choice task as less consequential and conclusions drawn by the insurance company for the new insurance product as less relevant for their farms. Such considerations affect choice behaviour in a way that it deviates from the classical assumptions of rational decision-making and utility maximization (CARSON and GROVES, 2007; VOSSLER et al., 2012; ZAWOJSKA et al., 2019).

"Premium adjustments" and "deductibles" did not affect insurance adoption. Even though puzzling, we are not the first to report non-significant effects of the deductible in a DCE on crop insurance. Our findings are in line with LIESIVAARA and MYRRÄ (2014), who also report a non-significant effect in one of their models. They suggest that the expected indemnity payments of the crop insurance are more influential than the deductible. Future research should take this into account. But preference heterogeneity exists for the length of the insurance contract and its automatical renewal. While segment 2 is more likely to sign one-year contracts and indifferent between extension options, segment 1 shows a tendency towards multi-year contracts but is simultaneously less likely to take out insurance if contracts are automatically renewed. Moreover, segments differ in their payment preferences. While the payment arrangements has limited influence on the insurance adoption of segment 2, prospective small adopters prefer payment deferrals as indicated by the positive and significant parameters for the 30:70 and 0:100 payment options. Payment later in the growing season may coincide with the first instalments of the crop harvest or insurance pay-outs and thus seems appropriate for small farmers with low on-farm income.

Finally, we turn to the contracting phase and fulfilling the obligations for financial support, which are covered by the attributes "contracting and calculation" and "submission of the cultivation register". Our findings stress their importance in the insurance decision but also imply significant heterogeneity across segments. First, prospective small insurance adopters are less likely to conclude contracts online or via intermediaries. Second, they avoid contracts requiring the online submission of the cultivation register. Consequently, they prefer assistance in concluding a contract and fulfilling administrative obligations for financial support. An explanation could be this group's lower general willingness to take risks since contracting and submissions without assistance are more error-prone and thus riskier, but could also arise from low familiarity with crop insurance. Moreover, they are more likely to purchase insurance if the regional office is involved in contracting as well as submitting the cultivation register. Taken together, this could point to their demand for more simple ways for meeting the administrative requirements for crop insurance. In contrast, farmers who hold and thus are familiar with insurance (segment 2), are more inclined to purchase insurance online or via intermediaries. They are, however, less likely to adopt insurance if submitting the cultivation register involves insurance company representatives. Thus, there is mixed evidence on the effects of risks and efforts involved in contracting on the insurance decision, as preferences for new contracting and compliance options and payment schemes vary by segment. However, they were important determinants of insurance choice.

5 Conclusions

We contrast the current state of insurance adoption by Lithuanian farmers and assess risk preferences and attitudes towards crop insurance for large, medium, and small-sized farms. In addition, we investigate how contract attributes and farm and farmer characteristics affect the adoption of crop insurance in Lithuania. In particular, we assess the effect of risk preferences and the effort associated with contracting and fulfilling obligations of subsidised insurance on smaller farms. Given the currently low insurance adoption in Lithuania, we design a hypothetical new insurance product targeting smaller farms and use a DCE to elicit farmer's willingness to participate in the insurance programme. Our study thereby furthers the understanding of risk preferences and insurance demand in

CEE countries. It highlights preference heterogeneity in contract attributes and provides first conclusions on the design of subsidised MPCI contracts targeting smaller farms.

Our results indicate that the adoption of crop insurance is positively associated with risk exposure and trust in insurance services. While insured and non-insured farms did not differ in their general risk preferences, those uninsured were less willing to take farming-specific risks. Overall, this implies issues of moral hazard and adverse selection and offers first practical implications. Since risk exposure affects insurance premiums, reliable weather and yield loss data are essential for sound calculations. Yet, these data are hard to come by in emerging insurance markets. Investing in the network of weather stations or satellite technology, thus, could facilitate just and individual premium calculations. Still, the design of subsidised insurance products needs to account for moral hazard and adverse selection. In particular, introducing deductibles and bonus malus systems can tackle these problems, especially as these attributes had no negative effect on the willingness to purchase insurance. Moreover, insurers in emerging insurance markets should foster trust in their services; for example, by collaborating with institutions familiar to farmers.

Our findings also suggest preference heterogeneity for contract attributes across farms and the potential for higher insurance rates among smaller farms if insurance schemes lower the risks and efforts associated with contracting and compliance. This has several implications for practice and policy. First, insurers could enable deferred payment of the invoice for small-sized farms. Second, simpler ways for meeting the notification requirements of subsidised insurance schemes could be developed jointly by insurance companies and policymakers to assist smaller farms in contracting and compliance. Investments in assistance, educating insurance averse farmers about the loss-hedging benefits, and better targeting insurance schemes seem appropriate because of higher achievable adoption rates and consequently the cost-effectiveness of public support.

Although this study is exploratory in nature, our results provide starting points for future research on the design and marketing of insurance products for smaller farms. First evidence of higher insurance adoption when contract design reduces the risks and efforts associated with subsidised insurance is informative for policy makers and insurers. Thus, these findings suggest that further research on contract design for small farms may be fruitful and should particularly consider contract characteristics that go beyond mere subsidy top-ups. Nevertheless, our study is not without limitations. These arise mainly from the data collection and small sample size for the DCE, which limit its representativeness. Moreover, one could assume that the insurance decision of smaller farms is a household decision, whereas we focus on the individual. Another assumption inherent in our study is that each contractor would apply for the premium subsidy. We leave these aspects for future research. Additional implications for research arise from our measures of risk preferences and the differences in their ability to explain insurance decisions. While our results should be corroborated with further studies, our findings suggest that future studies will benefit from measuring general and context-specific risk preferences as this allows a deeper understanding of risk as a driver in farmer decisions. Research should also further explore the role of consequentiality and loss aversion in stated choice experiments for crop insurance and if there are differences between insured and non-insured farmers. This could benefit the design of insurance contracts and extension services targeting prospective adopters. Finally, yet importantly, our limited success in approaching small-sized farms through an agricultural exhibition is an important lesson not only for researchers, but also for insurance companies targeting small-sized farms. They may need to consider alternative outreach activities.

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Acknowledgements

The authors are grateful to personnel of Vereinigte Hagel VVaG and VH Lietuva for their support in the design of the hypothetical insurance product and the data collection. Furthermore, we gratefully acknowledge comments and suggestions from the editor and two anonymous reviewers on an earlier version of the manuscript. The views expressed here are those of the authors and do not necessarily reflect the views of the authors' affiliations.

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