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Overconfidence And Crop Insurance Demand

A Minor Field Study in Tigrai, Ethiopia

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Abstract

This thesis investigates overconfidence and its effect on crop insurance demand in one of the most drought-prone regions in the world: Tigrai in Northern Ethiopia. As the formal safety-nets in this developing country are almost non-existent, the population is highly vulnerable to natural disasters. Microinsurance has been advocated by many as a solution to this problem, but demand has so far been surprisingly low. Through a survey on 201 farmers, we measure three different aspects of overconfidence and relate them to farmers' willingness to pay for crop insurance. To our knowledge, we are the first to study the relationship between overconfidence and crop insurance demand in a developing country. We find strong evidence of overconfidence, in line with previous research. However, our finding of weak indications of a positive relationship to crop insurance demand contradicts studies from USA. The differing results primarily stem from contextual differences, suggesting that the relationship cannot be generalized between countries.

Keywords: Overconfidence, Crop Insurance, Microinsurance, Agriculture, Ethiopia
JEL Classifications: D03, G22, Q12

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1. Introduction

What happens to a farmer when the harvest fails? In the western world farmers have suitable means to cope with such negative events. Apart from social security, various forms of crop insurance are available, but in the developing world this is generally not the case. There, farmers have low, if any, possibilities to sufficiently manage a harvest failure and the insurance sector is severely underdeveloped or non-existent. However, microinsurance targeting low-income people has emerged during the past years as a risk-management tool for developing countries.

So, why do the poor not insure? One of the great disappointments with crop microinsurance has been low demand, even for highly subsidized policies. The low demand is puzzling and proposed explanations for this have been risk-aversion, inefficient distribution and cash-constraints (Akotey et al. 2011 and Dercon et al. 2011). However, could it also be the case that behavioral biases affect demand?

One of the most common cognitive biases in the literature of psychology is overconfidence, a bias causing people to hold unrealistically positive views of themselves and the future. DeBondt and Thaler (1995) refer to it as "perhaps the most robust finding in the psychology of judgment". The practical implications of overconfidence have mainly been studied in finance, but overconfidence has also been accused of causing everything from labor strikes to war. Interestingly, the relationship between overconfidence and crop insurance demand has only been studied on American farmers and the results indicate both a negative relationship and no relationship at all.

In this thesis we make the, to our knowledge, first study of overconfidence and crop insurance demand in a developing country. We study if overconfidence is an important determinant of Willingness To Pay (WTP) for a crop insurance scenario in Ethiopia. The purpose is to assess whether overconfidence can be an alternative explanation for the low demand found in agricultural microinsurance.

The place of study, Tigrai in northern Ethiopia, is one of the most drought-prone areas in the world with devastating famines during the 1970s, 1980s and 1990s in recent memory. Ethiopia is further one of the poorest and most agriculture-dependent

countries in the world, with agriculture contributing to 46.6 percent of GDP and employing 84 percent of the population. Here, crop microinsurance could play a pivotal role for economic growth as well as food and income security. Microinsurance, in general, has experienced strong growth in the past years and the Ethiopian government has announced plans to make it a key national policy in the future. Despite this, only four agricultural insurance policies were offered in the country in 2012 with the number of policyholders so far being small.

In this study, we conduct a quantitative survey on Ethiopian farmers where we measure three different aspects of overconfidence, namely overplacement, overestimation and overoptimism. We also elicit WTP for an insurance scenario instead of studying actual participation. This enables conclusions of whether a causal relationship between overconfidence and crop insurance demand exists which could not be drawn in previous studies in USA (Shaik et al. 2005, Egelkraut et al. 2006 and Umarov 2009). Furthermore, we study the effects of overconfidence not only in agricultural, but also in general knowledge and suggest how to control the overconfidence indicators for actual performance, which have not been done in previous studies either.

The thesis is organized as follows: In section 2 we review the relevant literature. In section 3 we present a model for the relationship between overconfidence and insurance demand and derive our hypotheses. In section 4 the method for analysis and data collection is explained. The data is described in section 5 and in section 6 we present our results. Finally, we discuss our findings in section 7 and conclude the thesis in section 8.

2. Previous Research

2.1 Overconfidence

Overconfidence is a cognitive bias causing people to have unrealistic believes about themselves and the world. As concept overconfidence is rather general and can be specified in more detailed categories. In this thesis we will distinguish between three different types of overconfidence in the analysis of overconfidence and its relationship to crop insurance demand. The three types are; (a) overplacement of one's performance relative to others, (b) overestimation of one's actual performance and (c) overoptimistic believes about the future.

Overplacement is a belief that one is better compared to others than one actually is. It is mostly studied by asking people to compare themselves relative to the average person in a defined group and there are several theories for the strong overplacement that is often found. Kruger (1999) argues that overplacement is caused by individuals putting too much emphasis on their own performance and skills and neglecting those of others'. Moore and Cain (2007) present a related explanation, which is that people have more information about themselves than about others and therefore think they are better than they actually are. Also, overplacement can be caused from people recalling unrepresentative and below-average comparison targets when asked to compare themselves against an average person (Weinstein 1980) or because they want to present themselves in a desired fashion (Schlenker 1980).

Alicke (1985) find that overplacement is especially strong for personal traits and that it increases with the desirability and controllability of the trait. Furthermore, attributes that are specific and objectively measurable often result in weaker overplacement, whereas vague and private attributes result in stronger (Moore 2007).

One of the early and most famous empirical studies on overplacement, Svenson (1981), finds strong overplacement in perceived driving skills among American and Swedish students. Since then, overplacement has been studied in various areas, predominantly in the industrialized world, and it has been found to be a persistent phenomenon. In one of few studies in the developing world, Doerr et al. (2011) find strong overplacement on

Ethiopian farmers, which suggests that the phenomenon is not limited to the industrialized world.

Overestimation is an absolute measure focusing on the overestimation of one's actual performance in a specific task. A theory for the cause of it is that individuals have imperfect information about their performance, causing their estimates to differ from their actual performance. With imperfect information people's estimates tend to be regressive to the mean causing overestimation of own performance when performance is low and underestimation when it is high (Moore and Healy 2008). Similarly with overplacement, overestimation can also be caused by the desire to present oneself in a good way.

Fischhoff and Lichtenstein (1977) is one of the first studies to empirically investigate overestimation. Both Fischhoff and Lichtenstein (1977) and Yates (1990) find that people overestimate their score on general knowledge questions. The former also find that people with low scores overestimate their score more often than those with high scores. This is however challenged by Klayman et al. (1999) who use three new experiments and report that under- and overestimation do not vary with the difficulty of the questions.

Overoptimism is defined by us as the tendency to be unrealistically optimistic regarding the future when taking into account the information one possesses. The literature related to overoptimism mainly focuses on comparative optimism, i.e. people's beliefs that positive events are more likely to happen to them than to others and that negative events are less likely. Despite the slight difference, many insights can be drawn from the literature.

Shepperd et al. (2002) review the literature on comparative overoptimism and suggests that because it feels good to think that positive events are likely to happen and negative events are unlikely, people do it. Also, people have a need for control that leads to an unwarranted illusion of control and overestimation of the ability to control positive and negative events. Therefore, what we believe will happen is what we want to happen. Windschitl et al. (2010) presented another theory for the causes of comparative optimism. They argue that people are prone to make overoptimistic predictions because

evidence in favor of a desirable outcome is perceived as strong and valid and people also require less evidence to believe in a desirable outcome.

One of the most cited empirical studies on overoptimism, Weinstein (1980) finds strong overoptimism in subjects' perceived chances of experiencing positive and negative life events. It is strongest when an event is perceived as controllable and subjects have some degree of commitment or emotional investment in the outcome. Related to this, Perloff and Fetzer (1986) conclude that the desirability of an event affects comparative optimism particularly when it is personally important. The timing of feedback has also been shown to matter for optimism. In a study on participants in a medical test, those who thought that they would receive the results of the test within minutes were less optimistic about the results than those who thought they would receive it weeks into the future (Taylor and Shepperd 1998).

2.2 Overconfidence and Insurance

Apart from being proposed as a cause of everything from labor strikes (Neale and Bazerman 1985) to war (Johnson 2004) overconfidence has also been found to have other important practical implications. It has been found to cause excessive trading in financial markets (Glaser and Weber 2007) and distortions in corporate investments, such as excessive rates of mergers and acquisitions (Malmendier and Tate 2005). More interestingly, overconfidence has also been shown to affect insurance demand. Cebulla et al. (1999) report that people who are overoptimistic, measured as considering the risk of losing their own job as lower compared to others, purchase unemployment insurance to a lesser extent. Similarly, optimism regarding the likelihood of accidents, leading to loss of income, decrease demand for unemployment insurance.

Previous literature has proposed a theory for why overconfident people might underinsure, Sandroni and Squintani (2007, 2012), and how it could be an explanation for the low demand for crop insurance, Egelkraut et al. (2006) and Umarov (2009). The theory is that an overconfident person assigns too low probabilities to the likelihood of negative events and believes that she is unrealistically good at preventing and coping with these events. This in turn results in a lower perceived value of insurance than the actual value.

Sandroni and Squintani (2007, 2012) develop a model incorporating overconfident individuals in the basic framework of competitive insurance markets with adverse selection by Rothschild and Stiglitz (1976). In the original model there exist two rational individuals who are either high-risk or low-risk, seen from the perspective of an insurance company. To this setting a third, overconfident, individual is added. The overconfident individual is defined as being objectively high-risk but perceiving herself as being low-risk. This makes the overconfident individual's perceived value of insurance lower than her actual value, causing her to underinsure.

Surveying the literature on overconfidence Sandroni and Squintani (2004) conclude that "individuals who underestimate individual risk are less prone to adopt precautions facing risk". Weinstein and Lyon (1999) share this view and they find, in an experimental study, that overoptimism about personal risk makes it less likely that people undertake precautionary actions.

To our knowledge, the papers that exist on the relationship between overconfidence and crop insurance are all from USA (Pease et al. 1993, Egelkraut et al. 2006, Shaik et al. 2005, Umarov 2009). In addition, they only focus on overplacement and overoptimism regarding agriculture. Pease et al. (1993) study Kentucky farmers' expectations of future yields and find them to be significantly higher than the expected yield generated by the usual method to price multi-peril crop insurance. One conclusion is that this is due to overconfidence and the authors suggest this to be a potential reason for the generally low demand for crop insurance. Egelkraut et al. (2006) are among the first to investigate the relationship between placement - and optimism bias and the actual use of crop insurance. They find that farmers' crop insurance use is negatively affected by risk preferences, the yield variability of the region in which the farmer operates, but also under-/overplacement and under-/overoptimism. Perceptions that one's yield is larger than average (overplacement) has a negative effect on crop insurance usage and larger than average perceived variability in yields (underplacement) has a positive effect on usage. However, they argue that the effects of over- and underconfidence are quite low which may be due to a high proportion of their sample already using crop insurance. Therefore they encourage future research to study the effects of overconfidence on crop insurance in different contexts.

In accordance with Egelkraut et al. (2006), Shaik et al. (2005) find that farmers who expect to have relatively higher yields or expect relatively higher prices are less likely to insure their crops. They also see that farmers who believe that the future yield and price risks are high are more likely to insure. Contrasting results to these are Sherrick et al. (2004) and Umarov (2009). Sherrick et al. (2004) find a positive relationship between subjective expected yield and crop insurance usage. Umarov (2009) investigates the relationship between overplacement and crop insurance participation and does not find evidence that there is a relationship. Umarov (2009) differs from the other studies by trying to control for the actual yield of the subjects in his sample. To do this he includes, in the regressions, the average county yields where the farmers operate.

3. Model and Hypotheses

3.1 A Model of Overconfidence and Insurance

In this section we propose a model for why an overconfident individual would have lower WTP for crop insurance than a well-calibrated individual. The presented theories from the literature as well as the model by Sandroni and Squintani (2007, 2012) are used and adjusted to fit our study. As can be concluded from previous research the causes of overconfidence all relate to an inability to analyze the world in an objective way. Specifically what causes overconfidence is a failure to account for information about oneself and others, a failure to recall a valid comparison target and a desire to reach specific conclusions.

When an individual thinks about her need for insurance she may retrieve from memory information about her past performance and skills as well as previous costs for bad outcomes in general and within the insurable area in particular. However, the fact that she does not have perfect information about herself can cause her to overestimate herself. She will also risk overplacing herself in these areas, since she does not have perfect information about other people and may use an inappropriate person for comparison. Furthermore, when she considers the likelihood of negative events she may recall from memory similar events that have happened and try to assess the probability of them happening in the future. In this process she will probably be affected by the

desirability bias causing her to be overoptimistic regarding how often negative events will happen in the future. For these reasons it is likely that she will be biased from the three types of overconfidence when assessing her need for insurance and as a consequence underinsure.

To analyze overconfidence and its relationship with WTP for crop insurance we include this information in the model of overconfident individuals and insurance, by Sandroni and Squintani (2007, 2012), and adjust it slightly to fit in our study. The model is a mathematical formalization of the theories and the model should therefore be seen as a complement to them.

We assume that there are two states of the world. In state 1 the harvest of a farmer is normal giving the farmer a wealth of W. In state 2 the harvest is bad creating damage d to the farmer, giving her a wealth of $W - d$. When the farmer assesses her WTP α_1 for an insurance policy she will consider the pre-determined payout α_2 she receives if the harvest is bad and the probability p thatit will be bad. We assume $\alpha_1 \geq 0$, $\alpha_2 \geq 0$. The perceived value of the insurance policy in the eyes of the farmer is thus:

$$V(W, d, \alpha_1, \alpha_2, p) = (1-p)U(W - \alpha_1) + pU(W - \alpha_1 - d + \alpha_2). \quad (1)$$

Where V is the farmer's perceived value of the insurance policy and $U(\ )$ is the farmer's utility function of wealth. We assume that U has $U' > 0$, so that more wealth always gives more utility. The maximum α_1 will be the amount that makes the farmer's perceived value of the insurance policy equal to the her perceived value without it:

$$(1-p)U(W - \alpha_1) + pU(W - \alpha_1 - d + \alpha_2) = (1-p)U(W) + pU(W - d). \quad (2)$$

Let us assume that there are two types of farmers in the world, one well-calibrated farmer and one overconfident farmer. They are identical except for the probability they assign to a bad harvest and the damage they expect from of a bad harvest. The probability the well-calibrated farmer assigns to a bad harvest is p_w (correct) and the probability the overconfident farmer assigns is p_o(incorrect), where $p_w > p_o$. The well-calibrated farmer's expected damage is d_w (correct) and the overconfident farmer's expected damage is d_o(incorrect), where $d_w > d_o$. p_o is biased from overconfidence because both the belief that one is unrealistically high-performing as well optimism regarding future events affect the perceived probability of a bad harvest. d_o is also biased from

overconfidence because unrealistic beliefs in how good one is at handling a bad harvest affects the perceived damage of a bad harvest. We are aware of the fact that there could be other factors than p and d that are affected by overconfidence and influence the perceived value of an insurance policy. However, to make the model relevant for our purpose we limit it to these aspects.

The perceived value of the insurance policy for the well-calibrated farmer is thus:

$$V_w(W, d_w, \alpha_{1_w}, \alpha_2, p_w) = (1 - p_w)U(W - \alpha_{1_w}) + p_w U(W - \alpha_{1_w} - d_w + \alpha_2). \quad (3)$$

And the perceived value of the insurance policy for the overconfident farmer is:

$$V_o(W, d_o, \alpha_{1_o}, \alpha_2, p_o) = (1 - p_o)U(W - \alpha_{1_o}) + p_o U(W - \alpha_{1_o} - d_o + \alpha_2). \quad (4)$$

Because the overconfident farmer assigns a too low probability to a bad harvest and expects damage from the bad harvest to be too low, she will perceive the insurance policy to be worth less than the actuarially fair price, reducing her WTP. The well-calibrated farmer, on the other hand, will perceive it to be worth the actuarially fair price. Therefore, the overconfident farmer's WTP will be lower than that of the well-calibrated farmer, $\alpha_{1_o} < \alpha_{1_w}$.

3.2 Hypotheses

The overall aim of this thesis is to investigate if farmers' overconfidence negatively affects demand for crop insurance. As we have seen from previous research, overconfidence seems to be prevalent in different areas and contexts. Because of the large body of research that exists, many papers take the bias as given when studying it as a cause of different actions. This is done even when there are reasons to suspect that it is non-existent (Merkle and Weber 2011). We suspect that overconfidence could be lower in Tigrai, due to its history of harvest failures and famines, than in other parts of the world. Therefore, we need to investigate the existence of overconfidence to be able to draw meaningful conclusions about the relationship to insurance demand. Results indicating a negative relationship are relatively uninteresting in practice without knowing if the population is overconfident, underconfident or well-calibrated.

Even though there are factors in Tigrai that may reduce overconfidence and one shall be careful in generalizing previous research across contexts, we believe that the three types

of overconfidence will be found among Ethiopian farmers. Partly because the findings of Doerr et al. (2011) support it, but mainly because the underlying causes of the biases relate to the workings of the human mind, which should fairly be generalizable across countries. Based on these considerations our first hypothesis is:

Hypothesis I: *Farmers are overconfident.*

Derived from our proposed model and previous findings we have reasons to believe that all three types of overconfidence reduce WTP for crop insurance. The intuitive explanation that farmers, who are overconfident in themselves and the future prospects, find insurance less attractive is also compelling. As we have seen, papers studying the relationship to insurance support this theory. However, previous studies in USA have come to different conclusions regarding the relationship to crop insurance, with a larger part of the studies finding that overconfidence reduces the use of crop insurance. Therefore, it is not evident that the relationship will be negative in this context. Based on this discussion our second hypothesis is:

Hypothesis II: *Farmers' overconfidence reduces willingness to pay for crop insurance.*

4. Method

4.1 General Method

In this section we briefly present the method we use in this thesis and in subsequent sections it will be described in more detail.

Hypothesis I is ideally tested in a context where overconfidence is expected to be the lowest, as any significant findings there would have higher validity, everything else being equal. Therefore, the drought-prone Tigrai, with its history of harvest failures and famines, is a well-suited locality. Overconfidence is preferably measured through incentivized questions where subjects receive a bonus if their perceptions about themselves are correct, as this has been shown to result in more moderate overconfidence (Cesarini et al. 2006). Objective measures of actual performance should

be measured and compared to the perceptions to capture the true bias and enable incentivized questions. Incentives and objective measures of actual performance are therefore applied in the study, when it is possible.

To test hypothesis II a Random Control Trial (RCT) on an insurance policy would be optimal. As this is not practically feasible, random sampling and a crop insurance scenario is used to elicit WTP, which serves as proxy for demand. Derived from the model presented in 3.1, we use the following general estimation to test hypothesis II:

$$WTP = \beta_0 + \boldsymbol{\beta} Overconfidence + \boldsymbol{\beta} Controls + \varepsilon_i. \quad (5)$$

$Overconfidence$ is a vector consisting of an individual's various indicators of overconfidence and $Controls$ is a vector including overconfidence controls for actual performance, risk variables, and sociodemographic control variables. ε_i represents the random error in the regression model.

We measure the different types of overconfidence through five different indicators. They can be categorized with respect to two areas, agriculture and general knowledge. Previous studies on overconfidence and crop insurance (Egelkraut et al. 2006 and Umarov et al. 2009) have used agriculture-related measures, as they are likely to affect decisions related to crop insurance. However, since this is a novel area of research we want to expand the scope of understanding and investigate if overconfidence in other areas may also affect crop insurance demand. Therefore, we also measure overconfidence in general knowledge as it is a common area for measuring overconfidence.

Overconfidence is often measured by asking subjects about their perceptions about their performance or skills, or the future state of the world. To know if a subject is overconfident or has well-calibrated perceptions, objective measures of the individual have to be compared to the perceptions. This is important for analyzing the relationship between actual overconfidence and crop insurance demand. Previous studies have only studied the relationship between the subject's perception, which may not be true overconfidence, and crop insurance demand, without controlling for objective measures. In finance, however, where the study of cognitive biases is more common, overconfidence has been controlled for by comparing it to actual trading performance (e.g., Glaser and Weber 2007). Estimating individual measures of overconfidence also

enables the use of incentives on questions where subjects are asked to estimate their performance. This has been found to decrease overconfidence (Cesarini et al. 2006).

Of the five overconfidence indicators we study, three measures are of overplacement, one is of overestimation and one is of overoptimism. To measure overplacement we ask subjects about how good they perceive themselves to be compared to others. This is done with respect to their score on six general-knowledge questions, how good their last year's harvest was and their agricultural skills. We compare their answers with actual performance on the general knowledge-questions, with their actual last year's harvest, but we are unable to get information on actual agricultural skills. Therefore, overplacement of agricultural skills is only used to test hypothesis I, which in this case can be done without the comparison. Overestimation is measured by asking subjects what score they believed they had on the general knowledge questions and this is compared to their actual score. Overoptimism is measured by first asking about subject's memory of in how many of the last five years it has rained too little to get a normal harvest, which is then compared with their forecast of the future five years. All overconfidence indicators will be explained in more detail in 4.4.

4.2 The Survey

No data exist on overconfidence and WTP for insurance and we therefore collect data through a survey, which is included in appendix. The questions in the survey are based on theories and methods from previous research on insurance and overconfidence as well as field studies in Ethiopia and other developing countries. In general there is a trade-off between more advanced questions and measures and simpler questions appropriate for a mostly illiterate population not trained in probability theory. For every question that can be perceived as too abstract visual aids are used to enhance understanding. They consists of numbered scales to aid the subjects in questions regarding, for example, overconfidence and WTP. To demonstrate probabilities and randomization colored balls and numbered cards are used. This kind of visual aids have shown to improve understanding by subjects with no formal training in probability theory (Carlsson et al. 2004 and Corso et al. 2001). Four of the questions are incentivized and measure overplacement and overestimation in score on general knowledge questions,

risk preferences through a variant of Holt & Laury[1] and ambiguity preferences through a variant of the Ellsberg paradox[2].

4.3 Willingness to Pay for Crop Insurance

To elicit WTP, subjects are informed about a crop insurance scenario that gives a payout if the harvested amount falls below 50 percent of each subject's individual historical harvest. The frequency of this event is described to be approximately once every four years. Thus, this insurance covers all kinds of perils that a crop farmer may face, and is similar to a multi-peril crop insurance. We use a crop insurance scenario, to elicit WTP, because it has been used in several previous studies in developing countries, e.g., Hill et al. (2011) in Ethiopia, Dror et al. (2007) in India and Kouame and Komenan (2011) in Côte d'Ivoire.

After receiving the information about the insurance the subject is asked three questions to ensure understanding and then the information is repeated once again. Then the following question is asked:

"What is the maximum amount of money you would be willing to pay every month to get this protection for the whole year?"

The respondent is asked to choose on a payment scale ranging from ETB[3] 0 to 130. The use of payment scales is supported by Donaldson et al. (1997) who compare payment scales and open-ended approaches for eliciting WTP and conclude that the payment scale gives more valid values.

4.4 Overconfidence Variables

To elicit overconfidence in general knowledge the subject is asked six general knowledge questions, inspired by questions used in the Ethiopian Rural Household Survey[4] (ERHS) and related to the livelihoods of the population. Before answering the questions, the

[1] Holt & Laury is a game for eliciting risk preferences; see Holt and Laury (2002). In this study a simplified Holt & Laury was employed that has previously been used in Doerr et al. (2011). A more detailed explanation follows in section 4.5.

[2] The Ellsberg paradox is a game for eliciting ambiguity preferences. In this study a simplified version of the Ellsberg paradox was used. A more detailed description follows in section 4.5.

[3] 1 ETB = 0.3458 SEK as of 15 March 2013.

[4] Ethiopian Rural Household Survey (ERHS) is a longitudinal dataset covering 1477 households in a number of villages in rural Ethiopia. The data is collected by he International Food Policy Research Institute (IFPRI) in collaboration with Addis Ababa University and Oxford University.

subject is not informed that she at a later incentivized stage shall estimate her performance. This is in order for the subject not to predetermine her number of correct answers and make sure that she receives the incentive.

After answering the six general knowledge questions the subject is asked to estimate her score and are informed that she will receive ETB 10 if she is correct. Overestimation is calculated as the difference between the estimation and the actual score. It can take on a value between -6 and 6, and a positive value indicates overestimation and vice versa.

$$Formula: estimated\ score - \ actual\ score \tag{8}$$

For overplacement in general knowledge the subject is asked to compare her score to others' on a scale ranging from one to five, also used by Doerr et al. (2011), where 1 is "one of the worst" to 5 "one of the best". A correct assessment results in ETB 10. To compute the overplacement in general knowledge the following formula is used:

$$Formula:\ estimated\ score - (\frac{median\ of\ ranking\ numbers}{N/5} + 0.5) \tag{9}$$

Subjects are ranked by their score from lowest to highest. The one with the lowest score is assigned number one and the one with the highest is assigned number 201 (N=201). Subjects with the same amount of correct answers are grouped and the median of their ranking numbers is calculated. This is divided by N/5 to create a range comparable with their comparison. To this number 0.5 is added to create a variable ranging from 0.5 to 5.5 to match with the scale. The variable can take on values between -4.5 and 4.5, and a positive value indicates overplacement and vice versa.

For overplacement in last year's harvest, subjects are asked to compare their harvest to others per tsimad of land. This is done on the same scale of one to five. The yield value per units of land is calculated for each subject and the number that a well-calibrated individual would have assigned to her harvest compared to others' harvest is calculated. The formula used to compute the variable is shown below. Similar with, overplacement of general knowledge the variable can take on values between -4.5 and 4.5, and a positive value indicates overplacement and vice versa.

$$Formula: percieved\ relative\ harvest - (\frac{ranking\ number}{N/5} + 0.5) \tag{10}$$

For overoptimism subjects are first asked to recall in how many of the past five years it has rained too little to get a normal harvest. Later they are asked to forecast how often it will happen in the coming five years. Overoptimism is calculated as the difference between the answers. It can take on values ranging from -5 to 5, and a positive value indicates overoptimism and vice versa.

$$Formula: past\ years\ with\ too\ little\ rain - coming\ years\ with\ too\ little\ rain \quad (11)$$

4.5 Control Variables

As presented in section 4.1 control variables for overconfidence, risk, and sociodemographic characteristics are used in order to estimate the model. In this section we will describe the variables in detail.

In order to control for the finding by Fischhoff and Lichtenstein (1977) that *overestimation of general knowledge* is correlated to the score on the questions, the score (*score general knowledge)* is included in the regressions. Without doing this overestimation would risk becoming a proxy for the score due to omitted variable bias. The same logic is applied for the other overconfidence variables. *Relative score general knowledge* is a variable ranking subjects compared to each other and controls *overplacement of general knowledge*. *Relative harvest yield* functions in the same way and controls *overplacement of harvest yield*. *Memory past rain* is a measure of how many of the last five years subjects remember it to have rained too little, and it controls *overoptimism regarding future rain*.

The socio-demographic control variables are selected upon theory as well as empirical findings. Following Umarov (2009) we control for age, gender and educational level. Marital status is also controlled for as we expect marriage to increase perceived security since it implies that there is at least one more adult in the household who can provide income. Following Clarke and Kalani (2011) we control for household size and in line with Shaik et al. (2005) we control for wealth. Clarke and Kalani (2011) find that wealth has decreasing marginal effect on microinsurance demand and therefore squared terms of income and assets are included. In rural Ethiopia, 90 percent of a household's assets comprise of livestock (Dercon 2004) and 80 percent of a household's income is obtained from agriculture (Hill et al. 2011). Therefore owned livestock and agricultural income are used as proxies for assets and income by converting it to cash amounts measured in

thousands of ETB. In line with Umarov (2009) we also control for land size and loan amount.

Secondary data of market prices are used and due to low transportation and information costs the prices are virtually the same in the area of study[5]. Some degree of measurement bias can however exist due to fluctuations between the market price and the price each farmer actually obtains. Self-reporting bias could also be an issue as households may report income and assets that are lower than the actual value for the fear of taxation. Against that, it could be argued that harvest income and livestock is not problematic to discuss in Tigrai and that this information is public.

Four variables will be included to control for background risk, risk-preferences, preferences about uncertainty with known probabilities, and ambiguity-preferences, preferences about uncertainty with unknown probabilities. Risk-preferences are obviously associated with insurance and have shown to be correlated with overconfidence in several studies (Egelkraut et. al 2006 and Umarov 2009). However, people do not know the exact probabilities about future events, and therefore ambiguity-preferences are also important. This is especially true for weather.

Holt&laury elicits risk-preferences from a game in which a subject faces ten choices between a risky and a safe option, with the safe option increasing in attractiveness for each round. The value on the variable is the switching point from the risky to the safe option. An early switch indicates risk-aversion and a late switch risk-seeking behavior. The variable ranges from 0.5 to 10.5, where 0.5 is extreme risk-aversion and 10.5 extreme risk-taking.

In Ethiopian rural households (Knight et al. 2003), risk-aversion has been found to reduce technology adoption. Therefore *technology-adoption* is also used as a control for risk-preferences in the regressions. The question asks subjects to assess if they are early adopters of new technologies in farming, such as new seeds or new types of irrigation, on

[5] The market prices are from Mekelle during the last crop harvest season and are obtained from the Regional Consumer Market Survey for March 2013, Tigrai Regional state Bureau of Agriculture and Rural Development (BoARD) during the Minor Field Study. For a complete specification of conversion rates see Appendix, Table 4-5.

a scale ranging from 0 to 10. Similar scales to capture aspects of risk have previously been used by Egelkraut et al. (2006).

The degree of diversification in agricultural production is a proxy for farmers' background risk that comes from both external factors as well as farmers' past decisions. It is captured by the *herfindahl index,* previously used in Doerr et al. (2011). The formula for calculating it is:

$$H = \sum_{i=1}^{N} s_i^2 \tag{12}$$

Where s_i is income source i's share of the subject's total agricultural income[6]. Each share is squared and summed to create an index ranging from 0 to 1, where 0 is full diversification and 1 is no diversification.

ambiguity-aversion controls for aversion towards ambiguity and has previously been used in Ethiopia by Akay et al. (2012). It is measured through a simplified version of the Ellsberg paradox (Ellsberg 1961) in which subjects choose between a risky option, uncertainty with known probabilities, and an ambiguous option, uncertainty with unknown probabilities. The probability of winning is lower for the risky option, thus choosing the risky option indicates ambiguity-aversion. The variable takes on the value one if the subject chooses the risky option and the value zero if she chooses the ambiguous option.

4.6 Econometric Specifications

To test hypotheses II Ordinary Least Squares (OLS) regressions are estimated. The different aspects of overconfidence do to a large extent have the same underlying causes and may be correlated to each other. Therefore we regress WTP on each overconfidence variable separately to not risk having one overconfidence variable controlling another. WTP is hence regressed on each overconfidence variable separately with a control for the overconfidence measure. Also, a vector, $\boldsymbol{X}$, of other control variables and control variables for data collectors are included. These are the main specifications. Another

[6] To create an index for all individuals, also including those without land +1 is added. This does not disturb the analysis of the variable, but rather it is done to be able to include all subjects in the analysis.

vector with additional control variables, $\boldsymbol{Z}$, is added in the longest specifications. This is to investigate if the coefficients change when including more controls.

We also make an OLS estimation with WTP regressed on all overconfidence variables together with controls for all overconfidence variables. In this specification $\boldsymbol{X}$ is also included together with controls for data collectors. This is done to further test the consistency of potential results. For every parameter estimated, a rule of thumb is to have 10-20 observations (Harrell 2001). That is why $\boldsymbol{Z}$ is not included in the longest specification.

WTP on each overconfidence variable separately

$$WTP = \beta_0 + \beta_1 overconfidence\ variable + \beta_2 overconfidence\ control + \boldsymbol{\beta X} + \boldsymbol{\beta Z} + \beta_3 data\ collector\ 1 + \beta_4 data\ collector\ 2 + \beta_5 data\ collector\ 3 + \varepsilon_i. \quad (6)$$

Overconfidence variable is always one of the following four variables: overplacement of general knowledge, overplacement of harvest yield, overestimation of general knowledge or overoptimism regarding future rain.

Overconfidence control is always one of the following four variables: relative score general knowledge, relative harvest yield, score general knowledge or memory past rain.

$$\boldsymbol{X} = \delta_1 age + \delta_2 male + \delta_3 married + \delta_4 years\ of\ schooling + \delta_6 income + \delta_7 income^2 + \delta_8 herfindahl\ index + \delta_9 technology\ adoption.$$

$$\boldsymbol{Z} = \alpha_1 holt\&laury + \alpha_2 ambiguity\ aversion + \alpha_3 assets + \alpha_4 assets^2 + \alpha_5 land\ size + \alpha_6\ log(loan).$$

WTP on all overconfidence variables together

$$WTP = \beta_0 + \beta_1 overplacement\ of\ general\ knowledge + \beta_2 overplacement\ of\ harvest\ yield + \beta_3 overestimation\ of\ general\ knowledge + \beta_4 overoptimism\ regarding\ future\ rain + \beta_5 relative\ score\ general\ knowledge + \beta_6 relative\ harvest\ yield + \beta_7 score\ general\ knowledge + \beta_8 memory\ past\ rain + \mathbf{\beta X} + \beta_8\ data\ collector\ 1 + \beta_8\ data\ collector\ 2 + data\ collector\ 3 + \varepsilon_i. \quad (7)$$

The dependent variable *WTP* is a discrete variable ranging from 0 to 130 with equidistant intervals of 5 measuring willingness to pay for crop insurance. *Overplacement of general*

knowledge and *overplacement of harvest yield* are discrete variables measuring degree of overplacement of general knowledge and harvest yield respectively. *overestimation of general knowledge* measures degree of overestimation of general knowledge and *overoptimism regarding future rain* measures degree of overoptimism regarding future rainfall. A positive value indicates overconfidence, a negative value indicates underconfidene and zero well-calibration. As mentioned, the overconfidence controls are *score general knowledge, relative score general knowledge, relative harvest yield* or *memory past rain* and they are all control variables for one overconfidence variable.

male is a binary variable taking on the value one if a subject is male and zero if a subject is female. *married* is equal to one if a subject is married and zero otherwise. *age* and *years of schooling* are discrete variables with values corresponding to a subject's age and years of schooling, respectively. *income* is agricultural income in ETB and $income^2$ is a squared version of the income variable. *assets* is the value of a subject's livestock in ETB and $assets^2$ is the value of the assets raised to the power of two. *land size* is the subject's available land in tsimads[7] and *log(loan)* is the amount in ETB the farmer has borrowed, converted to logarithmic form.

herfindahl index, *technology-adoption, holt&laury* and *ambiguity-aversion* are proxies for background risk and risk- and ambiguity-preferences. Finally, *data collector 1, data collector 2* and *data collector 3* are binary control variables for each data collector conducting the survey. We will control for them as we suspect that they could influence the subjects' answers to some extent.

With a large sample size and large number of degrees of freedom the normality assumption of the population error can be relaxed through the central limit theorem (N>30) (Wooldridge 2009). However, asymptotic normality still hinges on the homoscedasticity assumptions. Therefore heteroscedasticity is tested for through the White test and Breusch-Pagan test. If necessary, it is corrected for by computing Huber-White standard errors in all estimations to get heteroscedasticity consistent standard errors and statistics. Again, with a large sample size Huber-White standard errors will cause no problems with inference testing. In addition, multicollinearity will be tested for in the regressions by computing the variance inflation factor (VIF).

[7] 1 Tsimad = ¼ Hectare.

4.7 Sampling and Data Collection

Previous research has established empirical evidence that it is the household head, irrespective of gender, that controls and manages the productive resources and makes agricultural decisions in rural Ethiopia (Fafchamps and Quisumbing 2002). Since crop insurance is bought for the harvest of the household we define household heads engaged in farming as our population. In order to hold as many factors as possible constant, the population is further defined as household heads occupied in grain, vegetable or fruit farming in the three *tabias*[8] Adi-Mesno, Dediba and Frewini south east of the regional capital Mekelle in Tigrai, Ethiopia. The tabias are selected on basis of homogeneity and more specifically the domination of crop, vegetable and fruit farming, the geographical conditions, uniform culture, the intermediate size of the tabias and the geographical proximity to each other as well as to Mekelle. The administrative order is that tabias are divided into *kushets*, which in turn are divided into *cells*, consisting of 20-30 household heads residing in the same area. In Table 1 the latest reliable number of household heads in the tabias is presented.

Table 1: Number of Household Heads.

Tabia	Adi-Mesno	Dediba	Frewini
Number of household heads	1768*	1496*	1820*

Note: Authors creation. Data obtained from Tigrai Regional state Bureau of Agriculture And Rural Development (BoARD) *As of June 2012.

In order to make correct inference about the population, a random sample is necessary. The ideal sampling method to ensure that the sample is similar to the population would be stratified sampling, where the population is divided into homogenous subgroups, before the sampling. Due to lack of reliable information in registers to define the subgroups, this method was not applicable. Furthermore, because of geographical separation between different kushets and cells, stratified sampling would incur costs in terms of reduced sample size that are disproportionate to the advantages of the method. Instead, multi-stage cluster sampling was employed. This is a common method for household surveys and is used by for example the World Health Organization. Because each household has only one household head, sampling on household heads corresponds to sampling on households. In this study the clusters were defined on geographical location, kushet and cells, and because the clusters differ in size the proportional to size

[8] Tabia is the Tigrinian name for municipality.

method was used. This procedure gives all clusters a probability of being selected corresponding to the proportion of household heads relative the total population, and all household heads an equal and non-zero probability of being sampled.

The procedures undertaken in the sampling are the following:

1) The desired number of responses from each tabia was calculated by multiplying our desired sample size by the proportion of households in each tabia.

2) For all tabias, kushets were defined as clusters and assigned a probability of being selected corresponding to the proportion of households of the population in the tabia it belongs to. Then random sampling was made to select one kushet.

3) Cells were assigned a probability of being selected and as the cells differ in size (20-30 households) they were assigned probabilities corresponding to their size.

4) After a pre-determined amount of cells were selected, 10 household heads from each cell were randomly selected for interview.

Based on information provided by tabia administrators[9] some of the selected household heads had to be removed from the lists as they were out of town or could not participate for other reasons. They were recorded as non-responses. To make it feasible to conduct interviews in two of the kushets, where households were widely dispersed, interviews were held at two community projects for soil-conservation. However, most of the household heads in the villages were present, since the kushet leader had to approve any absence from the projects.

The final study was conducted in March 2013 in the local language Tigrinya, to which the survey also was translated. Since we do not understand the local language, experienced and well-educated data collectors from Mekelle University were employed. All of them was working as assistant professors and had collected data in similar ways before.

[9] Tabia administrators as well as development agents employed by the local region, woreda, assisted in the study by identifying sampled people that were unavailable. Furthermore they informed each kushet leader beforehand about the study, the monetary incentives and how the interviews would be conducted. Each kushet leader in turn informed the population in each kushet. This was made in order to ensure that we had local acceptance as well as an invitation to conduct the study. Apart from fulfilling ethical aspects in research it also increased the feasibility of the study.

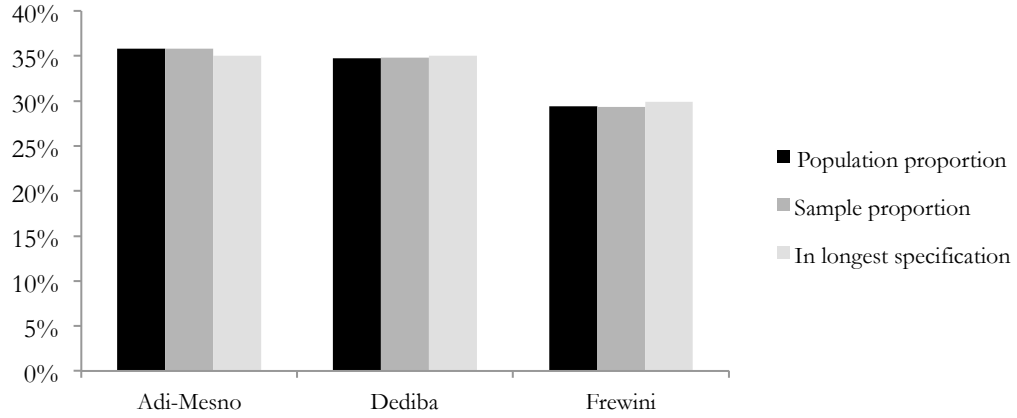
Before the study, two education sessions were held with the data collectors. To test the survey and give the data collectors practical experience a pilot study was made and a feedback session was held with the data collectors after the pilot study. Based on the pilot study and the feedback, changes were made in the survey, as some of the questions were perceived as too difficult to understand.

5. Data

5.1 Response Distribution

In Graph 1 the response distribution is presented. In Adi-Mesno 72 household heads were interviewed (35.8 percent of the interviewed), in Dediba 70 (34.8 percent) and in Frewini 59 (29.4 percent). These numbers correspond exactly to the proportion of the total population in each tabia rounded to one decimal. When controlling for missing values, in the longest specifications, the proportions are 68 (35.0 percent) for Adi-Mesno, 68 (35.1 percent) for Dediba and 58 (29.9 percent) for Frewini.

Graph 1: Response Distribution



Note: Authors creation. Proportions of household heads in Adi-Mesno, Dediba and Frewini. Proportion sampled from each tabia and proportions when controlling for missing values in the longest specification.

5.2 Response Rate

The total response rate was 77.4 percent including persons identified as unavailable in the sampling process and that could not be found in the field. The only kind of non-responses we experienced in the sample was unavailability, old age, deafness and sickness. There was no one who did not want to participate in the survey. We believe this

is thanks to the high monetary incentives used for participating as well as the attitude among the farmers that they should help research. The response rate in Adi-Mesno was 88.2 percent, in Dediba 75.4 percent and Frewini 66.8 percent. The difference in response rates is probably due to differences in the quality of the sample frames used. The lower response rate in Frewini comes from a higher amount of household heads being identified in the sampling process at the community projects as unavailable. The opposite was true in Adi-Mesno where a low amount of household heads were initially identified as unavailable. As the projects took place several kilometers from the villages, we suspect that the people not present differed systematically from the ones present as the most common criteria for not being present were old age or illness. Therefore a multivariate test of the means of age and perceived health the past year for the three tabias is done. It can be rejected that the age means are the same (p-value = 0.0137), but not that health means are the same (p-value = 0.5283). Thus there is some evidence of differences in the tabias, but we do not know if this is due to sampling or differences in the underlying population.

6. Empirical Results

6.1 Summary Statistics

Summary statistics for socio-demographic variables and payment are presented in Table 2. From the summary we can see that 34 percent are female, a ratio equivalent to the Ethiopian Rural Household Survey. Further we see that the average subject is a 40 year old married man, living in a household consisting of five people. On average he has received 1.3 years of schooling. However, only 30 percent of the subjects have received any schooling, meaning that the median farmer has not attended school. The average subject's household has 3.4 tsimads of available land, received an income last year amounting to ETB 11 499 and has assets of ETB 24 190. By participating in the study the subject received ETB 53, corresponding to 1.3 daily wages for an unskilled laborer in the tabias[10]. Excluded from the analysis is a variable measuring religion as all of the 201 farmers belonged to the Ethiopian Orthodox Church, indicating the homogeneousness of the population.

[10] Information about the daily wage rate was collected from each tabia office (Adi-Mesno, Dediba and Frewini) during the study and equaled to ETB 40 for all three tabias as of March 15, 2013.

Table 2: Summary Statistics.

Variable	N	Mean	Std. Dev.	Min	Max
Age	201	40.224	13.188	16.000	78.000
Ambiguity-aversion	201	0.443	0.498	0.000	1.000
Assets	201	24.190	23.600	0.000	191.800
Herfindahl index	201	0.430	0.232	0.000	1.000
Holt&Laury	201	7.953	3.425	0.500	10.500
Household size	201	5.333	5.333	1.000	10.000
Income	201	11.499	14.073	0.000	97.110
Land size	201	3.445	2.385	0.000	16.000
Loan amount	201	1.718	6.240	0.000	85.000
Male	201	0.657	0.476	0.000	1.000
Married	201	0.647	0.479	0.000	1.000
Payment	185	52.724	9.170	30.000	70.000
Technology-adoption	198	5.374	3.601	0.000	10.000
WTP	201	39.428	42.259	0.000	130.000
Years of schooling	201	1.303	2.352	0.000	12.000

Note: Summary Statistics for Dependent Variable, Socio Demographic Variables and Risk Variables.

6.1 Evidence of Overconfidence

According to hypothesis I farmers are overconfident. To test the hypothesis 99 percent confidence intervals are computed. These are presented in Table 3 together with summary statistics for the overconfidence variables. First, we will discuss the results of overplacement, then overestimation and finally overoptimism.

Overplacement of general knowledge is present and statistically significant at a 1 percent level. This is consistent with previous findings of overplacement in the industrialized world (e.g., Svenson 1981). For the sample as whole, people rate themselves to be 0.27 points better on a one-to-five scale compared to others, resulting in overplacement of 9.1 percent. This is calculated by dividing the average overplacement by three, which would be the mean of a well-calibrated sample. Regarding overplacement of last year's harvest yield, the results are insignificant. The average overplacement of agricultural skills is 12.3 percent, which is statistically significant at a 1 percent level. The average subject rated herself as 0.37 points better on a one-to-five scale than the average person. Doerr et al. (2011) ask the same question to Ethiopian farmers and find overplacement in agricultural skills of 15.2 percent[11]. In three out of four indicators they find overplacement and contrary to us, they find overplacement of average harvest yields.

[11] Calculated from Table A1, Doerr et al. (2011).

Overestimation of general knowledge amounted to 0.75 points or 25.0 percent, for the average farmer compared to her actual score. It is significantly larger than zero at the 1 percent level and consistent with the finding of overestimation by Fischhoff and Lichtenstein (1977) and Yates (1990). Overoptimism regarding future rain amounted to 30.0 percent. On average farmers thought the coming five years would have 0.71 fewer years with too little rainfall than the past five years had had. This is significantly larger than zero at a 1 percent level.

Table 3: Summary Statistics For Overconfidence Variables.

Variable	N	Mean	Std. Dev	Avg. overconfidence	99 % CI	
Overplacement of general knowledge	201	0.272	1.311	9.058 %	0.031	0.512
Overplacement of harvest yield	201	-0.067	1.442	-2.244 %	-0.332	0.197
Overplacement of agricultural skills	201	0.368	1.031	12.272 %	0.179	0.557
Overestimation of general knowledge	201	0.751	1.499	25.041 %	0.476	1.026
Overoptimism regarding future rain	197	0.711	1.608	30.009 %	0.413	1.009

Note: Authors creation.

6.2 Overconfidence and Crop Insurance

The average WTP in the sample is ETB 39.4 per month and the standard deviation of 42.3 shows that WTP varies considerably between individuals, see Table 2. This can be contrasted with the undiscounted expected value of the insurance policy of ETB 41.7[12], which is higher than average WTP.

According to hypotheses II farmers' overconfidence reduces willingness to pay for crop insurance. Regression results on this relationship are presented in Tables 6 – 10 (Appendix). In Table 6 – 9 results for WTP regressed on each of the overconfidence variables and sets of control variables are presented. In Table 6 results for overplacement of general knowledge as explanatory variable is found, in Table 7 overplacement of harvest yield as explanatory variable, in Table 8 overestimation of general knowledge as explanatory variable and in Table 9 for overoptimism regarding future rain as explanatory variable. Overplacement of agricultural skills is not included in the analysis of hypotheses II because actual agricultural skills cannot be controlled for.

[12] Undiscounted expected value (insurance policy) = (Payout / Probability of payout) = ETB 2000 / (1/4 years)= ETB 500 per annum = ETB 41.67 per month.

WTP is also regressed on all overconfidence variables together and the results are presented in Table 10. The main specification in each table is WTP regressed on an overconfidence variable together with its control variable, the short set of control variables, X, and controls for data collectors. In total there are five regressions of the main specification, one in each table.

When testing for heteroskedasticity we find that we can reject homoskedasticity. Therefore, we use Huber-White standard errors and statistics, since the sample size is large (N=201). Again, thanks to the large sample size, t-statistic follow an approximate normal distribution, enabling inference testing. However, it is not large enough for the F-distribution to be approximately normally distributed and therefore joint inference testing with the f-statistic is interpreted conservatively. As both the WTP variable and the overconfidence variables by definition cannot have outliers, we do not have to run additional regressions testing if this has any effect on the results.

When regressing WTP on each overconfidence variable and the short set of control variables including collectors (specification "main", Tables 6 – 9), we see that only overplacement of harvest yield is significant at a 10 percent level. It has a positive coefficient of 4.686, implying that a one-point[13] increase in overplacement of harvest yield results in a higher WTP of ETB 4.686. As this represents a little more than 10 percent of average WTP, the effect is clearly economically significant.

To test the consistency of the results, a longer specification (specification 4, Table 6 – 9) is run. To the short set of control variables including data collectors, we add more variables, Z, for socio-demographic characteristics, risk-preferences and financial situation. The pattern is the same as before. The only significant variable at a 10 percent level is overplacement of harvest yield, with a coefficient of 4.338, meaning that a one-point increase in overplacement increases WTP by ETB 4.338.

In the specification with WTP regressed on all overconfidence variables as well as a set of control variables including data collectors (specification "main", Table 10), the overconfidence variables are all insignificant. As all variables of interest are included in

[13] The scale ranges from -4.5 to 4.5.

this specification we test all possible combinations for joint significance through an F-test and find that none of the combinations are jointly significant.

When running the short regressions without data collectors (specification 1, Tables 6 – 10), we see that R^2 decreases substantially in all regressions. Furthermore, some coefficients of the variables of interest change. Overplacement of harvest yield becomes insignificant and overoptimism regarding future rain becomes significant at a 10 percent level with a negative coefficient of -3.719. This means that a one-point[14] increase in overoptimism regarding future rain reduces WTP by ETB 3.719. The coefficients of overplacement and overestimation remain insignificant.

When data collectors are removed from the long specifications, we see that overplacement of harvest yield becomes insignificant. Overplacement and overestimation of general knowledge have positive coefficients that are significant at a 10 percent level, with coefficients of 5.268 and 3.537, respectively. This means that a one-point increase in overplacement of general knowledge[15] increases WTP by ETB 5.268 and a one-point increases in overestimation of general knowledge[16] increases WTP by 3.537. Overoptimism regarding future rain has a negative coefficient of -3.616 that is significant at a 10 percent level, implying that a one-point increase in overoptimism decreases WTP by ETB 3.616.

As can be seen from these regression results, the effects and significances of the overconfidence variables are not consistent. Overplacement of harvest yield is the only variable of interest that is significant in the main specification type, which we trust the most because collectors are included as controls. The other overconfidence indicators are sometimes significant, but mostly insignificant and all are highly sensitive to which specification is run. Therefore, attempts to draw conclusions from the results are risky.

To investigate the validity of our results we undertake two robustness checks. The first is to compute the variance inflation factor (VIF) for all specifications. According to Wooldridge (2009, 99) a VIF above 10 indicates problems with multicollinearity. Only some of our control variables have factors larger than 10 in some specifications and the

[14] The scale ranges from -4.0 to 4.0.
[15] The scale ranges from -4.5 to 4.5.
[16] The scale ranges from -6.0 to 6.0.

overconfidence variables never have factors larger than 2.7 in any specification. Multicollinearity can therefore be concluded not to cause any problems for our analysis.

The second robustness check is to evaluate the control variables' effects on WTP in the five main specifications in order to assess if the elicitation of WTP was done correctly. The variables are compared to the expected effects based on theories and benchmarked against two previous studies on crop insurance demand in Ethiopia (e.g., Hill et al. 2011 and Clark and Kalani 2011).

Consistent with Hill et al. (2011), being male affects WTP positively and the effect is significant. Furthermore, higher age and being married affects WTP negatively, but only the effect of marriage is significant. The effect of income is significantly positive. As the squared term of income is significantly negative it indicates that income has decreasing marginal effect on insurance demand, consistent with findings by Clarke and Kalani (2011). The effect of a higher income concentration, the Herfindahl index, is not significant, but technology adoption is negative and significant. As technology adoption is a proxy for risk-preferences and a higher value indicates more willingness to take risk, it is logical that it reduces WTP. As most variables are significant and show the expected sign, we believe that the dependent variable was measured correctly. The variables controlling the different overconfidence variables are not included based on any theories or previous findings on insurance demand and therefore we do not analyze their effects on WTP.

7. Discussion

We have examined the existence of overconfidence and its relationship to WTP for crop insurance in a random sample of farmers from a homogenous area in Tigrai, Ethiopia. A contribution with the study has been to investigate overconfidence in a context with high frequency of agricultural-related shocks and almost non-existent safety nets. In this context overplacement, overestimation and overoptimism was a priori expected to be low. Furthermore, high monetary incentives have been used to elicit several of the overconfidence measures since it has been shown to decrease overconfidence.

According to hypothesis I farmers are expected to be overconfident and we find evidence for this in all the studied aspects of overconfidence. Overplacement is found in two out of three indicators and overestimation and overoptimism in the only indicators measuring this. The magnitudes of the effects are clearly statistically and economically significant and the effects are larger for overestimation and overoptimism than for overplacement. This is consistent also after controlling for the different lengths of the scales.

Our findings of overplacement are partially consistent with Doerr et al. (2011) that also study overconfidence among Ethiopian farmers. As they do, we find overplacement of agricultural skills, but contrary to them we do not find any evidence of overplacement of last year's harvest yield. One reason for this could be the localities of the studies. Their study is conducted in Oromia while this study is conducted in Tigrai, which has a history of harvest failures that might reduce overconfidence of the harvest. Also, people are less overconfident in parameters they get direct feedback on. One could expect the famers to get considerable information and feedback on how good their harvest was relative the others since they live in small communities and are dependent on the harvest for survival.

The overplacement of general knowledge we find (9.1 percent) is perhaps lower than expected. As this was not part of the study by Doerr et al. (2011) it is difficult to compare the results, but the magnitude of our indicator is slightly lower than what they found in overplacement related to agriculture. Regarding overestimation, we find an average overestimation of general knowledge score of 25.0 percent in a sample where the

average proportion of correct answers is 50 percent. Fischhoff and Lichtenstein (1977) find an average overestimation of 19.4 percent in a test where the proportion of correct answers is 62 percent. Consequently, there is some evidence supporting the theory of higher overestimation for difficult tasks in this context. However, the comparison should be done with caution since the experiment by Fischhoff and Lichtenstein (1977) is run on American university students in psychology.

To our knowledge, overoptimism regarding future rain has not been studied in the way done in this paper before, either by Doerr et al. (2011) or in other parts of the world, making comparisons difficult. The combination of the fact that the region has been affected by several droughts and the inherent uncontrollability of rainfall would suggest overoptimism regarding future rain to be relatively low. However, as we find overoptimism to be the strongest bias in our sample (30.0 percent) we suspect it to be due to the high desirability of future rainfall.

According to hypothesis II the effect of overconfidence on WTP for crop insurance should be negative. The method we use to investigate the relationship differs from previous studies with respect to three aspects and for these reasons the results are not completely comparable with previous research.

First, we study the relationship in a low-income country in Africa, whereas previous studies have been conducted in the USA. It is not an exaggeration to say that agriculture in Ethiopia differs greatly from agriculture in USA, and numerous factors therefore limit the generalization of results across the countries. Second, we control for actual individual measures in the areas where overconfidence is measured. To our knowledge there is only one study investigating the relationship between overconfidence and crop insurance, Umarov (2009), who has controlled for objective measures in the same areas that overconfidence is measured in. It was done by controlling overconfidence in a farmer's own yield for average county yield and the study found no significant relationship to insurance.

However, we believe that average county yield is a bad proxy for individual objective yield, because it implicitly assumes that all farmers have equal yields. Therefore we used a new method where overconfidence is measured individually and controlled for by

objective individual measures in the same area as overconfidence is studied. Third, we study hypothetical crop insurance in contrast to previous studies that have investigated the relationship between overconfidence and insurance on existing policies. The limitation of this is that we do not study farmers' real decisions. One recent study in Ethiopia has found that the correlation between WTP for weather index insurance and actual purchasing decision is weak (McIntosh et al. 2013), which could be one reason for our surprising results. However, the limitation of previous studies is that they cannot draw certain causal conclusion about the relationship between overconfidence and crop insurance demand because overconfidence is measured when the purchasing decision has already occurred.

As the control variables for data collectors change the magnitudes of the coefficients slightly and R^2 substantially, it is evident that the data collectors have had influence on subjects to some extent. Although unfortunate, it is not a new finding that data collectors have explanatory power in quantitative models for crop insurance demand. Clarke and Kalani (2011), using a dataset from the Ethiopian Rural Household Survey, find a substantial change in R^2 when controls for data collectors are included. In addition, it is not obvious that including controls for data collectors is appropriate in our case, because one of them could not participate during the whole period of data collection due to personal reasons. Also, they can randomly have interviewed farmers with different characteristics correlated with overconfidence and WTP. By including collectors when we should not, we risk including unwanted factors in the specifications. Therefore, we have presented both regressions with and without control variables for data collectors.

As most of the control variables are significant and show the expected sign in the main specifications we believe that the insurance scenario and elicitation process of WTP were appropriate. Also, the new methods for calculating individual overconfidence that were applied should not limit the validity of the results either. Rather they should enhance them, because the methods increase the preciseness of the overconfidence indicators and have greater potential of capturing the true effects in a regression.

We find no evidence of overconfidence negatively affecting WTP for crop insurance, rather we have indications of weak evidence of a positive relationship. This is in line with Umarov (2009) who does not find any significant effects and Sherrick et al. (2004) who

find a positive relationship between subjective expected yields and crop insurance usage. However, it contrasts Shaik et al. (2005) and Egelkraut et al. (2006) who find negative relationships with crop insurance usage. Because these studies are all conducted in USA we are cautious in making generalizations and comparisons to Ethiopia.

The effects we find are mostly insignificant and positive, contrasting the proposed theory. The only overconfidence indicator that is significant when collectors are included is overplacement of harvest yield, but it is not when the collectors are removed. Overplacement and overestimation of general knowledge is only significant in the specifications with the long set of controls without including collectors. The coefficient of overoptimism in rain is negative and significant in both specifications without collectors, but not when they are included. Furthermore, none of the overconfidence variables are significant when they are all included together, suggesting that they affect each other's coefficients when included in the same regression. Even though we find weak indications of a positive relationship with WTP, especially for overplacement of harvest yields, the results are far from robust.

We can conclude from the results that the proposed model presented in section 3.1 does not seem to explain the effects of overconfidence and WTP for crop insurance for farmers with little or no education and previous experience of insurance products. Since the results are weak, we are not confident enough in our findings to establish that there is a positive relationship. We do however have some suggestions for why there could be a true relationship in the context of Ethiopian farmers that could be found if all measurement error causing attenuation bias was removed.

In the USA commercial insurance is an established concept, which it is not Ethiopia. It could therefore be the case that insurance is perceived as different kinds of products in the two countries. From the Ethiopian farmer's point of view commercial insurance is something new, untried and complex. This could make an overconfident farmer believe that she will benefit more from the insurance than others, because she is more capable of understanding and using this rather complex financial product. With this interpretation, insurance demand in Ethiopia is related to the (over)confidence in how much one benefits from new financial products and in USA the (over)confidence in whether one can manage without insurance. Therefore, the effect of overconfidence on WTP for crop

insurance in Ethiopia would work in a similar way as when an overconfident investor engages in excessive trading (Weber and Glaser 2007). Combining the suggestion that overconfidence may positively affect crop insurance demand in this context with the fact that overconfidence is present leads to the conclusion that demand actually could be artificially boosted by overconfidence. Keeping in mind that demand for crop insurance already is low, then further raises the question: What is it that causes the low demand for crop insurance?

8. Conclusion

The purpose of this thesis was to investigate the effects of overconfidence on crop insurance demand in Ethiopia. To study this we conducted interviews with 201 Ethiopian household heads engaged in farming in the region Tigrai. To our knowledge this is the first paper analyzing this relationship in the developing world.

We measured three different categories of overconfidence, namely overplacement, overestimation and overoptimism both within agriculture and in general knowledge. On the questions that measured overconfidence and were possible to incentivize, monetary incentives were used. The study of the relationship to demand for crop insurance was enabled by eliciting willingness to pay for a crop insurance scenario.

In accordance with previous research we have found strong evidence of overconfidence with the strongest effects on overestimation and overoptimism. As Tigrai has a history of harvest failures and devastating famines, we expected to find lower overconfidence than other studies in the industrialized world, making the findings more valid.

In contrast to some studies, our finding is that overconfidence does not seem to negatively affect crop insurance demand. If anything the relationship seems to be positive. We found a weak positive relationship between overplacement of harvest yield and WTP for crop insurance, but the other indicators of overconfidence were all insignificant in the main specification. Reasons for the contrasting finding could be many and stem from contextual differences and the applied methods. The greatest difference in context is that our population consists of poor and mainly illiterate small-scale farmers

in Ethiopia and that insurance is an uncommon concept in this part of the world. This may cause the perception of insurance to be different in Ethiopia than in USA. The most important differences in method are the following: First, we studied the relationship in a developing country. Second, we controlled for actual individual performance and memory to separate overconfidence from objective information. Third, we used a crop insurance scenario to elicit WTP.

In conclusion, we want to point out that our results are mostly insignificant and not robust across different specifications. As overconfidence does not seem to negatively affect crop insurance demand this should not be a reason for the low demand of microinsurance in developing countries. However, if the relationship indeed is positive it could be the case that the demand for crop insurance of this overconfident population is actually boosted by overconfidence.

Future research on this topic is indeed important in order to assess whether the results from American crop insurance policies can be generalized to completely different contexts. As it was beyond the practical scope of this study, we recommend future research to investigate overconfidence and its relationship to crop insurance demand for existing insurance policies in the developing world. This is ideally done by eliciting indicators of overconfidence before an insurance policy is implemented and relating them to the farmers' actual purchasing decisions at a later stage, to be able do draw causal conclusions. This can hopefully assess whether overconfidence is a determinant of crop insurance demand in developing countries.

9. References

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10. Appendix

10.1 Tables

Table 4: Conversion Rates 1.

Agricultural output	Unit	ETB
Barley	Quintal	680
Beans	Quintal	673
Chickpeas	Quintal	684
Cowmilk	Liter	8
Egg	Piece	1.75
Fruits	Quintal	1000
Honey	Kilogram	67
Maize	Quintal	715
Millet	Quintal	547.5
Sorghum	Quintal	661
Teff	Quintal	1672
Vegetables	Quintal	750
Wheat	Quintal	760

* 1 Quintal = 100 Kg

Table 5: Conversion Rates 2.

Livestock	ETB
Beehive	584.5
Cattle	10500
Donkey	2250
Goat	1175
Poultry	80
Sheep	1300

Table 6: Analysis of Overplacement of General Knowledge as Determinant of WTP, Main and Long Specifications, With and Without Controls for Data Collectors.

	(1)	(Main)	(3)	(4)
Method	OLS	OLS	OLS	OLS
Dependent variable	WTP	WTP	WTP	WTP
Overplacement of general knowledge	4.659	3.050	5.268*	3.286
	(2.838)	(2.509)	(2.906)	(2.546)
Relative score general knowledge	10.29***	6.481***	11.42***	7.184***
	(2.596)	(2.290)	(2.670)	(2.434)
Age	-0.214	-0.167	-0.320	-0.224
	(0.209)	(0.193)	(0.229)	(0.211)
Male	24.70**	28.65***	27.64**	31.03***
	(11.60)	(9.345)	(11.04)	(9.279)
Married	-20.54*	-26.00***	-33.22***	-36.12***
	(11.01)	(8.660)	(11.64)	(9.712)
Years of schooling	0.104	0.447	-0.304	0.0129
	(1.265)	(1.072)	(1.394)	(1.145)
Income	1.476***	1.446***	1.006*	1.135**
	(0.537)	(0.491)	(0.546)	(0.504)
Income^2	-0.0153***	-0.0143***	-0.0157***	-0.0161***
	(0.00555)	(0.00512)	(0.00559)	(0.00507)
Herfindahl index	4.778	4.690	15.53	15.41
	(12.60)	(12.49)	(12.80)	(12.51)
Technology-adoption	-4.234***	-3.113***	-4.284***	-3.297***
	(0.802)	(0.826)	(0.814)	(0.836)
Holt&Laury			-0.120	0.401
			(0.838)	(0.791)
Ambiguity-aversion			11.55**	9.501*
			(5.615)	(4.957)
Log(household size)			4.488	0.381
			(6.951)	(6.112)
Assets			0.431*	0.384*
			(0.238)	(0.213)
Assets^2			-0.00298**	-0.00328***
			(0.00121)	(0.00110)
Land size			3.302*	3.830**
			(1.784)	(1.643)
Log(loan)			5.295	2.648
			(4.256)	(3.916)
Data collector 1		-14.14		-13.56
		(8.858)		(8.571)
Data collector 2		11.82		13.07
		(9.877)		(9.456)
Data collector 3		25.73**		26.13**
		(10.78)		(10.62)
Constant	21.78	19.45	-2.203	-3.130
	(13.27)	(13.00)	(20.09)	(19.30)
N	198	198	198	198
R-squared	0.282	0.417	0.328	0.456

Note: Robust Standard Errors in Parentheses. Significance Levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Analysis of Overplacement of Harvest Yield as Determinant of WTP, Main and Long Specifications, With and Without Controls for Data Collectors.

	(1)	(Main)	(3)	(4)
Method	OLS	OLS	OLS	OLS
Dependent Variable	WTP	WTP	WTP	WTP
Overplacement of harvest yield	3.336	4.686*	3.430	4.338*
	(2.636)	(2.497)	(2.620)	(2.400)
Relative harvest yield	-0.458	2.316	1.111	4.566
	(3.725)	(3.521)	(4.149)	(3.858)
Age	-0.252	-0.195	-0.346	-0.244
	(0.210)	(0.195)	(0.234)	(0.214)
Male	24.05**	27.95***	25.99**	29.05***
	(12.19)	(9.815)	(11.96)	(9.810)
Married	-20.32*	-26.77***	-29.94**	-34.41***
	(11.45)	(9.119)	(12.63)	(10.24)
Years of schooling	1.240	0.976	1.186	0.854
	(1.310)	(1.098)	(1.431)	(1.161)
Income	1.970***	1.666**	1.455*	1.088
	(0.740)	(0.660)	(0.845)	(0.751)
Income^2	-0.0182***	-0.0152**	-0.0169**	-0.0143**
	(0.00693)	(0.00634)	(0.00692)	(0.00610)
Herfindahl index	-0.675	2.909	7.975	13.02
	(13.11)	(12.69)	(13.71)	(12.79)
Technology-adoption	-4.580***	-3.168***	-4.636***	-3.365***
	(0.838)	(0.840)	(0.849)	(0.840)
Holt&Laury			-0.0256	0.543
			(0.884)	(0.774)
Ambiguity-aversion			9.961*	8.279*
			(5.667)	(4.896)
Log(household size)			7.733	2.864
			(7.576)	(6.519)
Assets			0.277	0.261
			(0.247)	(0.208)
Assets^2			-0.00257**	-0.00303***
			(0.00128)	(0.00111)
Land size			2.597	3.911**
			(2.147)	(1.960)
Log(loan)			3.222	1.305
			(4.359)	(3.873)
Data collector 1		-12.59		-12.31
		(8.633)		(8.320)
Data collector 2		14.40		16.41*
		(10.05)		(9.712)
Data collector 3		31.70***		32.94***
		(10.19)		(9.905)
Constant	55.57***	30.29**	30.82	2.426
	(15.36)	(15.08)	(24.96)	(22.94)
N	198	198	198	198
R-squared	0.236	0.408	0.268	0.441

Note: Robust Standard Errors in Parentheses. Significance Levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Analysis of Overestimation of General Knowledge as Determinant of WTP, Main and Long Specifications, With and Without Controls for Data Collectors.

	(1)	(Main)	(3)	(4)
Method	OLS	OLS	OLS	OLS
Dependent Variable	WTP	WTP	WTP	WTP
Overestimation of general knowledge	3.430	2.779	3.537*	2.578
	(2.084)	(1.945)	(2.086)	(1.920)
Score general knowledge	11.78***	8.097***	12.74***	8.627***
	(2.719)	(2.526)	(2.789)	(2.655)
Age	-0.198	-0.140	-0.323	-0.213
	(0.204)	(0.187)	(0.224)	(0.206)
Male	24.06**	28.46***	26.74**	30.61***
	(11.32)	(9.258)	(10.70)	(9.177)
Married	-19.38*	-25.11***	-31.93***	-35.17***
	(10.77)	(8.579)	(11.31)	(9.595)
Years of schooling	-0.178	0.264	-0.538	-0.138
	(1.201)	(1.029)	(1.321)	(1.105)
Income	1.267**	1.279**	0.777	0.952*
	(0.539)	(0.495)	(0.557)	(0.518)
Income^2	-0.0129**	-0.0126**	-0.0133**	-0.0142***
	(0.00554)	(0.00516)	(0.00561)	(0.00512)
Herfindahl index	5.354	5.948	16.11	16.42
	(12.20)	(12.33)	(12.26)	(12.31)
Technology-adoption	-3.977***	-3.013***	-4.001***	-3.188***
	(0.782)	(0.811)	(0.786)	(0.815)
Holt&Laury			-0.284	0.227
			(0.836)	(0.789)
Ambiguity-aversion			10.98**	9.357*
			(5.438)	(4.811)
Log(household size)			5.300	0.846
			(6.739)	(5.991)
Assets			0.383	0.363*
			(0.235)	(0.210)
Assets^2			-0.00276**	-0.00314***
			(0.00122)	(0.00112)
Land size			3.596**	3.952**
			(1.784)	(1.634)
Log(loan)			5.419	2.732
			(4.200)	(3.848)
Data collector 1		-17.65**		-17.01**
		(8.790)		(8.455)
Data collector 2		8.601		9.929
		(10.52)		(10.02)
Data collector 3		21.77**		22.11**
		(10.70)		(10.52)
Constant	15.21	15.47	-7.253	-4.934
	(14.34)	(13.19)	(20.45)	(19.18)
N	198	198	198	198
R-squared	0.292	0.424	0.337	0.462

Note: Robust Standard Errors in Parentheses. Significance Levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Analysis of Overoptimism Regarding Future Rain as Determinant of WTP, Main and Long Specifications, With and Without Controls for Data Collectors.

	(1)	(Main)	(3)	(4)
Method	OLS	OLS	OLS	OLS
Dependent Variable	WTP	WTP	WTP	WTP
Overoptimism regarding future rain	-3.719*	0.890	-3.616*	1.191
	(1.890)	(1.900)	(1.956)	(1.936)
Memory past rain	3.115	-2.609	2.763	-2.616
	(2.648)	(2.586)	(2.748)	(2.706)
Age	-0.145	-0.176	-0.262	-0.244
	(0.216)	(0.196)	(0.238)	(0.215)
Male	25.02**	25.12**	28.05**	27.87***
	(12.31)	(10.04)	(11.98)	(10.09)
Married	-20.19*	-22.62**	-32.20**	-33.12***
	(11.63)	(9.352)	(12.66)	(10.67)
Years of schooling	1.654	1.039	1.565	0.802
	(1.303)	(1.069)	(1.392)	(1.123)
Income	1.573***	1.470***	1.251**	1.249**
	(0.571)	(0.510)	(0.590)	(0.505)
Income^2	-0.0152***	-0.0137**	-0.0161***	-0.0160***
	(0.00572)	(0.00533)	(0.00585)	(0.00522)
Herfindahl index	-0.262	2.333	10.39	13.87
	(13.60)	(12.92)	(14.00)	(13.13)
Technology-adoption	-4.579***	-3.278***	-4.649***	-3.427***
	(0.853)	(0.844)	(0.862)	(0.846)
Holt&Laury			0.197	0.682
			(0.910)	(0.808)
Ambiguity-aversion			8.651	7.030
			(5.692)	(4.952)
Log(household size)			8.257	2.165
			(7.340)	(6.261)
Assets			0.323	0.340
			(0.254)	(0.223)
Assets^2			-0.00274**	-0.00331***
			(0.00133)	(0.00118)
Land size			2.906	3.822**
			(1.857)	(1.719)
Log(loan)			3.066	1.762
			(4.255)	(3.942)
Data collector 1		-16.48*		-15.25*
		(9.091)		(8.713)
Data collector 2		16.00		18.67*
		(10.64)		(9.986)
Data collector 3		28.63***		30.68***
		(10.24)		(9.830)
Constant	47.56***	45.97***	23.85	20.72
	(14.97)	(14.51)	(21.93)	(20.80)
N	194	194	194	194
R-squared	0.241	0.404	0.275	0.440

Note: Robust Standard Errors in Parentheses. Significance Levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Analysis of the Effects of all Overconfidence Indicators Together as Determinants of WTP, Main Specification, With and Without Controls for Data Collectors.

	(1)	(Main)
Method	OLS	OLS
Dependent Variable	WTP	WTP
Overplacement of general knowledge	2.822	1.310
	(2.789)	(2.429)
Overplacement of harvest yield	1.902	3.139
	(2.626)	(2.543)
Overestimation of general knowledge	2.975	2.927
	(2.155)	(1.981)
Overoptimism regarding future rain	-2.654	1.768
	(1.869)	(1.958)
Relative score general knowledge	-6.604	-4.771
	(9.237)	(8.476)
Relative harvest yield	-0.460	0.248
	(3.845)	(3.648)
Score general knowledge	20.71**	14.94
	(10.36)	(9.489)
Memory past rain	1.067	-4.176
	(2.711)	(2.543)
Age	-0.204	-0.207
	(0.203)	(0.186)
Male	24.65**	24.95**
	(11.66)	(10.02)
Married	-22.03**	-24.02**
	(11.02)	(9.329)
Schooling	-0.390	-0.400
	(1.227)	(1.015)
Income	1.714**	1.640**
	(0.747)	(0.681)
Income^2	-0.0175**	-0.0159**
	(0.00705)	(0.00654)
Herfindahl index	8.262	10.89
	(13.18)	(12.95)
Technology-adoption	-4.340***	-3.408***
	(0.830)	(0.808)
Data collector 1		-19.65*
		(10.05)
Data collector 2		13.03
		(11.28)
Data collector 3		21.89*
		(11.26)
Constant	7.999	19.14
	(18.60)	(18.02)
N	194	194
R-squared	0.316	0.449

Note: Robust Standard Errors in Parentheses. Significance Levels: *** p<0.01, ** p<0.05, * p<0.1.

10.2 Survey

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Note: English version of the final survey is presented below. Authors and copyright owners are Mattias Almqvist and Mats Wiklund. Valuable feedback was given by Kifle Tesfamariam Sebhatu, at Mekelle University, Anna Sandberg and Anna Dreber Almenberg, at Stockholm School of Economics.

Survey on Harvest Protection

Information to be given to respondent

This is a study conducted by university students concerning Tigrinian people's thoughts about harvest protection. This is not a study made by the government and your answers will never be given to any government authority. We would be very happy if you could help us by answering these questions. If you answer all the questions we will give you a payment of 30 Birr for the time you spend plus potential bonuses, which we will inform you about later on in the questionnaire. All payments will be distributed at the end of the interview. Try to answer the questions as truthfully as possible.

In the beginning of the survey we will ask for your name, but the paper it is written on will be removed from the answer sheet shortly after the interview is completed. Therefore, everyone participating in the survey will be anonymous and the information you provide can never be traced back to you. Whenever you want you can tell the interviewer to stop the interview without any consequences other than that you will not receive any payment.

Before starting the interview I would just like to make sure that you are the head of this household and that you are fully or partially a grain, vegetable or fruit farmer. Is this correct?

(If the answer is yes, continue with the interview. Otherwise end the interview.)

Thank you in advance for your collaboration!

If the respondent is unavailable or does not want to participate, please state the reason for not participating:

_____

_____

_____

If the respondent does not want to participate, hand in the unfinished questionnaire anyway.

Name of respondent:

_____

ALL ANSWERS SHOULD BE WRITTEN IN ENGLISH
ANSWER ALL QUESTIONS, EVEN IF THE ANSWER IS ZERO

A.

Country: Ethiopia
Region: Tigrai
Tabia: _____
Kushet (village): _____
Interview Date (in Gregorian Calendar, Day – Month – Year):_____
Starting time of interview: Hour _____ Minute _____ (European time)
Ending time of interview: Hour _____Minute _____ (European time)
Checked by: _____ Date: _____

B.

1. Gender
(Observed by data collector)
[ ] [ ]
Male Female

2. How old are you?
(If the respondent does not know, help the respondent estimate an age)
_____Years

3. What is your marital status?
[ ] [ ] [ ] [ ] [ ] [ ]
Married Unmarried Widowed Separated Divorced Under age

4. How many people live in your household?
Male: _____ Female _____ Total _____

5. How many of the household members are working? _____

6. To what religion do you belong?
[ ] [ ] [ ] [ ] [ ]
Orthodox Islam Catholic Protestant Other

7. Are you able to read and write?
[ ] [ ]
Yes No

8. How many years of schooling do you have? _____ years *(if 0 write 0)*

9. How would you say that your physical health has been during the past year? Answer on a scale between 1 and 5, where 1 is very bad and 5 is very good.
(Use card 1 – 5)
[ ] [ ] [ ] [ ] [ ]
1 2 3 4 5
Very bad Very good

C.

10. Compared to other farmers in this region, how would you say that your agricultural skills are? Answer on a scale between 1 and 5, where 1 is one of the worst and 5 is one of the best.

(Use card 1 – 5)

[ ]	[ ]	[ ]	[ ]	[ ]
1	2	3	4	5
One of the worst		About the same as others		One of the best

11. Think of the last five years. In how many of the last five years would you say that it has rained too little to get a normal harvest?

(Use card 0 – 5 years)

[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
0 years	1 year	2 years	3 years	4 years	5 years

D.

12. Now I will ask you some general-knowledge questions where you can choose between alternatives.

12.1. Is Tigrai located to the north, south, east or west of Ethiopia?

[ ]	[ ]	[ ]	[ ]
North	South	East	West

12.2. Which of the following things float on water?

[ ]	[ ]	[ ]	[ ]
Metallic needle	Plastic ball	Stone	Bone

12.3. How many months every year are there in the Ethiopian calendar?

[ ]	[ ]	[ ]	[ ]
11	12	13	14

12.4. Which one of the following domestic animal types requires the longest gestation period?

[ ]	[ ]	[ ]	[ ]
Pig	Cow	Sheep	Goat

12.5. Let us say I draw a ball from this bag containing 6 balls. 2 are pink, 2 are white and 2 are blue. Which color is it most likely that I will draw from the bag?

(Show with balls)

[ ]	[ ]	[ ]	[ ]
Pink	White	Blue	All colors are equally likely

12.6. What is 15 % of 200?

[ ]	[ ]	[ ]	[ ]
10	20	30	40

13. How many of these questions do you think you answered correctly? If you guess the right number you will receive a 10 Birr bonus.

(Use card 0 – 6)

[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
0	1	2	3	4	5	6

14. We have asked these general-knowledge questions to other farmers in this region. Compared to them, how good do you think you were at answering them correctly? Answer on a scale between 1 and 5, where 1 is one of the worst and 5 is one of the best. If you guess correctly how good you were compared to others you will receive a 10 Birr bonus.

(Use card 1 – 5)

[ ]	[ ]	[ ]	[ ]	[ ]
1	2	3	4	5
One of the worst		About the same as others		One of the best

E.

15. Compared to other farmers in this region with the same amount of land, how good would you say that your harvest was the last crop harvest year? Answer on a scale between 1 and 5, where 1 is one of the worst and 5 is one of the best.

(Use card 1 – 5)

[ ]	[ ]	[ ]	[ ]	[ ]
1	2	3	4	5
One of the worst		About the same as others		One of the best

16. Imagine the coming five years. In how many of the coming five years do you think it will rain too little to get a normal harvest?

(Use card 0 – 5 years)

[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
0 years	1 year	2 years	3 years	4 years	5 years

17. Imagine the coming five years. In how many of the coming five years do you think you will get a harvest that is normal or better?

(Use card 0 – 5 years)

[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
0 years	1 year	2 years	3 years	4 years	5 years

18. How do you think your physical health will be during the coming year? Answer on a scale between 1 and 5, where 1 is very bad and 5 is very good.

[ ]	[ ]	[ ]	[ ]	[ ]
1	2	3	4	5
Very bad				Very good

F.

19. In this bag there are 10 balls. 5 are blue and 5 are pink. If you draw a blue ball, without looking, you will win 10 a Birr bonus, but if you draw a pink ball you win nothing. Now we will play a game where you make 10 choices. In each choice you can choose between drawing a ball and maybe win money or choose to receive a sure amount. After you have made all choices one of the choices will randomly be selected and played for real. For that choice you may earn money. Have you understood? *(If not, explain the game again)* In the first choice most people choose the bag where you can get either 10 or nothing and in some later choice they choose the sure amount instead.

Bag Sure option

[ ] [ ] Choice 1: Draw one ball from the bag with 5 blue and 5 pink and get 10 birr if the ball is blue or get 1 birr for sure.

[ ] [ ] Choice 2: Draw one ball and get 10 birr if the ball is blue or get 2 birr for sure.

[ ] [ ] Choice 3: Draw one ball and get 10 birr if the ball is blue or get 3 birr for sure.

[ ] [ ] Choice 4: Draw one ball and get 10 birr if the ball is blue or get 4 birr for sure.

[ ] [ ] Choice 5: Draw one ball and get 10 birr if the ball is blue or get 5 birr for sure.

[ ] [ ] Choice 6: Draw one ball and get 10 birr if the ball is blue or get 6 birr for sure.

[ ] [ ] Choice 7: Draw one ball and get 10 birr if the ball is blue or get 7 birr for sure.

[ ] [ ] Choice 8: Draw one ball and get 10 birr if the ball is blue or get 8 birr for sure.

[ ] [ ] Choice 9: Draw one ball and get 10 birr if the ball is blue or get 9 birr for sure.

[ ] [ ] Choice 10: Draw one ball and get 10 birr if the ball is blue or get 10 birr for sure.

(Make sure that the respondent makes a choice in all 10 choices. After the respondent has made 10 choices draw one piece of paper with a number on from the bag and play the choice corresponding to that number)

Played Choice: [ ]

Payment for respondent: _____

20. Are you a person who often try new technologies in farming before others or are you a person who waits? New technologies could be: fertilizer, improved seeds or drip irrigation which can both have positive and negative effects. Answer on a scale between 0 and 10, where the value 0 means 'not at all willing to try new farming technologies and the value 10 means 'very willing to try new farming technologies'. *(Use card 0 – 10)*

[ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]
0 1 2 3 4 5 6 7 8 9 10

G.

21. You are now going to play a game where you draw a ball out of a bag without looking. If the ball you choose is the right color, then you win a 10 Birr bonus. You get to decide which bag to choose the ball from.

Bag One: In Bag One there are 4 BLUE and 6 WHITE balls. You must pick a BLUE ball in order to win.

Bag Two: In Bag Two there are 10 balls – some are BLUE and some are WHITE, but we do not know how many of each color.

You decide what color ball wins. You must then pick this color ball to win.

Which bag would you like to choose from?

Respondent's choice: [ ] Bag 1 [ ] Bag 2

Result of the draw: [ ] Win [ ] Loss

22. If you could choose between getting 100 Birr today or 120 Birr after one week, what would you choose?

(Continue if the respondent chooses 100 Birr today, otherwise stop)

If you could choose between getting 100 Birr today or 140 Birr after one week, what would you choose?

(Continue if the respondent chooses 100 Birr today, otherwise stop)

If you could choose between getting 100 Birr today or 160 Birr after one week, what would you choose?

(Continue if the respondent chooses 100 Birr today, otherwise stop)

(Continue with increases of 20 birr per step until the respondent chooses the amount after one week (or when you reach 300 Birr where you stop in any case) Write the amount the respondent chose after one week on the line below.)

Chosen amount after one week: _____

23. Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?

[ ]Most people can be trusted [ ]Cannot be too careful

H.

24. For how many years have you been working as a grain, vegetable or fruit farmer?
_____Years

25. Does your household have access to water conservation?

[ ] Yes [ ] No

26.

26.1. What was the size of your household's farmland during 2004 (EC) in tsimads?

Owned:_____ Rented:_____ Total:_____ [ ] Did not have any farmland

26.2. What is the size of your household's farmland today in tsimads?

Owned:_____ Rented:_____ Total:_____ [ ] Do not have any farmland

27. What and how much did you harvest the last crop harvest year (2004 EC)?
(If the respondent uses another measure than quintal, use the second row and write both the quantity and measure in the box. Leave the box empty if the respondent did not harvest the specific crop or livestock products.)

	Teff	Wheat	Barley	Sorghum	Maize	Oats	Beans
Quintals							
Other measure							

	Chick Peas	Fruits	Vegetables	Cow milk	Honey	Egg	Other	Other
Quintals								
Other measure								

28. What livestock does your household own? Please state how many.
(Leave the box empty if the respondent does not own the specific livestock.)

	Ox en	Cow	Sheep	Goats	Horses	Donkeys	Mules	Poultry
Quantity								

	Beehives	Other	Other
Quantity			

29. Has your household been affected by any of the following serious shocks during the last year? Drought, disease or pests or weed affecting crops, livestock death from disease, death or serious illness of household member.

[ ] Yes
[ ] No

I.

30. If you are borrowing any money, how much are you currently borrowing?
(Count everything that will be repaid in money) [ ] Amount: _____ Birr
[ ] I am not borrowing any money at the moment

30.1 How many harvests did you have last crop harvest year (2004 EC)?
[ ] [ ] [ ] [ ]
0 1 2 3

31. Which of the following groups are you a member of?
(Read all alternatives. Several alternatives can be ticked)

[ ] Iqqub
[ ] Iddir
[ ] Tsebel
[ ] Wofera
[ ] Village (kushet) based groupings
[ ] Cooperative (general)
[ ] Other: _____
[ ] I am not a member of any group

32.

32.1. Do you know what commercial insurance, which you buy from an insurance company, is?

Yes No
[ ] [ ]

32.2 Do you have commercial insurance?

Yes No
[ ] [ ]

J.

To answer the next questions, imagine the following:

- You can pay every month to protect your household from a bad harvest during the coming whole year
- If the harvest is bad you get 2 000 Birr right after the harvest
- You get the compensation if the harvest is half of the normal harvest or worse
- If this is your normal harvest (*show 10 balls),* then this is half of the normal harvest *(show 5 balls)*
- Most probably, in one of the coming four years the harvest will be bad and you will then get 2 000 Birr

I will now ask you some short questions to make sure that you have understood.

Correct	Incorrect	
[ ]	[ ]	What does this (medhin) protect? *-Your harvest*
[ ]	[ ]	What must happen to your harvest for you the get the compensation? *-The harvest must be half of the normal harvest or worse*
[ ]	[ ]	How much compensation will you get if the harvest is bad? *-2 000 Birr*

(Repeat all the information once again, but do not ask the control questions.)

33.

33.1. What is the MAXIMUM amount of money you would be willing to pay EVERY MONTH to get this protection for the WHOLE YEAR?

You can choose between 5 Birr every month, 10 Birr every month, 15, 20, 25, 30 all the way up to 130 Birr every month. So look at this scale: *(Show card 0-130)*

0 I cannot pay in cash		0 I do not want the protection							
5	10	15	20	25	30	35	40	45	50
55	60	65	70	75	80	85	90	95	100
105	110	115	120	125	130				

33.2. If you instead could pay with hours of labor to get the protection. What is the MAXIMUM number of hours you would be willing to work EVERY MONTH to get this protection for the WHOLE YEAR?

You can choose between 2 hours every month, 4 hours every month, 6, 8, 10, 12 all the way up to 52 hours every month. So look at this scale: *(Show card 0-52)*

0 I cannot pay in labor		0 I do not want the protection							
2	4	6	8	10	12	14	16	18	20
22	24	26	28	30	32	34	36	38	40
42	44	46	48	50	52				