GENDER DIFFERENCES IN DEMAND FOR INDEX-BASED LIVESTOCK INSURANCE

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ABSTRACT

Risk management is an important aspect of helping households avoid and escape chronic poverty throughout the world. In many settings, women and their dependents are disproportionately negatively affected by poverty and shocks, suggesting particular applicability of improved risk management. Index-based insurance products are an innovative approach to risk management that circumvents difficulties associated with transactions costs and information asymmetries that plague standard insurance products in developing countries. General demand for index-based insurance products remains limited despite its theoretical strengths, and very little is known about women's demand. This paper examines the relationship between gender and demand for index-based livestock insurance (IBLI) among Boran pastoralists in southern Ethiopia. It uses three years of household survey data and a series of qualitative interviews to investigate which demand factors for IBLI vary by gender. Results suggest that, though IBLI appears to be equitably accessed by men and women alike, the factors determining access may indeed vary by gender. Risk aversion and informal insurance influence IBLI demand differently for men and women. At the same time, baseline differences in financial literacy and herd size have a negative impact on women's demand, but lower education and smaller shares of income from livestock have a positive effect on IBLI demand by women.

BIOGRAPHICAL SKETCH

Elizabeth Bageant hails from Moscow, Idaho. She received her B.S in Development Sociology from Cornell University in 2010. Before, during and after receiving her B.S., she volunteered and worked for a variety of development-related projects in Mozambique, Ghana and Kenya. She currently lives in Ithaca, New York with her partner where they enjoy gardening, biking, skiing and all things outdoors.

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INTRODUCTION

Multiple studies demonstrate how, in the developing world, women and their children are disproportionately negatively affected by household-level shocks (Dercon and Krishnan 2000, Hoddinott 2006, Hoddinott and Kinsey 2000, Dercon and Hoddinott 2005, Behrman 1988, Rose 1999). In a majority of these studies, low-income households exhibit larger intra-household inequalities relative to higher income households, suggesting that poor women and their children experience shocks more profoundly than their wealthier counterparts do. As a result, women are overrepresented among the world's poor and vulnerable and therefore may benefit disproportionately from improved risk management (Banthia et al. 2009). The social norms and institutions that render women's physical, social and economic vulnerabilities different than those of men may, at the same time, impact their access to innovative products designed to mitigate the long-term detrimental effects of shocks, such as microinsurance. Index-based livestock insurance (IBLI), designed to protect against catastrophic livestock loss due to drought, is one such product, and the question of whether and how access to IBLI coverage varies by gender remains unexplored. Understanding what determines access to IBLI by gender can shape strategies to equitably provide access to this and other innovative risk management products.

Unlike standard insurance, index insurance contracts are not designed around policyholders' actual losses, but around an exogenous index that is supposed to be highly correlated with policyholders' losses. In the case of IBLI, the index was originally designed for a pilot program in northern Kenya using longitudinal data on herd mortality statistically fit to remote-sensing data known as Normalized Differenced Vegetation Index (NDVI), that depicts the vegetative conditions (i.e., greenness and brownness) in these difficult-to-reach areas (Chantarat et al. 2012).[1] When the cumulative deviation of NDVI from mean levels predicts livestock mortality rates beyond a given threshold—the "strike"—

[1] NDVI images used in the construction of the IBLI contract has resolution of 8km^2 and is taken every 10 days from a U.S. National Oceanic and Atmospheric Association satellite used largely for weather forecasting (Chantarat et al. 2013).

insurance payouts are triggered. Compensation varies linearly with the size of the predicted loss. IBLI has been subsequently adapted to southern Ethiopia, where the index is based solely off of NDVI measures, without any forecasting of livestock mortality rates.

This type of index is particularly useful in developing country settings where insured amounts tend to be relatively small in relation to the transactions costs associated with executing a contract in an environment with limited infrastructure. Information asymmetries that plague insurance products (i.e., moral hazard, adverse selection) may be more likely to exist in remote parts of the developing world due to poor infrastructure and monitoring capacity. Given high transactions costs and information asymmetries, it is easy to understand why relatively few formal insurance products are marketed to low-income individuals in the developing world.

Despite its potential to overcome difficulties associated with more standard insurance products, demand for IBLI and similar products has been weaker than expected (Jensen, Mude and Barrett 2014). One key difference between standard insurance products and index-based products that may explain poor demand is basis risk. Basis risk is the mismatch between a policyholder's actual losses and the losses predicted by the index, which can result in the policyholder being compensated for losses he or she did not experience or experiencing losses without receiving compensation. The degree to which basis risk is a concern varies among index insurance products, and is relatively poorly understood (Miranda and Farrin 2012). The relationship between basis risk and demand for index products has been investigated in multiple contexts (Giné et al. 2008, Mobarak and Rosenzweig 2012, Jensen, Barrett and Mude 2014). Conventional wisdom holds that basis risk has an inverse relationship with insurance demand, but the magnitude of the effect remains largely unknown, given few studies on this to date (Mobarak and Rosenzweig 2012, Jensen, Mude and Barrett 2014).

Basis risk aside, theory and prior empirical work suggest that other primary determinants of demand for index-based products include price, trust, credit constraints, understanding of the product and the consumer's attitude toward risk (Hill et al. 2011, Giné et al. 2008). A willingness to pay field experiment and ex ante simulation of IBLI performance suggests that the availability of coping strategies,

a household's expectation of loss and herd size are key determinants of demand for IBLI specifically (Chantarat 2009).

To the best of my knowledge, there are no studies of gender and demand for index insurance products specifically, though several studies of demand include gender controls with no significant effect found. However, in environments where men have higher financial literacy, greater control over assets, more education and access to information, one might expect differential access to innovative risk management products between men and women. In northern Kenya, more than half of IBLI purchases are made by women (ILRI 2012). In Ethiopia, roughly 20 percent of purchasers are women, which corresponds to the proportion of households that are female-headed. Virtually all purchases in Ethiopia were made by household heads.

This study exploits the overlap between purchasers and household heads in Ethiopia to understand determinants of IBLI demand that may vary by gender using household-level panel data and a series of qualitative interviews. Building on previous empirical findings, I posit that risk aversion, informal insurance, product education and female-held assets are particularly relevant to women's demand for IBLI. Using a combination of qualitative and quantitative approaches, I find no gender difference in overall demand for IBLI, but that there are subtle differences in drivers of demand by gender. I find gender-differentiated average marginal effects of informal insurance access and high risk aversion on the IBLI purchase decision and level of purchase, respectively. Lower baseline levels of financial literacy and herd size have a negative effect on IBLI demand, while women's lower education and smaller shares of income from livestock have a positive effect on IBLI demand.

The remainder of the paper begins with a review and discussion of key elements of insurance demand and gender, followed by descriptions of the study setting, data. I then discuss qualitative findings related to model specification before moving on to the estimation strategy and interpretation of results. After a final discussion of synthesized results and methodological reflection, I conclude with implications for further research.

KEY ELEMENTS OF INSURANCE DEMAND AND GENDER

Risk aversion

A consumer's attitude toward risk should be a key determinant of his or her willingness to pay (WTP) for insurance. However, in the case of index insurance, the presence of basis risk may confound this theoretical positive relationship between risk aversion and insurance WTP. If the factors that drive IBLI's basis risk have a gender dimension, then we could expect to see gender gender-differentiated responses to equal levels of risk aversion.

Much empirical and experimental work has attempted to determine whether there is a relationship between gender and risk aversion and, if so, what the underlying mechanisms of the relationship are. In a review of studies of gender and risk aversion Eckel & Grossman (2008) note that despite numerous findings consistent with the hypothesis that women are more risk averse, there remain many studies with inconclusive findings on the question. Measures of risk aversion and its associated characteristics, such as perceptions of risk, are likely highly sensitive to context and risk domains (Weber et al. 2002). Not all studies adequately control for difficult-to-measure traits like confidence, while many fail to control even for income or wealth. These factors may drive gender differences in risk aversion. The vast majority of studies on gender and risk aversion have taken place in experimental settings at American or European universities, often with relatively low stakes. Given the sensitivity of risk aversion measures, caution should be exercised in applying findings from one context to another.

One study of risk aversion in the Ethiopian highlands found no difference in risk preferences between men and women (Yesuf & Bluffstone 2009), though these results may not be generalizable to pastoralist Ethiopia given the substantial difference between the two settings. In the context of index insurance, Giné et al. (2008) find no relationship between demand and gender, but they suggest an interaction effect between risk aversion and knowledge in that risk averse individuals with little knowledge of the product are less likely to purchase than those with greater knowledge. In cases where women's knowledge of the product is systematically lower, this could translate to a gender effect

associated with risk aversion. Similarly, a gender difference in perceived risk of, say, drought, could translate to a gender effect on demand that operates through risk aversion. Given the lack of consistent, generalizable findings on gender and risk aversion, the relationship between gender, risk aversion and demand for livestock insurance remains an empirical question. Any differences in the impact of risk aversion on IBLI uptake by gender may be attributable to inadequate controls for product understanding, differences in trust of the product or insurance company. We can expect the effect of risk aversion on IBLI uptake to vary by gender, but the direction of the effect remains ambiguous.

Informal insurance

Informal risk management institutions exist in virtually every society and include kin networks based on reciprocity, indigenous lending organizations and similar arrangements designed to mitigate the impact of shocks, either ex ante or ex post. The effect of informal insurance on demand for formal insurance products remains an empirical question. Studies on the coverage of informal risk management institutions, both aggregate and differentiated by income, have repeatedly shown that informal insurance falls short of fully protecting households against covariate shocks and performs only slightly better in protecting against idiosyncratic shocks (see Morduch 1999, Bhattamishra and Barrett 2010 for reviews), but whether informal insurance is a substitute for or a complement to index insurance is unclear. Where index insurance protects households against covariate shocks, it may serve as a complement to informal mechanisms that protect against idiosyncratic shocks and a substitute for informal mechanisms, such as remittances, that protect against covariate shocks.

To what extent do informal mechanisms among Boran pastoralists in southern Ethiopia cover idiosyncratic risk? Lybbert et al. (2004) suggest that idiosyncratic risk dominates among Boran pastoralists and that livestock transfers offer only limited insurance coverage. Santos and Barrett (2011) find that that informal loans of cattle among Boran pastoralists function as a safety net rather than as insurance in that loans are given contingent on the borrower's expected gains from insurance rather than

the borrower having experienced a shock. These two cases suggest that informal mechanisms weakly, if at all, insure Boran pastoralists against idiosyncratic or covariate risk.

Mobarak and Rosenzweig (2013) consider participation in informal networks in the context of index insurance where basis risk is present. They find that participation in networks that cover idiosyncratic risk, as opposed to the covariate risk targeted by index insurance, interacts with basis risk to affect demand for the index insurance product. Where basis risk driven by idiosyncratic risk is high, index-based products complement informal insurance participation, but where basis risk is low informal risk sharing has no effect on demand. If idiosyncratic risk is poorly covered by informal mechanisms IBLI is unlikely to complement informal insurance. If that is the case, then informal insurance should have a negative or no effect on demand for IBLI.

While none of the above findings pertain specifically to gender, women's risk might be less covered or differently covered by informal institutions than that of men, due to differences in wealth or social connectedness. Even if IBLI were to cover covariate shocks perfectly over a given index area, women's experience may be more or less like the average of the index area. If gender is correlated with something that makes women different from the average, such as social connectedness, this could drive levels of idiosyncratic losses.

Additionally, access to informal groups and networks is not exogenously determined and thus the most vulnerable might be excluded from some informal insurance arrangements due to their inability to keep up with reciprocity arrangements or pay entry costs (Santos and Barrett 2011, Cohen and Sebstad 2005, Bhattamishra and Barrett 2010). A gender effect operating through variation in wealth or social networks may be evident in econometric analysis if adequate measures of these attributes are not included. It is also important to remember that heterogeneity within female-headed households likely plays a role, as the marital status of a female household head is likely correlated with her wealth and the nature of her social networks. If female-headed households and male-headed households are engaged in different types of informal insurance or experience different levels of coverage, they may exhibit a different demand pattern for an index-based product.

IBLI product education

The challenges of marketing a sophisticated insurance product to remote communities with high illiteracy and limited prior exposure to formal insurance cannot be understated, as consumer understanding of how the product works is essential to making the decision to purchase. Thus, marketing of index-based insurance products necessarily involves an education component. Many microinsurance products are marketed in conjunction with financial literacy training, the success of which varies widely, suggesting a need for further research on the best ways to present information on insurance (Dror et al. 2012, Matul 2013). When information channels are male-dominated and women are difficult to reach, gender sensitivity in marketing and education matters for uptake by women (Banthia et al. 2009).

Anecdotal evidence suggests that women do not have access to the information they want about IBLI, but it is not clear whether this is a gender-specific phenomenon. Women's community involvement and market participation is clearly on the rise (Hertkorn 2013, McPeak et al. 2011), suggesting that the extent to which women are able to access information channels may also be in flux. The successful education of women about IBLI hinges upon specific strategies for accessing women and increasing their understanding of IBLI. We would expect that education via female-accessible channels would have a stronger positive association with IBLI uptake by women than by men.

Female assets and bargaining power

Asset holdings have implications for avoiding chronic poverty and, worldwide, women tend to command fewer assets than men (Deere and Doss 2006). Pastoralist regions in Ethiopia are consistent with this. In this setting, livestock is the primary asset, but intra-household ownership arrangements are complex. Within the household, decision-making about livestock management might fall to some individuals, while the rights to livestock products might fall to others, and still others may control livestock products for sale (Kristjanson 2012, Hertkorn 2013). Previous work investigating gender and

livestock ownership focuses almost exclusively on household-level livestock ownership in relation to the gender of the household head rather than intra-household ownership arrangements. McPeak et al. (2011) suggest that male-headed households in southern Ethiopia and northern Kenya are more likely to own all types of livestock, while female-headed households are more likely than male-headed households to own no livestock at all, but the intra-household details of these ownership arrangements are not clear. McPeak et al. emphasize, however, that many female-headed households report both owning livestock and buying livestock, in some cases more than male-headed households.

Although in pastoralist Ethiopia, ownership is not clearly articulated, it can be argued that women hold special rights over animals that are lactating, because milk production and caring for young animals falls squarely into the female domain in these societies (Coppock 1994, McPeak et al. 2011). Lactating animals thus generate a large portion of the female income stream. During drought, men and stronger animals travel to areas with better pasture, leaving lactating and young animals behind with women and children at the base camp where conditions are poor. In addition, lactation rates themselves are sensitive to drought. Given these factors, one would expect women to have greater incentive to insure when there are many lactating animals in the household herd. That said, a woman's control over lactating animals and associated income might increase her capacity to self-insure and lower her WTP for IBLI. Therefore, the relationship between wealth alone and IBLI uptake remains ambiguous.

Asset ownership can also increase a woman's intra-household bargaining power, which is important in cases where the unitary model of household decision-making fails and household members do not have identical preferences (see Chiappori and Donni 2009 and Alderman et al. 1995 for discussions of the unitary model). McPeak and Doss (2006) demonstrate contested decision-making processes in milk marketing decisions in northern Kenya, supporting the conclusion that preferences are likely different among household members. In the context of non-identical preferences among household members, one of the factors that shapes an individual's bargaining position within a household is her defection point, or what she can expect to walk away with if bargaining fails and the household dissolves. The control a woman exerts over household assets such as livestock influences her defection point.

Women's incentive to insure could be positively correlated with the size of her endowment, which would in turn be positively correlated with bargaining power, suggesting potential for a positive relationship between female assets and female IBLI purchase. Given these factors, we might expect that female assets have a stronger positive effect on IBLI uptake by women than by men, but considering the ambiguity of the relationship between wealth and IBLI uptake discussed above, the overall effect is ambiguous.

In light of the four key elements of gender and microinsurance demand discussed above, the remainder of this analysis considers demand for IBLI for an individual *i* at time *t,* (Y_{it}) as

$$Y_{it} = f(G_i,\ R_i, I_{it}, K_{it}, A_{it}, P_{it}, V_{it-1}, X_{it}) +\ \varepsilon_{it}$$

where G_i represents gender, R_i represents an individual's time-invariant risk aversion, I_{it} represents informal insurance coverage, K_{it} represents product education and A_{it} represents female assets. Additionally, P_{it}, V_{it-1}, and X_{it} represent, respectively, price, current IBLI coverage and a host of demographic and insurance-related characteristics. Finally, ε_{it} represents a disturbance term. Before specifying the model in depth, we turn to discussion of the setting, data and key variables.

SETTING AND DATA

The International Livestock Research Institute (ILRI), Cornell University, and the Oromia Insurance Company (OIC), in collaboration with local government Development Agents (DAs), and numerous researchers, introduced the IBLI product in the southernmost part of the Oromia Regional State of Ethiopia in August 2012, following the successful piloting of a similar product in neighboring northern Kenya in January 2010. IBLI is marketed and sold by OIC, with technical support provided by ILRI. IBLI policies are sold twice a year during sales periods in August/September and January/February, which correspond to the ends of the dry seasons in the bimodal rainfall pattern in the arid-to-semi-arid

region. Contracts cover a one-year period and individuals choose the number of animals they insure. IBLI is priced by geographic region and species, according to drought risk. Insurance premiums range from 7.5-11 percent of the estimated value of the animal.

This analysis takes advantage of two sources of data. The introduction of the IBLI product involved collection of annual household survey data and several experimental features, all of which were designed to aid in impact assessment and encourage IBLI uptake. Informed by initial exploration of two rounds of survey data, I then designed a complementary qualitative data collection tool that was implemented in April 2014 with the express purpose of addressing gaps in the survey data and enhancing understanding of key concepts relating to IBLI uptake and gender.

Survey and Implementation Data

The survey sample was selected prior to IBLI implementation to capture geographic, agro-ecological and livelihood variation in the eight southernmost woredas of the Oromia Regional State where IBLI would be offered. Using multi-stage cluster sampling, the household survey sample was clustered by reera, a subunit of the woreda, containing approximately 100-300 households. Reeras inaccessible by vehicle were excluded for logistical and cost reasons.[2] For the selected reeras, local government development agents were deployed to compile household rosters containing the name of the household head and livestock holdings.[3] Stratifying by livestock terciles, a proportional random sample of 15 percent of each reera was drawn with a minimum rule of 25 households per reera. Where 15 percent of households in one reera did not meet the 25 household minimum, neighboring reeras were combined into a single sampling unit, making a total of 17 sampling units (ILRI 2014).

[2] Note that reeras were not selected randomly and therefore cannot be said to be representative of the regional state, woredas or kebeles from which they were drawn. Reera-level population data outside of the selected reeras is not available and therefore survey weights, if used, would apply only to the selected reeras and will not be statistically valid for conclusions outside of the sample.

[3] Households were defined as "a group of people who live in the same homestead (which may consist of more than a single dwelling) and share food and other items bought from a common household budget." In the context of polygamous marriages, one husband can have multiple wives and each wife may or may not have a separate household (ILRI 2014).

The household survey is conducted annually in March, following the conclusion of the January/February IBLI sales period. Baseline data were collected in 2012 with repeated data collection in 2013 and 2014. Though data are collected annually, many variables are collected using a monthly or seasonal recall structure. This allows for analysis using two panel periods within each year that correspond to the twice-yearly IBLI sales period and bimodal rainfall pattern, as depicted in Figure 1.[4] Data are collected on a broad range of household characteristics and behaviors relating to livelihoods, livestock management, herd dynamics, wellbeing, risk management and demographic characteristics. Baseline data consist of 515 households. After attrition and missing data, 464 households are retained for analysis.[5]

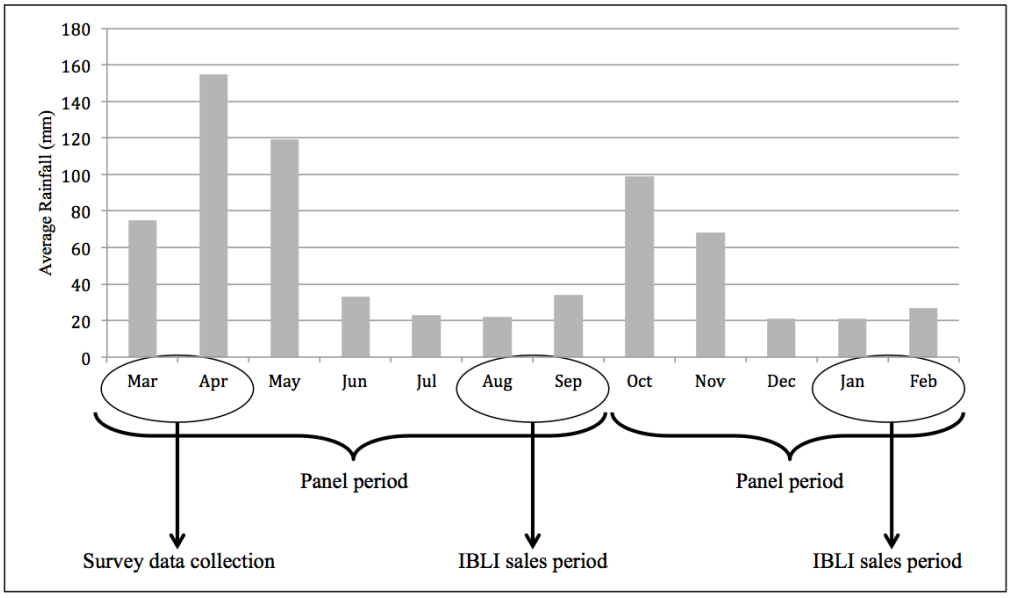

Figure 1: Seasonal Survey Structure

In order to encourage uptake of IBLI and aid in understanding the effects of liquidity constraints on insurance purchase, discount coupons were randomly distributed to 80 percent of households across all reeras. Discounts ranged from 10-80 percent for purchase of up to 15 tropical livestock units (TLU) of

[4] Rainfall data from Lasage et al. 2010.
[5] See Appendix A for further details on panel construction. See Appendix B for complete attrition analysis.

livestock.[6] The remaining 20 percent of household received no coupon, unless they were participants in ILRI's annual herd migration survey, in which case they had a 50 percent chance of receiving a 100 percent voucher for IBLI purchase up to 15 TLU. Only ten households received the 100 percent voucher in any given sales period.

Two additional educational treatments were also randomly assigned to separate samples of 50 percent of the survey households. The first treatment was an audio recording of a skit about IBLI, developed by ILRI and OIC. Local development agents were asked to play this tape to selected households. The second treatment was an illustrated pamphlet describing IBLI. Both the audio and visual treatments were distributed in the course of broader extension and marketing visits to communities. Using data obtained directly from ILRI as well as data from the household survey, Table 1 demonstrates how households were assigned to receive the encouragement treatments at least once between August 2012 and January 2014 and either did not receive them or did not remember receiving them at the time of the survey. This could be due to implementation failure and/or poor recall by respondents. Assignment data, rather than household self-reported data, for these treatments are used in analysis and, given imperfect compliance, effects should be interpreted as intention-to-treat estimates.

Table 1: Randomized Encouragement Treatments

Treatment	HHs assigned treatment (% of total)	HHs reported receiving treatment (% of total)
Discount coupon	80%	55%
Skit tape	13%	9%
Cartoon	20%	19%

The 2014 data collection had two features designed to contribute to this study. First, marital status for all female-headed households was verified and, where the household head was a married female, additional information about the status of the husband was gathered. This served to validate

[6] TLU, or tropical livestock units, are calculated based on metabolic weight. 1 TLU = 1 bovine = 0.7 camel = 10 sheep/goats.

previously collected marital status data. Second, ILRI collected information on the endowment of livestock brought to the household by brides at marriage, as well as information on current stocks and recent flows of such animals.

Qualitative Data

Following the logic of purposive sampling (Patton 2002), the qualitative sample is stratified along the key dimensions of IBLI purchase history and gender of household head. To better understand heterogeneity within female-headed households, we stratify within this category by marital status. This created eight unique categories from which I intended to sample two households at specific points along the distribution of wealth, measured by the household's herd size during the 2014 survey period. Appendix C contains details on the sampling strategy. Based on this sample, qualitative interview data were collected from 15 survey households[7] in April 2014. The interview guide was designed after preliminary analysis of the first two rounds of survey data in order to complement survey data in pursuit of testing the four conceptual hypotheses outlined above.[8]

The primary intended contribution of the qualitative data was to complement the survey data in the investigation of the above gender-related hypotheses. In particular, qualitative data provided an opportunity to examine the perceptions of risk associated with IBLI in order to better understand the role of risk aversion. Interviews also examined the nature and extent of informal insurance coverage in Borana and perceptions of differences in coverage between men, women and people of different marital statuses. Lastly, interviews elicited consumer preferences surrounding sources of information about IBLI and the stated reasons for these preferences. With respect to these hypotheses, qualitative data also provided an opportunity to enhance description and contextual understanding, and bring new information about heterogeneity to categories and behaviors that appear homogeneous in the survey data. Finally, the

[7] Unforseen changes in marital status and purchase behavior resulted in only 15 out of the intended 16 households being interviewed.
[8] Complete interview guide is contained in Appendix C.

qualitative data validated survey data to improve the identification and understanding of measurement error in key variables, thus informing variable construction, econometric model specification and interpretation of econometric results. The most salient qualitative findings are reported in the following discussion of variable construction and, later, in the interpretation and discussion of econometric findings.

KEY VARIABLES

IBLI purchase and TLU insured

The ILRI survey contains a question asking if the respondent purchased *insuraansii horrii,* or livestock insurance, in the past year and the qualitative sample was selected based on reported purchase behavior. However, we found significant error in these variables when implementing qualitative interviews, which led us to validate survey responses using OIC administrative data. When compared against administrative data, only 87% of respondents correctly identified their recent purchase behavior. Of all misreported purchases, 80 percent were false positives while only 20 percent were false negatives, indicative of systematic over-reporting of IBLI purchase. Households that had purchased IBLI at least once in previous years, but appeared to misunderstand the reference period of the question, accounted for a majority of false positives. Other false positives may be households that failed to make the distinction between purchasing the IBLI product and being part of the survey sample. A majority of households (73%) in our qualitative sample conflated the ILRI survey or visits by OIC and ILRI staff with the IBLI product at least once in the interview when asked about *insuraansii horrii,* suggesting that people understand the term in a variety of ways. False negatives are likely due to the interviewee in the survey being different from the person who purchased and poor information sharing within the household, a pattern that could also contribute to false positives. Given the non-random nature of the measurement error in reported IBLI purchase, and its centrality to this analysis, this analysis uses OIC administrative IBLI purchase data.

Gender of IBLI purchaser

The gender of the household head is the most practical proxy for gender of purchaser, given that it is highly correlated with the gender of the person named on the insurance contract with a bivariate correlation coefficient of 0.94. Furthermore, in the limited cases where the head was not the purchaser, one can assume that the household head influences the purchase decision in some way and indeed, this dominates in the qualitative data on decision making where being the household head was cited as the reason the respondent had the most influence over a livestock or budget allocation decision in 67% of households. In this analysis, a female-headed household with a male individual named on the insurance contract is considered a female IBLI purchase and vice versa. Neither of these cases is a common occurrence in the survey data where women in male-headed households made only 2.2 percent of total IBLI purchases and 1.3 percent of purchases were made by men in female-headed households.

Risk aversion

The baseline household survey included a risk preference experiment in which the respondent chooses from a set of six gambles where risk and expected outcome are positively correlated (ILRI 2014). Using these data, I created a set of binary variables by combining the two lowest, middle and highest levels of risk aversion to represent low, moderate and high risk aversion.

Informal insurance coverage

Finding a meaningful indicator of informal insurance coverage is challenging. Given prior studies' use of informal cash and in-kind transfers between households and network group participation as measures of informal insurance coverage (Lybbert 2004, Jensen et al. 2014), qualitative data collection was tailored to explore the extent to which these institutions—groups and transfers—serve an informal insurance function in the Borana context. It appears that network groups and transfers capture participation in institutions that may function as informal insurance, but not all groups and not all transfers are insurance. So it is complicated.

Qualitative validation of survey data suggests that the network groups captured in the survey—mostly savings and loan groups and small business groups—provide extremely limited idiosyncratic insurance coverage and may not be meaningful as a measure of informal insurance. While all but one group allowed members to take out loans when facing a shock, the three respondents who had taken advantage of this option described the group contribution to the wellbeing of their household as "small" or "low" compared to other sources of assistance in difficult times. Two respondents stated explicitly that the group had not helped them to date and the remaining six respondents were unwilling to say the group had no benefits but at the same time were unable to articulate benefits they experienced.[9]

Qualitative data suggest that the decision to give a transfer is driven by two factors. The first, which was demonstrated in the data from 100 percent of qualitative respondents, is the normative belief that one is obligated to help those who are most in need, regardless of transfer history. The second consideration is the giver's recollection or expectation of reciprocity by the receiver, which was stated directly by 60 percent of qualitative respondents. Qualitative validation of 58 specific transfers recorded in the survey data suggested that 46 percent of transfers may be insurance-related in that they provide one of several types of coverage in the form of ex ante investment in future incoming transfers from recipients (50%), ex ante preparation for the receiver in anticipation of a planned expense such as a birth or marriage (34%) and/or ex post coping for the receiver after an idiosyncratic shock (42%). The ex ante insurance for giver function is often combined with the latter two functions, though this cannot be confirmed directly because data were only collected from either the giver or the receiver for a given transaction. Informal insurance is represented using the total of the absolute values of monthly cash and in-kind transfers received and given by the household in order to capture not only the insurance a household experiences in the form of a transfer receipt, but also the insurance a household experiences when they engage in ex ante insurance behaviors by giving to others with the expectation of reciprocity.

[9] Four respondents had no household members participating in groups.

Product education

The survey captures the IBLI education experience of the household based on 14 specific questions about sources of information through which the household learned about IBLI. Qualitative interviews probed the ways that people learned about IBLI and which information channels worked and didn't work for them individually. Again, this issue of whether people consider the difference between the IBLI product and participation in the IBLI survey sample comes into play. When asked about learning about *insuraansi horrii*, nearly half (46%) of respondents focused initially on "learning" that the IBLI team was coming to do the survey (i.e., being informed to stay home and wait for the enumerator) or similar administrative information rather than increasing their understanding of how the IBLI product functions. During the interviews, we took care to clarify the focus of our interest, but it is unlikely that enumerators did so during survey data collection. While all respondents—male and female—indicated that they prefer to be taught about IBLI in their homes for such reasons as convenience, reducing distractions and increased opportunity to ask questions, one might expect that this is more important for women whose domestic responsibilities, such as caring for children, cooking and looking after lactating and newborn animals, limit their mobility. Additionally, only two women indicated that they attended community meetings where IBLI was discussed, and both opted to listen and let others ask questions.

One approach to measuring the product education experience of the household using existing data is the number of separate sources of information about IBLI that the household received. The survey data do not capture the intensity of information or the type of information received through these sources, so this fails to disentangle IBLI product-focused information itself from information about the implementation of the survey or the presence of OIC sales agents in the community on a given day. Another approach is to incorporate survey data on the "most important source" of IBLI information, however qualitative data completely contradicted patterns in the survey data.[10] Another approach is to

[10] According to the survey data, the most important information sources for both male- and female-headed households were community meetings and NGOs, followed by the insurance company and informal conversations with friends and family. Qualitative data contradict this. All respondents who attended community meetings where IBLI was discussed reported not effectively learning about the IBLI product at community meetings. No one

use only information sources that are explicitly product-focused such as radio, posters and OIC extension agents, but this fails to account for the unanimous sense that learning is more difficult in away-from-home settings. One may learn less from a product-focused information session at a community meeting and more from an incidental conversation about IBLI with a health worker who visited the home to perform vaccinations. Coincidentally, home-centered and product focused information channels are nearly mutually exclusive, as laid out in Table 2. The intersection of these two categories consists of radio broadcasts—only 10 percent of the sample owns a radio—and the cartoon/tape intervention assigned to 33 percent of households in the first sales period only. Thus, in the variable construction decision there is a tradeoff between different types of measurement error associated with product-focused channels versus home-centered channels. Home-centered channels may be biased upward from information "learned" related to implementation that is reported as IBLI product information, while product-focused channels may present information focused on the IBLI product directly, but without capturing the level of learning that took place. Given the importance of home-centered information to women, I opt to structure the variable as the proportion of total information sources that are home-centered.

reported community meetings as a preferred channel, though for many people they were the only product-focused channel, which may explain why this was chosen as "most important" in the survey data. No one indicated that they learned about the IBLI product from informal conversations with friends and family. The category "NGO" meant different things to different people, including ILRI, OIC or anyone who comes to the community in a car.

Table 2: IBLI Information Sources

Product-focused channels	Home-centered channels	Neither	Prevalence (%)
OIC staff			11.8%
Television			1.2%
Posters			4.6%
Cooperatives/Network Groups			3.7%
Community meetings			49.2%
Radio	Radio		4.3%
DAs (cartoon/tape)	DAs (cartoon/tape)		37.1%
	ILRI household survey		76.2%
	NGOs		1.6%
	Neighbors, friends and relatives		52.9%
		Discount coupon distribution	50.1%
		DAs (non-cartoon/tape)	64.8%

Female assets

A good proxy for intra-household bargaining power in the context of IBLI will be correlated with a woman's bargaining power, but not endogenous to her decision to purchase IBLI. Commonly used proxies for bargaining power include women's inherited assets, women's current assets, women's income shares, unearned income and assets, and human capital brought to marriage (Quisumbing & Maluccio 2003, Hoddinott & Haddad 1995, Fafchamps et al. 2009, Schultz 1990, Thomas 1990). Educational attainment at marriage is a logical human capital measure. However given the limited educational attainment of the population of interest, I propose two different measures of female-controlled assets as proxies for bargaining power.

In the process of marriage in Boran culture, the bride and groom bring livestock gifted from their family members to the newly-formed household herd. Cattle from the bride's father are known as *horrii siiqqee* (HS). HS animals and their offspring are given names that relate to their origin with the bride's family. Focus group discussions suggest that while everyone considers all animals to belong to the household, HS cattle are identifiable by all as part of the wife's endowment and that there may be subtle restrictions on what can be done with these animals (e.g., selling, slaughtering, gifting) without the wife's consent. Importantly, the wife retains these cattle in the rare, but possible, event of a divorce. As such, HS cattle provide an excellent indicator of a woman's endowment.

The use of assets at marriage as an instrument for the wife's endowment comes with concerns of endogeneity. Assets gifted by family members at marriage may be correlated with the degree to which a woman's family invested in her physical and social wellbeing throughout her childhood. As such, a married woman's decision to purchase IBLI may be influenced by her bargaining power, but also directly influenced by the unobserved ways her parents invested in her as a child. Quisumbing and Maluccio (2003) suggest that virtually all proxies for bargaining are vulnerable to endogeneity, but that a strength of using assets brought to marriage is that, unlike current asset holdings, it is unaffected by endogenous decision-making processes within the marriage.

An alternate measure of bargaining power using current assets controlled by the woman can be proxied by the number of lactating animals in the household herd. Milking and milk products fall into the female domain in Borana society and they represent the female contribution to the economy of the household (Coppock 1994, Hertkorn 2013). As such, reduced lactation rates due to drought will affect women profoundly as lactation slows and, for some animals, lactation stops altogether, removing them from the female domain. Lactating animals are expressed as a percentage of total herd.

Data on HS cattle were collected in March 2014. Rather than attempting to elicit recall data for previous years, we collected information on HS cattle endowed at marriage, current stocks and births, deaths, transfers and sales over the previous year. Using these data, we have generated HS animal stocks at seasonal periods beginning with March 2013 as well as stocks at the time of household formation. Both are expressed as a percentage of the household's cattle herd.

RESULTS

Summary Statistics

As summarized in Table 3, panel households are 21 percent female-headed, a majority of whom are widows (70%). Married female household heads comprise 20 percent of the female-headed households. Married female-headed households tend to be polygamous households where multiple wives maintain separate households, or men may have been away herding at the time of the survey. In terms of

female headship, the sample is consistent with other estimates of the prevalence of female headship in Ethiopia which range from 9 percent of married households countrywide (Fafchamps and Quisumbing 2002) to 29 percent of households in southern Ethiopia specifically (McPeak et al. 2011). Households were overwhelmingly Boran and practiced traditional forms of religion. More than three quarters of households are fully settled and few households remain nomadic.

Table 3: Panel Household Characteristics

		Frequency	Percent
Head Gender	Female Head	97	20.9
	Male Head	367	79.1
	Total	*464*	*100.0*
Marital Status of Female Heads	Never married	2	2.1
	Married	19	19.6
	Divorced/separated	8	8.2
	Widowed	68	70.1
	Total	*97*	*100.0*
Ethnic Group	Borana	427	92.0
	Guji	36	7.8
	Gabra	1	0.2
	Total	*464*	*100.0*
Religion	Traditional	385	83.0
	Muslim	18	3.9
	Orthodox	1	0.2
	Protestant	42	9.1
	Catholic	7	1.5
	Other Christian	11	2.4
	Total	*464*	*100.0*
Settlement Status	Fully Settled	356	76.7
	Partially Settled	72	15.5
	Nomadic	36	7.8
	Total	*464*	*100.0*

Table 4 shows the overall means for the full sample as well as means for male and female-headed households and differences. Detailed information on the construction of all variables is located in Appendix A. Households in the sample herd, on average, 19 TLU of livestock. Total income is, on average, equivalent to $190 USD per household per month, only about $18 of which are cash earnings. Given the average household size of 7.3 individuals, this implies an average income of roughly $0.86 per day across the sample, 90 percent of which is in-kind, highlighting widespread poverty and the subsistence economy in the region. Male-headed households have per-person income of $0.89 per day while female-headed households have a per-person income of $0.68. Other statistically significant differences between male and female-headed households also emerge and suggest potential for differentiated IBLI demand by gender. Female-headed households (FHHs) have, on average, smaller

herds, lower total income, participate in lower total transfers and fewer network groups. Female-headed households' reliance on livestock income is 14 percentage points lower than men. Between male- and female-headed households there is no difference in highest educational attainment of any household member, but female households heads have significantly lower personal educational attainment than male household heads and also scored lower on a financial literacy test conducted at baseline. There are no differences in risk aversion or expectations of upcoming rangeland conditions. Female household heads are, on average, older than male household heads, probably due to the number of widows and longer female life expectancy. FHHs are smaller by almost two people, yet there is no apparent difference in dependency ratios. Members of FHHs also participate in fewer network groups. These two features are likely due to male-headed households consistently containing at least two adults while most female-headed households contain only one, consistent with significant differences in household size. With respect to IBLI, FHHs have fewer sources of IBLI information, yet this is not reflected in a lower score on a series of questions designed to test an individual's knowledge of IBLI. The rate of IBLI purchase does not differ by gender of household head, but FHHs who purchase IBLI tend to report having insured fewer TLU than male-headed households, though the percentage of herd insured is not significantly different between household types.

These means tests demonstrate multiple pathways in which demand could shift for women. To the extent that income and wealth impact demand, one might expect lower demand for IBLI in female-headed households due to smaller herd sizes and lower incomes, or, conversely, if income increases the capacity to self-insure, one might see higher demand among lower-income groups such as women. Gender differences in the proportion of income from livestock could also shift demand in either direction, depending on whether reliance on livestock income provides an incentive to insure or, given that it is largely in-kind, constrains liquidity with which to purchase insurance. Gender differences in education and financial literacy have the potential to impact demand for a financial product such as IBLI, yet this would likely operate through their understanding of the product which appears to be similar. If there is an age dimension to the adoption of new financial products, female-headed households, being older on

average, may exhibit differential demand. These possibilities will be further explored through regression analysis after examining the characteristics of IBLI purchasers and non-purchasers in greater detail.

Table 4: Panel Household Characteristics Disaggregated by Gender of Household Head (R3)

	Aggregate		Male Head		Female Head		Differences	
	Mean	SD	Mean	SD	Mean	SD	Male-Fem	(t-stat)
Herd size (TLU)	18.43	25.87	20.63	27.61	10.00	15.08	10.6***	(5.22)
Total Income (ETB)	3,750.00	5,853.00	4,122.00	6,233.00	2,328.00	3,780.00	1794.2***	(3.68)
Cash Income (ETB)	357.40	3,397.00	361.70	3,677.00	340.80	2,009.00	20.9	(0.077)
Proportion of income from livestock	81.82	28.93	84.71	25.73	70.77	36.93	13.9***	(3.61)
Cash Savings (ETB)	1,493.00	9,791.00	1,709.00	10,802.00	669.40	3,986.00	1039.8	(1.55)
Asset Index	0.00	1.00	0.04	1.04	(0.15)	0.83	0.19	(1.91)
All Transfers	237.80	317.30	257.20	341.60	163.70	181.60	93.5***	(3.76)
Network Groups	0.96	0.93	1.05	0.95	0.62	0.77	0.42***	(4.74)
Education	3.29	3.13	3.32	3.16	3.16	3.04	0.16	(0.45)
Household Head Education	0.52	1.84	0.62	2.02	0.15	0.85	0.47***	(3.46)
Financial Literacy	4.16	1.27	4.26	1.19	3.78	1.50	0.48**	(2.98)
Age of Head	51.78	17.96	50.81	17.72	55.53	18.48	-4.72*	(-2.32)
Household Size	7.28	2.81	7.69	2.83	5.70	2.11	1.99***	(7.88)
Dependency ratio	1.39	0.87	1.35	0.74	1.54	1.24	-0.20	(-1.53)
Low risk aversion	0.39	0.49	0.39	0.49	0.41	0.49	-0.019	(-0.36)
Moderate risk aversion	0.43	0.50	0.43	0.50	0.45	0.50	-0.020	(-0.37)
High risk aversion	0.18	0.38	0.19	0.39	0.15	0.35	0.040	(0.99)
Expected rangeland below normal	0.46	0.50	0.45	0.50	0.49	0.50	-0.031	(-0.56)
Expected rangeland normal	0.30	0.46	0.30	0.46	0.30	0.46	-0.0040	(-0.079)
Expected rangeland above normal	0.24	0.43	0.25	0.43	0.21	0.41	0.035	(0.76)
Home-Centered Info Sources	37.22	20.00	37.59	19.67	35.81	21.26	1.78	(0.77)
IBLI Knowledge	4.91	1.80	4.96	1.82	4.73	1.72	0.23	(1.21)
Effective price per TLU	280.00	134.00	281.60	132.10	273.60	141.40	8.00	(0.52)
IBLI Purchase --Reported	0.30	0.46	0.30	0.46	0.30	0.46	-0.0015	(-0.029)
IBLI Purchase--OIC	0.08	0.27	0.08	0.27	0.08	0.27	-0.0015	(-0.051)
TLU Insured—Reported (n=149)	2.49	5.07	2.87	5.62	1.05	0.99	1.19	(1.79)
TLU Insured--OIC (n=38)	4.41	6.26	4.96	6.49	2.33	5.16	2.64	(1.06)
Percent herd insured--Reported (n=149)	0.03	0.14	0.03	0.16	0.03	0.09	0.00006	(0.0021)
Percent herd insured--OIC (n=38)	0.28	0.42	0.28	0.45	0.29	0.33	-0.0124	(-0.0072)
Observations	497		394		103		497	

* p<0.05, ** p<0.01, *** p<0.001

At the aggregate level, there are many differences between purchasers and non-purchasers (Table 5). Purchasers have larger herds, fewer non-livestock assets and a larger proportion of their income comes from livestock, consistent with the idea that dependence on livestock contributes to IBLI demand. Purchasers have greater financial literacy and IBLI-specific knowledge, highlighting the importance of the relationship between product understanding and uptake. Contrary to standard insurance demand theory, IBLI purchasers have lower risk aversion, suggesting that IBLI may not be perceived as risk-reducing, yet at the same time purchasers are more likely to expect below-normal rangeland conditions. Purchasers had greater access to home-centered information sources than non-purchasers, but we see no differences in total information sources between these groups.

Among women, few differences emerge between purchasers and non-purchasers. Purchasers continue to have fewer non-livestock assets, but aggregate differences in herd size and proportion of income from livestock do not hold for the female subsample. Female purchasers do appear to give and receive less total transfers, suggesting potential for an inverse relationship between informal insurance and demand for IBLI. IBLI knowledge remains important for women's demand.

When comparing purchasers by gender, the differences presented in the final columns of Table 5 largely mirror differences in the population as a whole presented in the final columns of Table 4. Notably, the absolute amount of TLU insured is significantly higher for men than for women, yet the proportion of herd insured is not significantly different.

Table 5: Differences Between Purchasers and Non-Purchasers, and Purchasers By Gender

	Aggregate		Female		Purchasers by Gender	
	Purch - Non	t-statistic	Purch - Non	t-statistic	Male-Female	t-statistic
Herd size (TLU)	6.28**	(2.85)	-0.96	(-0.63)	18.8***	(6.43)
Total Income (ETB)	-351.3	(-1.48)	45.9	(0.14)	1174.7**	(3.05)
Cash Income (ETB)	-52.8	(-0.80)	-91.4	(-0.85)	69.5	(0.82)
Proportion of income from livestock	-7.66***	(-3.55)	-0.0043	(-0.0009)	3.99	(0.78)
Cash Savings (ETB)	3018.6	(1.89)	243.3	(0.39)	4515.7*	(2.17)
Asset Index	-0.077**	(-2.79)	-0.091*	(-2.28)	0.11***	(3.52)
Total Value of Transfers	21.0	(0.27)	-57.6*	(-2.41)	173.6	(1.76)
Network Groups	0.10	(1.90)	-0.010	(-0.13)	0.53***	(5.77)
Education	0.21	(1.09)	0.46	(1.05)	-0.024	(-0.052)
Household Head Education	-0.15	(-1.44)	0.075	(0.58)	0.26	(1.57)
Financial Literacy	0.17*	(2.21)	0.17	(0.85)	0.51**	(2.68)
Age of Head	-1.10	(-1.03)	-4.86	(-1.94)	-1.21	(-0.48)
Household Size	-0.26	(-1.68)	-0.077	(-0.32)	1.69***	(6.36)
Dependency ratio	0.0082	(0.14)	0.087	(0.47)	-0.43*	(-2.45)
Low risk aversion	0.077*	(2.51)	0.12	(1.78)	-0.059	(-0.86)
Moderate risk aversion	-0.020	(-0.67)	-0.082	(-1.25)	0.057	(0.85)
High risk aversion	-0.056**	(-2.89)	-0.037	(-0.89)	0.0019	(0.045)
Expected rangeland below normal	0.077*	(2.50)	0.048	(0.71)	0.073	(1.06)
Expected rangeland normal	-0.035	(-1.33)	-0.033	(-0.56)	-0.012	(-0.20)
Expected rangeland above normal	-0.041	(-1.65)	-0.015	(-0.26)	-0.060	(-1.03)
Total IBLI Info Sources	0.18	(1.86)	0.26	(1.49)	0.31	(1.68)
Home-Centered Info Sources	2.57*	(2.00)	1.34	(0.48)	1.30	(0.47)
IBLI Knowledge	0.52***	(5.27)	0.74***	(3.63)	0.013	(0.062)
Effective price per TLU	-93.8***	(-11.2)	-68.7***	(-4.55)	-26.3	(-1.63)
IBLI Purchase—Reported					0.0038	(0.068)
TLU Insured—Reported					1.25***	(4.67)
TLU Insured—OIC Records					2.39***	(5.91)
Percent of herd insured--Reported					-0.27	(-0.93)
Percent of herd insured--OIC Records					-0.27	(-0.90)
Observations	1940		404		316	

* p<0.05 ** p<0.01 *** p<0.001

Econometric Strategy and Challenges

The econometric approach to estimating gender-differentiated demand for IBLI involves estimating determinants of an individual's propensity to insure as well as the level of coverage purchased by that individual. The binary purchase decision can be expressed as:

$$Purchase_{it} = \alpha + \gamma_1(G_i * R_i) + \gamma_2(G_i * I_{it}) + \gamma_3(G_i * K_{it}) + \gamma_4(G_i * A_{it}) + \delta_0(G_i) + \delta_1(R_i) + \delta_2 I_{it} + \delta_3 K_{it} + \delta_4 A_{it} + \eta(V_{it-1}) + \varphi(P_{it}) + \zeta(X_{it}) + \mu_i + \varepsilon_{it}$$

in which the purchase decision, $Purchase_{it}$, is regressed on interactions of gender, G_i, with the variables of interest described in detail above as well as the first-order interacted variables and controls for price (P_{it}), current coverage (V_{it-1}), and household characteristics (X_{it}). The acomposite error term consists, of μ_i, the unobserved individual effect, and ε_{it}, the idiosyncratic error with zero mean, finite variance σ_ε^2 and distributed i.i.d over all observations. In this model $G_i = 1$ represents a female-headed household. This allows us to understand the extent to which the average marginal effects (AME) of the variables of interest on the probability of IBLI purchase might vary by gender. The level of coverage purchased, TLU_{it} can be understood best by incorporating the predicted propensity to purchase from the purchase decision results in order to correct selection bias arising from the fact that values of TLU_{it} are only observed when $Purchase_{it} = 1$. Level of purchase is modeled as

$$TLU_{it} = \alpha + \gamma_1(G_i * R_i) + \gamma_2(G_i * I_{it}) + \gamma_3(G_i * K_{it}) + \gamma_4(G_i * A_{it}) + \delta_0(G_i) + \delta_1(R_i) + \delta_2(I_{it}) + \delta_3(K_{it}) + \eta(V_{it-1}) + \varphi(P_{it}) + \zeta(X_{it}) + \beta(\lambda_{it}) + \mu_i + \varepsilon_{it}$$

where TLU_{it} is regressed on interaction terms, first-order variables and the same set of controls as the first stage. Following Heckman's (1979) approach to correcting selection bias, we incorporate the inverse Mills ratio, λ_{it}.

$$\lambda_{it} = \frac{\phi(\widehat{purchase}_{it})}{\Phi(\widehat{purchase}_{it})}$$

When λ_{it} is calculated as a function of the same set of covariates in the first stage regression as is used in the second stage, selection is theoretically accounted for, but in practice the process is strengthened by the use of an exogenous instrument, Z_{it}, in the first stage that predicts selection, but has no relevance to the second stage dependent variable. The first stage regression then becomes

$$\begin{aligned} Purchase_{it} = {} & \alpha + \gamma_0(Z_{it}) + \gamma_1(G_i * R_i) + \gamma_2(G_i * I_{it}) + \gamma_3(G_i * K_{it}) \\ & + \gamma_4(G_i * A_{it}) + \delta_0(G_i) + \delta_1(R_i) + \delta_2 I_{it} + \delta_3 K_{it} + \delta_4 A_{it} \\ & + \eta(V_{it-1}) + \varphi(P_{it}) + \zeta(X_{it}) + \mu_i + \varepsilon_{it} \end{aligned}$$

where, in our case, Z_{it} is a binary variable representing the randomly assigned discount coupon, independent of the discount received which is incorporated into the regression as part of P_{it}.[11] With the discount considered separately, the coupon merely represents a piece of paper that reminds individuals of the existence of the IBLI product and the idea of purchase. As such, the coupon is justifiably excluded from the second-stage regression under the assumption that once the individual has already made his or her purchase decision, the reminder effect of coupon itself is irrelevant.

[11] The effective price of IBLI per TLU of coverage, accounts for discount coupons received in addition to spatial and temporal price variations. However, IBLI is priced by species, not TLU. Therefore, the price facing each individual depends on the animals they choose to insure. For simplicity, I have calculated the effective TLU price as the price of insuring one cow rather than using the actual prices paid for the diverse combinations of animals individuals chose to insure. Had I used the latter method, I would have difficulty defining a price for those who chose not to purchase IBLI.

Recall that in both equations, the composite error term consists of μ_i, the unobserved individual effect, and ε_{it}, the idiosyncratic error. The unobserved individual effect is likely to induce bias if a pooled estimator is used. A fixed-effects estimator may be tempting, but the probit regression is then subject to the incidental parameters problem in estimations where the number of observations is large relative to the number of time periods, as is the case in these data. A random effects estimator will be consistent if the individual effect is uncorrelated with covariates, an assumption that is unlikely to hold. Wooldridge (1995) proposes that, to the extent that the individual effect is associated with within-household means of time-varying household characteristics, incorporating these means as controls can reduce the bias associated with a simple pooled estimator in the presence of fixed effects. To do so, variables contained in X_{it} that are potentially associated with the individual effect are used to generate a set of within-household means, $\bar{X}_{it}$, that are used as time-invariant controls. These variables are also demeaned and re-incorporated as time-varying controls, $\ddot{X}_{it}$. After these variables are separated out, X_{it}contains household head education, IBLI knowledge, financial literacy and dummy variables for each woreda in order to control for unobservables at the woreda level. $\bar{X}_{it}$ and $\ddot{X}_{it}$ contain group means and demeaned values, respectively, of the household's dependency ratio, expected rangeland conditions, previous period losses, age, age-squared, non-livestock assets, income, proportion of income from livestock, herd size and cash savings. The two-stage Heckman correction is then estimated using

$$
\begin{aligned}
Purchase_{it} = {} & \alpha + \gamma_0(Z_{it}) + \gamma_1(G_i * R_i) + \gamma_2(G_i * I_{it}) + \gamma_3(G_i * K_{it}) \\
& + \gamma_4(G_i * A_{it}) + \delta_0(G_i) + \delta_1(R_i) + \delta_2 I_{it} + \delta_3 K_{it} + \delta_4 A_{it} \\
& + \eta(V_{it-1}) + \varphi(P_{it}) + \zeta_0(X_{it}) + \zeta_1(\bar{X}_{it}) + \zeta_2(\ddot{X}_{it}) + \mu_i + \varepsilon_{it}
\end{aligned}
$$

and

$$TLU_{it} = \alpha + \gamma_1(G_i * R_i) + \gamma_2(G_i * I_{it}) + \gamma_3(G_i * K_{it}) + \gamma_4(G_i * A_{it})$$
$$+ \delta_0(G_i) + \delta_1(R_i) + \delta_2(I_{it}) + \delta_3(K_{it}) + \eta(V_{it-1}) + \varphi(P_{it})$$
$$+ \zeta_0(X_{it}) + \zeta_1(\bar{X}_{it}) + \zeta_2(\ddot{X}_{it}) + \beta(\lambda_{it}) + \mu_i + \varepsilon_{it}$$

to formally test the following hypotheses.

1. The effect of risk aversion (R_i) on IBLI uptake is invariant with respect to gender (G_i).

   H_0: γ_1=0

   H_A: $\gamma_1 \neq 0$

2. The effect of informal insurance (I_{it}) on IBLI uptake is invariant with respect to gender (G_i).

   H_0: γ_1=0

   H_A: $\gamma_1 \neq 0$

3. The effect of product education (K_{it}) on IBLI uptake is invariant with respect to gender (G_i).

   H_0: γ_1=0

   H_A: $\gamma_1 \neq 0$

4. The effect of female assets (A_{it}) on IBLI uptake is invariant with respect to gender (G_i).

   H_0: γ_4=0

   H_A: $\gamma_4 \neq 0$

Econometric Challenges

Statistical identification of interaction terms included in the above models involves sufficient variation within gender subsamples. Standard deviations reported in Table 4 suggest that, for the

interacted variables is indeed adequate. Endogeneity of key variables is a concern in this estimation. Simulteneity between an individual's knowledge or understanding of the IBLI product and their decision to purchase leave the knowledge variable correlated with the idiosyncratic error term over time. The most logical potential instruments for the knowledge variable are the randomly assigned cartoon and tape treatments described above but preliminary analysis found these two variables to be only weakly correlated with households' understanding of the IBLI product.[12] To the extent that households adjust informal insurance behaviors based on whether they have purchased IBLI or not, or their level of coverage, the informal insurance variable will also be correlated with the error term. The lagged dependent variable, V_{it-1}, representing previous period IBLI purchase, or, put otherwise, whether an individual is covered in the current period, is likely correlated with household unobservable characteristics which impact the current purchase decision. Given the lack of suitable instruments to address these endogenous variables, results should be interpreted with this likely endogeneity in mind. Other potentially endogenous variables include herd size and income, because income is primarily composed of herd-related income. The extent to which these related variables are endogenous depends on the ways in which households adjust their herding practices in response to being insured and differences in effects of drought on herd size between those who purchased IBLI and those who did not. To date, no Ethiopian households have received an IBLI indemnity payout and one might expect the credibility of the product and subsequent likelihood of detectable behavioral and herd size effects to develop substantially after a payout, but not before.

[12] First-stage regressions of IBLI knowledge on assigned cartoon and assigned tape yield F-statistics ranging from 1.36-2.80, depending on the specification.

Econometric Results

Purchase decision

Marginal effects from the first-stage probit regression of the IBLI purchase decision are presented in Table 6.[13] I begin with a brief discussion overall demand patterns that appear consistently across all models.[14] I then turn to the gender-specific results associated with the above hypotheses. The relationship between IBLI uptake and price is statistically significant, but modest, with a decrease in probability of purchase of 0.1 percent for every 1 percent increase in price. Where included in the model, previous period purchase reduces the probability of purchase by 8 percent. This result is sensible, given that the previous purchase period is 5-7 months prior to the current period and an IBLI insurance contract lasts 12 months. Therefore, those who purchased in the previous period are currently covered and, assuming they understand the length of the coverage period, they would be less likely to purchase IBLI. Coupon assignment increases the probability of purchase by 5.5 percent, consistent with the assumptions that underpin its use as an instrument in the selection equation. Households that expect lower-than-normal rangeland conditions in the coming months are associated with a 6.4 percent increase in the probability of IBLI purchase. Households with high livestock mortality in the previous period see a decrease in the probability of purchase of 4.5 percent. In a society where livestock sales are a main source of liquidity, this points to liquidity constraints to access to IBLI.

Moving now to gender-specific results, column (1) represents a restricted regression that excludes any characteristics that vary visibly by gender in Table 4, as well as any characteristics that have the potential to vary systematically by gender. The average marginal effect (AME) of female-headed household in this restricted regression is not statistically significantly different from zero. This specification implicitly assumes that characteristics such as financial literacy, education or others that are excluded from this regression have no effect on the probability of IBLI purchase, so if there is any

[13] Coefficient estimates can be found in Appendix D.
[14] These results are consistent across all specifications, including those using reported IBLI purchase rather than OIC record of purchase. Those results can be found in Appendix D.

correlation between such variables and gender and the exclusionary assumption is false, the coefficient estimate on the gender variable would be biased. What this regression tells us is that when we include all of the various gender-related factors, whether mediated by other (currently omitted) characteristics or not, there is no variation in IBLI demand by gender. This is consistent with the proportionality of IBLI purchase by female-headed households to the number of female-headed households in the population.

Even if women's overall demand for IBLI is not higher or lower than men's, it is still possible that women's demand is driven at least partially by a different set of factors. Therefore, model (2) incorporates these characteristics that we would expect to vary by gender and to influence IBLI uptake, either by shifting slopes or intercepts for women. We see that IBLI knowledge and financial literacy both have a positive effect on the probability of IBLI purchase, with a one-point increase in the scores on these respective tests corresponding to a 2.1 and 1.9 percent increase in the probability of IBLI purchase. While tests for statistically significant differences in means (Table 4) do not indicate differences in IBLI knowledge between male and female-headed households, they do suggest a difference in financial literacy at baseline, with women's financial literacy lower on average than men's. This could translate into a systematically lower likelihood of IBLI purchase by women that is driven by baseline financial literacy, something we will explore in the next section. Similarly, the percentage of income from livestock (scaled from 0-100) indicates that for every point increase in the share of income from livestock, the probability of purchasing IBLI decreases by a modest 0.2 percent. The more livestock income one has, the less likely one is to purchase IBLI. This contradicts the idea that those who are more dependent on livestock income are more vulnerable to drought and would have higher demand for IBLI. Most likely, this reflects the superior self-insurance capacity of those with the largest herds; they do not need insurance the way those with small or moderate herd sizes do. Table 4 results indicate that, overall, female-headed households have a lower proportion of income from livestock, which suggests a greater likelihood of IBLI purchase by women than men. We see no significant coefficient estimates on the interaction terms relating to product education, informal insurance and risk aversion and therefore fail to reject the null hypotheses that the average marginal effects are equal for men and women along these dimensions. However, the

significant coefficient estimate on female-headed household suggests that there may be more to the story than is captured by our model. Simply being a female-headed household is associated with a 14.5 percent increase in the probability of IBLI purchase, conditional on all observable factors that may differentially affect demand. The optimistic explanation is that women's sensitivity to risk is not fully captured by the risk aversion variable included in the model, leaving women's perception of IBLI's risk reduction potential captured in the coefficient on female-headed household. A less optimistic, but perhaps more likely explanation is that, in a context where IBLI sales agents are paid on commission and all sales agents are men, women are more easily pressured to purchase.

Model (3) uses a sub-sample of two decision maker households to test for a bargaining effect associated with female assets at time of marriage. We fail to reject the null that the average marginal effects of female asset holdings on IBLI uptake are equal for men and women. These results are consistent across multiple representations of female assets, which can be found in Appendix D. A modest, but statistically significant gender difference in the marginal effects of total cash and in-kind transfers on IBLI uptake of 0.05% is identified, suggesting that the relationship between informal insurance and IBLI may indeed differ between men and women. Either women are covered differently than men in ways that are not captured by the transfers variable, or women respond differently to informal insurance coverage than men do. The effect of transfers on men's demand for IBLI is very modestly negative and not statistically significantly different from zero. For women, informal transfers appear to reduce demand for IBLI in a way that they do not for men.

Table 6: IBLI Purchase Decision (AME)

	(1)	(2)	(3)
Female-headed household	0.010	0.145**	0.209
	(0.020)	(0.074)	(0.161)
Female Head X HS at marriage			0.096
			(0.144)
HS at marriage			0.039
			(0.028)
Female Head X Home info		-0.000	0.002
		(0.001)	(0.002)
Home-centered information		0.001	0.001
		(0.000)	(0.000)
Female Head X Transfers		-0.018	-0.051**
		(0.013)	(0.025)
ln Transfers		-0.001	-0.001
		(0.006)	(0.006)
Female Head X Moderate risk aversion		-0.064	-0.093
		(0.043)	(0.081)
Moderate risk aversion		0.008	0.008
		(0.021)	(0.021)
Female Head X High risk aversion		-0.014	-0.382
		(0.069)	(0.309)
High risk aversion		-0.023	-0.029
		(0.032)	(0.032)
IBLI knowledge		0.021***	0.019***
		(0.005)	(0.006)
Financial literacy		0.019***	0.024***
		(0.007)	(0.008)
Head Education		-0.006	-0.008
		(0.005)	(0.005)
ln Effective price per TLU	-0.112***	-0.114***	-0.113***
	(0.012)	(0.013)	(0.014)
Lagged IBLI purchase		-0.080***	-0.065**
		(0.026)	(0.028)
Assigned coupon	0.066**	0.055**	0.046
	(0.027)	(0.027)	(0.029)
Dependency ratio	-0.026	-0.020	-0.058*
	(0.020)	(0.020)	(0.031)
Expected rangeland below normal	0.062**	0.064**	0.073**
	(0.027)	(0.028)	(0.030)
Previous period losses	-0.039**	-0.045**	-0.048**
	(0.018)	(0.018)	(0.019)
ln Total monthly income		-0.011	-0.025**
		(0.009)	(0.011)
Proportion of income from livestock		-0.002***	-0.001***
		(0.000)	(0.000)
Household Average Characteristics 1	Y	Y	Y
Household Average Characteristics 2	N	Y	Y
Observations	1,824	1,824	1,510
LR Chi2	362.3	630.2	574.2
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 The following coefficients are non-significant and not reported: Household Average Characteristics 1includes household averages of dependency ratio, expected rangeland above normal, expected rangeland below normal and previous period losses. Household Average Characteristics 2 includes household averages of age, age-squared, non-livestock assets, ln monthly income, proportion of income from livestock, ln herd size and savings >5 TLU. Also not reported and non-significant are demeaned ln herd size, expected rangeland above normal, age, age-squared, non-livestock assets, ln monthly income, proportion of income from livestock and savings > 5 TLU. Full results can be found in Appendix D.

Level of purchase results

The second stage results presenting the effects of a range of factors on the level of IBLI coverage purchased are presented in Table 7. The dependent variable is the natural logarithmic transformation of the number of TLU insured, therefore effects reported in the text have been back-transformed where necessary. Independent of gender, several general demand findings are worth mentioning. IBLI price is inelastic, with estimated elasticities in the range of -0.36 to -0.47. This is consistent with price elasticities identified in a separate study of IBLI demand in neighboring Marsabit, Kenya (Jensen, Mude and Barrett 2014). Households that, on average, expected below normal rangeland conditions were negatively associated with IBLI uptake, suggesting that expectation of below normal conditions is associated with a 33-39 percent decrease in TLU insured. One possible interpretation is that this is the effect of household-level pessimism that impacts IBLI uptake and is captured in the expected rangeland conditions variable. This explanation does not, however, fit with the positive coefficient on below normal expected rangeland conditions that we see in the purchase decision model. For every one percent increase in household average herd size, we see a corresponding 0.2 percent increase in TLU insured, suggesting that, as herd size gets larger, households are prone to insuring a smaller portion of their herd. As with the purchase decision model, there appears to be no gender variation in IBLI demand as indicated by the lack of significant coefficient on female-headed household in model (1). This is consistent with the observation that, in the data, women's IBLI purchase levels relative to herd size are proportional to men's.

As with the purchase decision estimation, model (2) incorporates all variables that potentially shift slopes or intercepts by gender. Unlike in the purchase decision model, here we do not see a significant marginal effect on female-headed household, suggesting that any effect related to sales agent pressure might be restricted to the decision to purchase and other factors drive the chosen level of purchase. A single point increase in the IBLI knowledge score is associated with a 3.8 percent increase in TLU insured. Interestingly, the relationship between the education level of the household head and the level of IBLI purchase is negative, suggesting that each additional year of education is associated with a 5.3 percent decrease in the TLU insured. Assuming education and social status are correlated, this is

consistent with the idea that lower status may result in vulnerability to pressure by educated, commission-motivated sales agents. This may lead those with less education, such as women, to purchase higher TLU coverage than they otherwise would, were they positioned differently in society.

A change of one standard deviation in non-livestock assets is associated with a 16-19 percent decrease in TLU insured. One might think that households holding diverse assets are less vulnerable to the threat of livestock mortality due to drought when such assets tend to be related to non-pastoralist livelihoods. Yet at the same time one would not expect to see this effect operating through assets where estimates are conditioned on non-livestock income levels. In this case, proportion of income from livestock is included as a control and is not statistically significant, therefore we consider this result with caution.

When gender is interacted with variables of interest in models (2) and (3), we fail to reject the hypotheses that there are no gender differences in the relationships between IBLI demand and home-centered information sources, cash and in-kind transfers or female asset holdings. These results are consistent across multiple specifications of female asset holdings (see Appendix D). We do, however, weakly reject the null that the average marginal effect of high risk aversion differs between men and women. The effect of high risk aversion on males, represented by the coefficient on high risk aversion alone, is positive but not statistically significantly different from zero. High risk aversion increases women's purchase of IBLI by 41 percent compared to an equally risk averse man. Insurance demand theory suggests that as risk aversion increases, demand for insurance also increases. We only see such effects among women in this sample, and only weakly and in one specification. The effect disappears when we control for female assets brought into the marriage.

Table 7: Level of Purchase

	(1)	(2)	(3)
Female-headed household	-0.085	0.218	-0.254
	(0.068)	(0.234)	(0.572)
Female Head X HS at marriage			0.325
			(0.357)
HS at marriage			-0.036
			(0.072)
Female Head X Home info		-0.003	0.004
		(0.003)	(0.007)
Home-centered information		0.001	0.001
		(0.001)	(0.002)
Female Head X Transfers		-0.020	0.003
		(0.038)	(0.073)
ln Transfers		0.009	0.003
		(0.019)	(0.020)
Female Head X Moderate risk aversion		-0.140	-0.312
		(0.130)	(0.238)
Moderate risk aversion		-0.012	-0.029
		(0.057)	(0.058)
Female Head X High risk aversion		0.346*	-0.678
		(0.206)	(0.792)
High risk aversion		0.037	0.037
		(0.097)	(0.103)
IBLI knowledge		0.037*	0.041**
		(0.019)	(0.020)
Financial literacy		-0.007	-0.004
		(0.023)	(0.027)
Head Education		-0.052***	-0.057***
		(0.016)	(0.017)
ln Effective price per TLU	-0.473***	-0.358***	-0.356***
	(0.061)	(0.040)	(0.040)
Lagged IBLI purchase		-0.044	-0.059
		(0.078)	(0.080)
Dependency ratio	0.099	0.083	0.093
	(0.082)	(0.078)	(0.101)
Expected rangeland above normal	0.080	0.089	0.111
	(0.104)	(0.093)	(0.103)
Expected rangeland below normal	0.129	0.009	0.017
		(0.088)	(0.100)
Asset index	(0.101)	-0.147**	-0.173**
		(0.074)	(0.078)
ln Total monthly income		-0.023	-0.016
		(0.027)	(0.032)
Proportion of income from livestock		-0.000	0.001
		(0.001)	(0.001)
ln Herd size		-0.086	-0.031
		(0.097)	(0.115)
Savings > 5 TLU		-0.175	-0.165
		(0.118)	(0.123)
HA Expected rangeland below normal	-0.328***	-0.316***	-0.284**
	(0.117)	(0.106)	(0.118)
HA Previous period losses	0.382***	0.024	0.023
	(0.074)	(0.085)	(0.092)
HA ln Herd size		0.202***	0.207***
		(0.064)	(0.074)
Constant	3.001***	2.870***	3.083***
	(0.166)	(0.465)	(0.523)
Household Average Characteristics 1	Y	Y	Y
Household Average Characteristics 2	N	Y	Y
lambda	0.329	-0.00473	-0.0226
	(0.210)	(0.139)	(0.142)
Observations	1,824	1,824	1,510
Chi2	362.3	630.2	574.2
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The following coefficients are non-significant and not reported: Household Average Characteristics 1 includes household averages of expected rangeland above normal and dependency ratio. Household Average Characteristics 2 includes household averages of age, age-squared, non-livestock assets, proportion of income from livestock and savings >5 TLU. Also non-significant and not reported are demeaned age, age^2 and previous period losses.

Discussion

Neither the IBLI purchase decision nor the level of IBLI purchase appear to demonstrate gender-differentiated demand when tested using the restricted regressions discussed above. Yet further analysis suggests that there are several pathways for gender-differentiated drivers of demand for IBLI, even if they do not amount to differences in demand outcomes. I first discuss gender differences in average marginal effects, and then discuss how differences in initial conditions shape demand for women in relation to men.

High risk aversion appears to have an appreciably different effect on IBLI demand for women than for men. Future improvements that incorporate measures of risk aversion that are appropriate to the cultural context and decision-making domain could make a significant contribution to understanding what drives this gender difference. Better understanding of gender and the perceived risks associated with IBLI specifically is also essential. Qualitative respondents, who were mostly women, appeared to accept IBLI's risk-reducing claims at face value, while simultaneously maintaining a wait-and-see attitude toward initial or further purchase. Perceptions of IBLI as helpful were overwhelmingly positive (86%), despite no one having received an insurance payout. Some degree of response bias is likely, given that non-local IBLI staff were involved in qualitative data collection. As individuals learn about IBLI from experiences such as witnessing payouts or lack of payouts to themselves or their neighbors, understanding of the risks and benefits of the product will further develop. Further data on these topics will be essential to understanding the relationship between risk-aversion and IBLI demand and will need to include careful consideration of whether the identity of those collecting information on perceptions of IBLI induces response bias.

Informal insurance has a negative effect on demand for women that is modestly different from the effect for men with equal informal insurance coverage, as we have measured it. The nature and extent of coverage by informal risk management underpins the perceived benefits of IBLI relative to other risk management approaches and using total transfers may not adequately capture gender differences informal insurance coverage. The qualitative study's respondents stated unanimously that access to basic levels of informal risk management in the form of mutual assistance and reciprocity is driven by need rather than

social connectedness or wealth. Assuming that need is defined by the household's material and labor resources, then it is captured in our model through herd size, income and dependency ratio controls. However, qualitative respondents described the extent of coverage provided by mutual assistance as a function of the "good behavior" of the individual, defined as pro-social behaviors encompassing all manners of helping others to the best of one's ability given one's material and labor resources. Better understanding of the overall effect of informal insurance on IBLI uptake using data designed for such purposes will contribute to future understanding of any gender-differentiated effects.

I find no evidence of a gender-differentiated effect of home-based product information. This suggests that targeting marketing strategies to women via home-centered education may not provide a gender-differentiated benefit, and further consideration of the means of education that women prefer would be needed if improved targeting of women is a goal. Considerable confusion among qualitative respondents regarding the definition of *insuraansi horrii* in the context of the product education module of the survey point to unusually high levels of random noise in this variable, which may limit statistical identification by attenuating any effect that may be present.

I also find no evidence of an intra-household bargaining effect associated with any of three specifications of female assets, including those based on *horrii siiqqee*, a particularly locally relevant variable. This suggests that preferences among decision-makers are identical with respect to IBLI, and if this is true, implies that gender-based targeting in two-adult households is not relevant to increasing access to IBLI in this context. Given the significant body of evidence that contradicts the presence of identical preferences among household members, these findings point to a need for further exploration of intra-household decision making in Borana.

Even where AMEs do not differ between women and men, gender differences in averages of key characteristics may also play a role in gender-differentiated IBLI demand patterns. Means differences between male- and female-headed households' financial literacy, education level and proportion of income from livestock are statistically significant, along with average marginal effects of these variables on IBLI demand. This allows us to calculate the total effect of these differences in initial conditions of

financial literacy and proportion of income from livestock on the purchase decision and of household head education on the level of purchase. As shown in Table 8, the total effect of one additional unit of financial literacy (in this case, a correct answer on a quiz) on the decision to purchase IBLI is quite modest at 0.009%. On average, women depend less on livestock income and have smaller herd sizes than their male counterparts. These two facts are consistent with the relative challenge single-adult households face of maintaining a pastoralist livelihood on the scale necessary to recover from shocks through self-insurance strategies and the related trend toward town-based livelihood for female-headed households. However, the effect that these two factors have on IBLI uptake is ambiguous. Female-headed households' lower dependence on livestock income increases the probability of purchase by 2.8 percent, while their smaller herd sizes decrease their probability of purchase by 2.1 percent, reflecting the complicated relationship IBLI demand has with herd size, liquidity, and dependence on pastoralism. Women's lower educational attainment, perhaps operating through previously discussed vulnerability to pressure by sales agents, increases TLU insured by 2.5 percent. If pressure by sales agents is indeed behind this demand increase, it is unlikely to be sustained over the long term and we would expect to see a decline in women's demand over time.

Table 8: Total Effects of Gender-Differentiated Initial Conditions on IBLI Uptake

	Mean Difference (Female-Male)	AME (%)	Total Effect (%)
Financial literacy score	-0.48	0.019	-0.009
Proportion of income from livestock (%)	-13.9	-0.2	2.8
Herd size (TLU)	-10.6	0.2	-2.1
Head Education (years)	-0.47	-5.3	2.5

These results suggest that addressing gender disparities in financial literacy would have a negligible effect on IBLI uptake by women. Meanwhile, the relationship between a female-headed household's reliance on the pastoralist livelihood appears to have a complex effect on IBLI uptake. One can imagine a trajectory in which a female-headed household's herd size decreases due to vulnerability to drought, while local towns increasingly offer alternatives to livestock income for single women. Female-

headed households with a lower average shares of income from livestock may recognize the potential offered by IBLI coverage to reduce the likelihood of shifting away from pastoralism completely in favor of town-based income sources. Lastly, the negative effect of education on IBLI uptake, along with the strongly positive effect of being female, merits a closer look IBLI marketing and sales processes in order to understand whether the methods and strategies used encourage IBLI purchase induce a gender effect that inflates IBLI purchase based on social pressure rather than the product's potential to reduce risk and limit the effects of catastrophic drought. Employing sales strategies that encourage information-based choice to purchase IBLI will contribute to sustainable demand over the long term.

CONCLUSION

Methodologically, this study provides an example of a structured strategy to combining qualitative and quantitative approaches in order to enhance insights into the phenomena of interest. The role of qualitative data was identified based on initial exploration of survey data. Qualitative data collection procedures were developed with extra care taken to be explicit about the research process by first identifying the intended role of qualitative data, careful design of an empirically-grounded data collection tool and an empirically-grounded analysis strategy. Data collection procedures were standardized in order to facilitate replication of similar approaches. Qualitative data ultimately strengthened model specification and contextualized understanding of the range of possible interpretations of the econometric results.

This paper provides an initial perspective on dimensions of demand for index based livestock insurance that vary by gender. Female-headed households purchase IBLI at the same rate as men, relative to their share of the population, yet the factors that drive women's demand appear to diverge from men's Econometrically, we reject the null that the AMEs of risk aversion and informal insurance are equal to zero for the level of purchase and purchase decision models, respectively. Average marginal effects of high risk aversion and informal insurance coverage are positively and negatively associated with IBLI demand by women, respectively. These relationships are statistically significantly different between

women and men. We fail to reject the null that home-based product education and female assets have no gender-differentiated effects. We find that women's demand differs from men's due to differences in initial financial literacy, herd size, income and education conditions. A complex relationship between herd size, liquidity, dependence on livestock income and gender of household head is evident and demand effects are ambiguous. The largest gender-differentiated demand effects relate to women's lower social status and lower education status, which are positively associated with demand for IBLI, possibly through women's vulnerability to pressure by sales agents. Gender differences in financial literacy affect demand only slightly.

In addition to aiding in econometric specification and interpretation, qualitative data suggest variables used to understand information sources and informal insurance may not capture these concepts precisely. Specifically, differences in informal insurance coverage and access may be driven by omitted variables reflecting pro-social behaviors and general confusion in terminology surrounding the IBLI product and the activities of ILRI researchers who implement IBLI generate considerable noise in variables relating to the marketing experience of the household, such as IBLI information sources. A case is made for further investigation of the topic using data that captures unobservable effects that may underpin locally defined behavioral aspects of informal insurance access and gender differences in perceptions of IBLI's risk reduction potential, as well as ongoing reduction of measurement error in key variables such as IBLI information sources. Future findings can be leveraged to develop tools and strategies for ensuring that access to and benefits from innovative financial products are equitably distributed across the population.

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APPENDIX A: Panel and Variable Construction

Panel Structure

The Borana household data are collected annually, but the structure of the questionnaire involves seasonal recall for many variables of interest to this analysis. Seasonal recall uses four seasons: long rain, long dry, short rain and short dry, which I combine into long rain + long dry (LRLD) and short rain + short dry (SRSD). The IBLI purchase periods are in August/September and January/February, at the end of each SRSD and LRLD period. The panel is analyzed by period, but data are collected by "round" as described in Table A1. Variables that are not collected using the seasonal recall structure, require an assumption to be made based on the nature of the variable in order to determine the value at the intermediate period. Any assumptions and other information about variable construction are described in detail below.

Table A1: Panel Structure

Time Period	Season	Period (P)	Round (R)
March-Sept 2012	LRLD	P1	
Oct 2011-Feb 2012	SRSD	P2	R1
March-Sept 2012	LRLD	P3	
Oct-Feb 2013	SRSD	P4	R2
March-Sept 2013	LRLD	P5	
Oct 2013-Feb 2014	SRSD	P6	R3

Gender of Household Head

The gender of the household head is virtually time invariant in the current data, with the exception of six observations where the gender of the household head changed. For these I chose to use the within-household mode, which also happened to be the gender of the household head at the time that IBLI was introduced.

Marital Status

Marital status is collected using five categories: Never married, married, consensual partner, divorced and widowed. From the point of view of our analysis, consensual partnership (n=4) is functionally equivalent to marriage in that it creates a dual decision maker household, therefore I merged the consensual partner category with the married category. This allows consensual partner households to be included in dual decision maker analyses. Marital status for P1, P3 and P5 are assumed to be the same as P2, P4 and P6, respectively.

During data collection at P6, extra care was taken in collecting marital status data. Households headed by widows often reported that they were married. These errors were corrected in previous rounds by analyzing household member deaths. For households where the husband died in a previous round, the wife's marital status was adjusted to widowed after that point and married before. For households where there was no record of the husband's death, the death was assumed to have happened prior to survey implementation and therefore the wife's marital status was adjusted to widowed for all survey periods.

Herd Size

The size and species composition of animals herded by the household was collected at P2, P4 and P6, along with seasonal mortality, birth, offtake and slaughter information. This information is used to calculate the P1, P3 and P5 values for these variables. Herd information is then converted to Tropical Livestock Units (TLU) based on species metabolic weight to allow for aggregation across species. Borrowing from previous researchers in this area, 1 TLU = 1 bovine = 0.7 camel = 10 sheep/goats (McPeak et al. 2011, Lybbert et al. 2004, Jensen et al. 2014 and others).

Total Income

Income is calculated as monthly average cash and in-kind income and includes labor market participation, milk production, livestock sales, livestock slaughters, aid and cash income from other sources. Total income excludes informal cash and in-kind transfers.

Daily average milk production per animal was valued using average market prices by species and season reported by households that sold milk. Price data were too sparse to calculate prices by each of the four seasons, so two seasonal sets of prices—dry and rainy—were used. This daily average milk value was then multiplied by 30.4 (average days per month) to get monthly average milk income.

Livestock that was sold and slaughtered was valued at median sale price by species and rainy/dry season. Similar to milk prices, livestock sales data were too sparse across all 16 season/species combinations, I aggregated seasonal prices into dry and rainy season prices. Given high variance in reported prices and the presence of extreme outliers, I opted to use median season/species prices. I then estimated the animal sales revenue using transactions that were reported as sales, excluding gifts, loans and repayment of debts. While these non-sale transactions most certainly have value to households, assigning monetary values to these cases is problematic. Some of these activities are captured in the livestock transfers variable. As it is, I think the estimated prices are a stretch given that animal age, quality, and sex are likely determinants of price that we are not capturing. The alternative is to use prices as reported by households for livestock sales, but the problem of valuing slaughtered animals remains. The argument for using reported prices is that they may be more likely to correspond to the market value of the specific animals sold better than mean or median prices.

Income from aid was reported by respondents as average monthly values of supplementary feeding, food aid and other aid. Respondents identified the number of months in the previous year that they received these three types of aid, which was then multiplied by the monthly value to get a yearly value of aid. This yearly value was apportioned to the panel periods by the number of months in the period and that value was used to create an average monthly value for each panel period.

Cash income is calculated using respondent recall of income and income source by season (panel period). Seasons are then divided by the number of months therein to obtain monthly average cash income for corresponding periods. All income is included except that from sale of livestock, sale of milk and NGO work. This income should be captured in milk, offtake and other assistance sections of the survey.

Cash Savings

Cash savings are reported by respondents in P2, P4 and P6, but there are no data on savings fluctuations between these periods, making it difficult to determine an appropriate value for P1 and P3. Currently, total savings data are only used descriptively and not in panel analysis. In the panel analysis, I use a dummy variable to represent having enough savings to insure five cattle. For P1, P3 and P5 I use the P2, P4 and P6 values of this dummy variable.

Asset Index

The asset index is constructed using principal components analysis on 58 non-livestock durable goods. Each item is listed in Table A2, along with the associated factor loadings for each survey round. Each variable is a count of the number of that item owned by household. Items for which there was zero ownership and/or zero variance, such as motorcycles and satellite dishes, were excluded. Complete stock of durable goods and housing amenities was taken at P2 and changes were collected at P4 and P6, allowing for calculation of P4 and P6 stocks. Any recall error at P4 will carry over to P6. For now, values for P1, P3 and P5 are assumed to be the same as P2, P4 and P6, respectively, though there is little basis for this assumption besides convenience. The assets section is one of the more tedious sections of the survey and is poorly tailored to the Borana context. Both enumerators and respondents regularly expressed frustration with the assets module. The stocks and flows nature of the data collection strategy creates potential for measurement error from previous periods to carry through to current periods and to accumulate over time.

Table A2: PCA Factor Loadings

Asset	P1/P2	P3/P4	P5/P6
Animal Bell	0.303	0.609	0.233
Animal Cart	-0.135	.	0.217
Anvil	0.080	0.215	.
Axe	0.401	0.922	0.431
Barbering Items	0.399	0.642	0.013
Basin	0.400	0.855	0.207
Beads	0.249	0.628	0.114
Bedframe	-0.001	.	-0.021

Bicycle	0.192	.	.
Box or Trunk	0.380	0.673	0.199
Brickmold	0.256	0.215	0.467
Bucket	0.317	0.332	.
Mobile Phone	0.436	0.603	0.061
Chair	0.282	.	0.244
Hammer	0.318	0.147	0.064
Cup	0.006	0.944	0.570
Dresser	0.220	.	.
Gourd	0.173	0.915	0.704
Grinding Mill	0.208	0.370	0.227
Traditional Healer Items	-0.063	.	0.000
Hides or Pelts	0.064	0.910	0.498
Hoe	0.264	0.470	0.421
Jerrycan	0.287	0.965	0.689
Jewelry	0.107	0.303	0.104
Knife	0.339	0.945	0.264
Machete	0.257	0.540	0.143
Mat	0.121	0.160	0.499
Mattress	0.492	0.425	0.290
Mosquito Net	0.328	0.824	0.075
Motorcycle	0.153	.	0.060
Natural Bed	0.120	0.808	0.590
Oven	0.056	.	.
Pannier	0.392	0.376	0.471
Paraffin Lamp	0.334	0.331	0.079
Pickaxe	0.337	0.507	0.333
Plow	0.209	0.593	0.173
Chisel	0.367	0.640	0.513
Radio	0.331	0.358	0.134
Shelves	0.167	0.353	0.094
Shop	0.192	.	0.019
Sickle	0.466	0.481	0.251
Sofa	0.120	.	.
Spade	0.428	0.589	0.344
Spear or Club	0.307	0.553	0.381
Stocks	.	.	-0.009
Stall	-0.107	.	.
Stool	0.095	0.959	0.775
Natural Stove	0.197	0.254	-0.032
Kerosene Stove	-0.073	.	.
Cooking Pot	0.243	0.969	0.684
Table	0.050	.	-0.016
Television	0.077	.	.
Thermos	0.268	0.350	0.195
Till	0.064	.	.
Wardrobe	0.208	.	0.099
Watch	0.363	0.356	0.329
Water Drum	-0.130	0.263	.
Wheelbarrow	0.150	.	-0.038

Where loading is missing, variable was dropped due to limited variance in that survey round.

Cash and In-kind Transfers Received and Given

Transfers data are reported by respondents using the seasonal recall structure, allowing for calculation of season-specific values for all periods, which are then divided by the number of months in the period to create monthly averages for transfers received and transfers given. In regressions, transfers are represented as the total of the absolute values of transfers in both directions.

Education

Education is education level of the household head, in years. Through grade 12, each grade corresponds to one year. Beyond that, education levels were re-scaled to correspond to the number of years of education associated with each level of attainment. Education data are collected in full at P2, and then only information on household members who enter and leave school are collected in later periods. To calculate the attainment of an individual, one must make an assumption about whether individuals in school advance to the next grade. I assume that all individuals advance every year they are in school. Educational attainment of the household head for P1, P3 and P5 are assumed to be the same as P2, P4 and P6, respectively

Financial Literacy

Financial literacy is the number of correct answers to the seven questions listed below. Financial literacy data were collected only at baseline and is treated as a time-invariant characteristic.

- *If you have 6 female goats and 3 male goats, how many goats do you have in total?*
- *If you have 4 cattle subherds with each subherd with 5 animals, how many animals do you have in total?*
- *If you have 400 goats and subdivide then into 10 equal subherds, how many goats are in each subherd?*
- *I will read the following digits. Please listen to me, memorize it, and tell me the number: 369219?*

- *Suppose you want to borrow some money, and you have to pay back Birr 10 for every Birr 100 that you borrow. This is called interest rate. Are you familiar with this concept?*
- *Suppose you borrow Birr 100 , and you have to pay back Birr 10 every month for every Birr 100 that you borrow. If you have not repaid any of the total for a period of three months, how much do you owe at the end of the 3 months?*
- *Suppose you need to borrow Birr 500. Two people offer you a loan. One requires you to pay back Birr 600 in a month. The second requires you to pay back Birr 500 plus Birr 15 for every Birr 100 you borrow that month. Which loan represents a better deal for you?*

Dependency Ratio

The dependency ratio is calculated as the number of dependents divided by the number of adults. Children are defined as those aged 15 and under, while adults are defined as those older than 15. I omitted elderly dependents due to suspected age inflation in the right tail. Including elderly dependents created households without adults. Ages for P1, P3 and P5 are assumed to be equal to P2, P4 and P6, respectively.

Household Size

Household size is a simple count of the number of members listed in the household roster. We do not have data on household size fluctuation between survey rounds and I assume that household sizes at P1, P3 and P5 are equal to P2, P4 and P6, respectively.

Risk Aversion

Risk aversion is measured at baseline using a coin toss gamble where risk and return are positively correlated. The respondent is presented with the following introduction:

Let me introduce you to a lottery, whose value depends on the outcome of a coin. I am going to flip a coin. In each lottery, if the coin lands on head, you will win the amount below the picture of the head. If the coin lands on a tail, you will win the amount below the picture of tail of this coin….I now offer a chance for you to choose one of the six lotteries displayed in the next image, which may allow you to earn from 0 to 200 ETB, depending on your choice of lottery and your luck. The total amount of reward you will get will depend on the outcome of the lottery you choose, which will depend on the outcome of the coin that I'm going to flip. (ILRI 2014)

The respondent is then shown a series of six images of head and tail sides of an Ethiopian coin and associated amounts of money and is asked to choose. The six gambles are displayed in Table A3. Using these data, I created a set of binary variables by combining the two highest, middle and lowest choice numbers to represent low, moderate and high risk aversion, respectively.

Table A3: Risk Preference Experiment Choices

Choice Number	Heads Amount (ETB)	Tails Amount (ETB)
0	50	50
1	45	95
2	40	120
3	30	150
4	10	190
5	0	200

IBLI Information Sources

Information was collected at P4 on whether individuals heard about IBLI through specific information sources. These sources are: neighbors, friends and relatives in informal groups; development agents or other government officials; community meetings; the survey conducted by ILRI; discount coupons; cartoons; poet tapes; radio; television; posters; Oromia Insurance Company staff and/or Oromia Savings and Credit Share Company; NGO staff; network groups; other. Given confusion about this question that was noticed during the qualitative phase of research, this variable was structured the

percentage of total information sources that were home-centered, that is, information sources that potentially educate about IBLI that are accessible from home. This percentage is expressed as whole numbers between 0 and 100 to aid in interpretation. The number of information sources at P3 and P5 are assumed to be the same as at P4 and P6.

IBLI Knowledge

The IBLI knowledge variable is constructed using a count of correct answers to the following eight questions:

- *Based on your understanding of the livestock insurance, how often do you have to pay a premium in order to remain insured?*
- *If you did not receive indemnity payout (compensation) from the livestock insurance, would you expect to receive your premium back?*
- *When you receive an indemnity payment (compensation) in what form do you expect to receive it in?*
- *Based on your understanding of the livestock insurance, under what conditions do you expect indemnity payout (compensation)?*
- *Suppose that you had insured 10,000 Birr of cows. What is the maximum indemnity payment that you can receive after a worse drought?*
- *What institution will provide you indemnity payout in October 2013 if there is a payout?*
- *Boru insured 10 cattle by IBLI. There was no drought but Boru lost 8 cattle due to disease outbreak. Will Boru receive indemnity payout?*
- *Godana has decided to purchase IBLI for 1 cattle, 1 camel and 1 shoat among his herds. Will Godana pay different amount of premium for all the three species of animals?*

These questions are asked only at P4 and P6, so values for P3 and P5 are assumed equal to P4 and P6 values.

Lactating Herd

The number and species of lactating animals is collected as part of the survey. However, the survey doesn't capture herd dynamics (birth, death, offtake, slaughter) by animal sex, so I cannot compute lactating animals for P1, P3 and P5 directly. Therefore these values are assumed to be the same as P2, P4 and P6 respectively. Lactating animals are aggregated using TLU in order to at least partially capture the differences in milk production volume between species. However, TLU conversions are not designed specifically for lactating animals, which may have profoundly different metabolic processes.

Horrii Siiqqee Animals

Horrii siiqqee (HS) animals are cattle that are transferred to a newly married couple from the bride's household. Current HS stocks were collected at P6, along with information on birth, death, offtake and slaughter of HS animals in the preceding year. Flows information was used to back out HS values for P4 and P5. Additionally, HS stocks at the time of marriage were collected for all ever-married households. All HS values are converted to percentage of total cattle herd.

Effective Price

The effective price of IBLI is designed to capture as accurately as possible the actual price faced by the individual consumer. The price of IBLI varies by species, geographic location (woreda) and discount coupon amount. Coupons offer a percentage discount on IBLI purchase up to the first 15 TLU of livestock purchased. However, IBLI is priced by species and not by TLU and effective price must be in price per TLU in order to allow for aggregated analysis across species. One approach is to use the actual prices paid by those who purchased IBLI on various combinations of animal species, but I would still have to transform those prices into a price per TLU and would still have no straightforward way of

defining a price for non-purchasers. I chose to calculate the effective TLU price as the price per animal for the first 15 cattle using the woreda-level IBLI cattle prices minus any discount coupon received by the household. Woreda-level IBLI prices remain relatively constant throughout the survey periods, while coupons are distributed in advance of each sales period. This allows for calculation of effective price for all panel periods.

Share of Income from Livestock

The share of income from livestock is defined as income from milk, offtake and slaughter divided by total income and is calculated for all panel periods. It is expressed as a number from 0-100 to aid in interpretation of results.

Losses in Previous Period

Previous period losses are the lagged values of livestock mortality as reported by respondents. Because this information is reported seasonally, no assumptions were needed to complete the panel.

Expected Rangeland Conditions

Respondents are asked about their expectation for the coming (long) rainy season and rangeland condition. Their responses are scaled so that 1=much below normal, 3=normal and 5=much above normal. I then created a set of dummy variables representing above normal, normal and below normal, with normal as the omitted category in regressions. Expected conditions for P1, P3 and P5 are assumed equal to P2, P4 and P6.

APPENDIX B: Attrition Analysis

Ten percent of the original survey sample attritted over the three survey rounds. I used two approaches to testing for systematic attrition—simple means tests on key observables and a logistic regression using a binary variable representing whether a household was retained in the panel or lost to attrition. Means tests using the main sample used for purchase decision regressions suggest that multiple variables are different between panel and non-panel households, as reported in column (1) of Table 1B. However, means differences disappear when multivariate methods are used. So in column (2) I report the logit estimates of the binary variable that the household attritted. The logit model demonstrates that attrition is not systematic once we condition on key variables. Similar to the main sample, univariate means tests, reported in column (3) show significant differences. The logit of attrition within the bargaining subsample of two decision maker households, reported in column (4), shows gender and wealth related attrition patterns, which are not surprising given that households with two married adults have different dependency ratios and productive capacity than single-adult households. Marital status is also a significant predictor of attrition, which makes sense since being married and having two decision makers in the household are highly correlated. Overall, attrition does not appear to be of concern to the main estimation results, and bargaining results need to be interpreted with attrition patterns in mind.

Table 1B: Attrition Analysis

	Main Sample		Bargaining Sample	
	(1)	(2)	(3)	(4)
Female-headed household	0.152	-0.00520	0.660***	-0.0488
	(1.97)	(0.00607)	(15.52)	(0.0522)
Married=1/Nonmarried=0	0.022	-0.00935	-0.635***	0.432***
	(0.39)	(0.0102)	(-14.49)	(0.118)
Moderate risk aversion	-0.005	-0.00361	-0.019	-0.0557*
	(-0.06)	(0.00401)	(-0.37)	(0.0327)
High risk aversion	-0.054	0.0180	-0.008	0.0369
	(-1.25)	(0.0136)	(-0.23)	(0.0602)
ln Total Transfers	-2.420***	0.00525	-1.215***	0.0988***
	(-5.89)	(0.00530)	(-6.74)	(0.0273)
Financial literacy	-0.272	0.000430	-0.622***	0.0308**
	(-1.26)	(0.000921)	(-4.25)	(0.0138)
Head Education	-0.062	0.00143	-0.346*	0.0191
	(-0.21)	(0.00208)	(-2.27)	(0.0171)
Dependency ratio	0.101	0.000914	0.453***	0.00516
	(0.53)	(0.00130)	(3.63)	(0.0147)
Expected rangeland above normal	-0.009	0.00349	0.058	0.0511
	(-0.18)	(0.00513)	(1.65)	(0.0602)
Expected rangeland below normal	0.027	0.00370	-0.041	0.0539
	(0.41)	(0.00458)	(-0.90)	(0.0414)
Age of household head	-4.898	0.000004	2.350	0.000782
	(-1.68)	0.0000574	(1.21)	(0.000915)
Asset Index	-0.100	0.000385	-0.525***	0.00979
	(-0.75)	(0.00119)	(-5.75)	(0.0188)
ln Income	-0.971***	-0.000181	-0.755***	-0.00405
	(-6.16)	(0.00194)	(-8.92)	(0.0363)
ln Herd Size	-0.822***	-0.00504	-0.871***	-0.0820**
	(-4.16)	(0.00554)	(-8.62)	(0.0341)
ln Savings	-0.362	0.000217	-0.963***	0.00770
	(-0.91)	(0.000421)	(-3.89)	(0.00594)
Observations	514	512	514	512

T-statistics and standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX C: Description of Qualitative Study

Introduction

Mixed methodological and interdisciplinary approaches have been common in many disciplines, including development economics, since the 1980s. The 2001 "Q-squared" workshop and associated compilation of works (Kanbur 2002) highlighted the use of multiple research methodologies as a corollary to the broader interest in interdisciplinary social science research. Within development economics, qualitative methodologies are increasingly used to tackle questions of identification of the poor and causal explanations of poverty (see Shaffer 2013 for review). Qualitative approaches have contributed to these analyses in a variety of ways, such as determining locally meaningful definitions and weights for dimensions of poverty, which are then incorporated into formal modeling, as well as enriching understanding of the overall causal framework underlying poverty dynamics.[15] Few, if any, mixed methods studies in development economics explicitly describe the qualitative methods used to the extent that is demanded in quantitative studies. Quantitative methodological procedures are made explicit, but qualitative are not, which undermines the credibility of inferences drawn using qualitative data (see Constas 1992).

Methodologically, this study aims to take the Q-squared work a step further by making explicit the purposes of qualitative approaches for the questions of interest and the procedures used. The credibility of any empirical finding hinges upon adherence to standards of validity and reliability in data collection tools, and the nature of the inference one intends to make from data is associated with a necessary level of rigor in these areas (Shadish, Cook, and Campbell 2002). With this in mind, this study applies lessons learned from Q-squared in order to understand the determinants of demand for Index-Based Livestock Insurance (IBLI) that vary by gender in the Borana Zone of southern Ethiopia. Within this, some sub-questions lend themselves easily to

[15] See Krishna's (2009) Stages of Progress methodology, Parker and Kozel (2007), Sharp (2007), Adato et al. (2007) for examples.

quantitative approaches, while others benefit from a complementary qualitative approach. Questions focused on the magnitude and direction of relationships, and the relative influence of variables on IBLI purchase behaviors are well served by quantitative approaches. Questions focused on individual perceptions, reasoning processes, and context-dependent explanations associated with the decision to purchase IBLI are well served by qualitative approaches. From a modeling perspective, qualitative methods can improve modeling precision by exploring the structure of measurement error in existing quantitative data and identify omitted variables. Key quantitative research questions and their qualitative extensions (italics) include:

1. What is the relationship between gender and the IBLI purchase decision?
    a. *How and why does household decision-making differ by gender and marital status of household head?*
2. Does the relationship between risk aversion and demand for IBLI vary by gender? If so, how?
    a. What are men and women's perceptions of risks associated with IBLI purchase?
3. What is the relationship between informal insurance and demand for IBLI?
    a. *What insurance strategies, if any, are represented by informal transfers and network group participation?*
    b. *Outside of transfers and network group participation, what forms does informal insurance take in Borana?*
4. Does the relationship between informal insurance and IBLI vary between men and women?
    a. *Do women experience informal insurance differently than men in terms of access and coverage?*
    b. *Among women, how and why do/don't informal insurance experiences and coverage differ?*

5. What is the relationship between IBLI information channels and IBLI uptake by gender?
    a. *What are women and men's preferred marketing channels and what reasons are given for such preferences?*

For each of these five sets of questions, qualitative approaches bring more detailed descriptive content to existing quantitative data, which extends our understanding in three specific ways. The first of these, is aiding in model specification. Qualitative data will provide an opportunity to validate assumptions made during construction of key variables in the econometric model so that they more accurately reflect determinants of IBLI demand. This is particularly relevant given the unique and rapidly changing cultural and economic practices of southern Ethiopian pastoralists in the 21st century. Second, qualitative data may reveal heterogeneity within categories that appear homogeneous in quantitative data. Difficult-to-capture drivers of behavior such as social status may vary dramatically among the seemingly homogeneous categories such as "women," or "men," and qualitative exploration of these categories may explain contradictory or inconclusive findings. Finally, insights gained from qualitative data will be used to strengthen the interpretation of econometric findings in order to explain outliers, inconsistent findings and provide descriptive support. The ways which each of these purposes supports deeper understanding of the above research questions are described in detail in the following section.

Gender and the IBLI purchase decision

This line of inquiry is designed to investigate intra-household decision-making related to IBLI purchase. The quantitative strategy uses household level data with the gender of the household head as a proxy for the gender of IBLI purchaser. This approach may limit understanding of intra-household dynamics that affect the decision to purchase IBLI. The quantitative strategy accounts for some degree of bargaining in two-adult households, but is

unable to shed light on decision-making in single-adult households. Single adult households in the sample are all female-headed, but autonomy and social status will affect the decision-making power of these individuals and likely varies by marital status (McPeak et al. 2011). Qualitative interviews will focus on who in the household initiated decision-making related to IBLI, the involvement and influence of different household members, and how this decision-making process compares to other household decisions. These data will be used to unpack heterogeneity of decision-making processes, with particular emphasis on single-adult households. Qualitative data on two-adult households will aid in the interpretation of bargaining-related quantitative findings.

Risk aversion, gender and IBLI demand

Perceptions of the IBLI product are clearly linked to the decision to purchase. Theory suggests that a risk averse individual will have a higher willingness-to-pay for insurance, however, the relationship between risk aversion and index-based insurance products does not convincingly follow this pattern (Giné et al. 2008, Cole et al. 2012). If purchasing the insurance product is perceived as risky in itself, then the individual's ambiguity aversion becomes an important factor if he or she prefers the known risk of, say, drought to the relatively unknown risk of drought insurance. Ambiguity aversion has been cited as a reason for poor uptake of index-based products and has been incorporated into some studies of demand (Clarke and Dercon 2009, Clarke 2011). Elabed et al. (2013) link ambiguity aversion to compound risk aversion in an experimental setting involving index insurance decisions, finding that compound risk aversion may play a role in limited demand for index insurance products. The quantitative strategy for understanding risk aversion and IBLI demand does not allow for ambiguity aversion as a determinant of demand. Those who are risk-averse but opt not to purchase IBLI may be doing so because they perceive IBLI purchase to be an unknown risk relative to drought. In a review of four field studies of index insurance marketing, Patt et al. (2009) identify three sources of

perceived risk by consumers as (a) lack of trust in the implementers of the insurance product, (b) lack of trust in the index and (c) lack of trust in one's own understanding of the product and associated ability to make the best decision. Qualitative interviews will focus on trust in these aspects of IBLI and, using Patt's framework, the data will allow for better understanding of the potential role of ambiguity aversion. Of particular interest is whether there is a difference in trust in the IBLI product between men and women, which will contribute to interpretation of econometric results relating to risk aversion.

Informal insurance and IBLI demand

The relationship between informal insurance strategies and formal insurance products is key to understanding demand for IBLI. The quantitative strategy for understanding this relationship uses data on cash and in-kind transfers and network group membership to represent access to and coverage by informal insurance. Limitations of the use of observed transfers or network groups are multifold. First, transfers and network groups are institutions that have the potential to provide insurance, but the extent to which they do so is unknown and therefore these may be poor measures of informal insurance. Second, they do not represent the complete set of transfers or network activities available to the respondent; they represent only those the respondent chose to activate in the reporting period. Finally, informal insurance behaviors are driven by unobserved characteristics that are likely to simultaneously influence IBLI demand. These challenges are very difficult to overcome analytically using qualitative or quantitative methods alone. Mixed methods using the best techniques from each side may be especially useful. Interviews will attempt to understand the extent to which reported transfers and groups represent insurance by eliciting detailed information on the circumstances surrounding actual transfers received and given as well as network group participation reported in the household survey. Of particular interest are the circumstances and expectations surrounding the transfer and, for transfers given, the consequences of not agreeing to give the transfer. For transfers

received, I will attempt to elicit information on hypothetical alternative sources of transfers and/or recourse available to the recipient had the giver refused to give. Qualitative data will serve to validate existing survey data by uncovering heterogeneity in the functions of transfers and group membership. This may inform the specification or interpretation of the econometric model. Qualitative data will also provide description of other informal insurance strategies outside of transfers and network groups that may not have been captured in the survey data.

Informal insurance, gender and IBLI demand

Empirical evidence supports the hypothesis that there exist notable differences in access to and coverage by informal insurance along dimensions of wealth and social-connectedness (Santos and Barrett 2011, Vanderpuye-Orgle and Barrett 2009). Gender differences in wealth and social-connectedness are visible in existing IBLI household data from the study region, suggesting the existence of gender differences in informal insurance access and coverage. Within female-headed households, one sees variation in wealth and social connectedness by marital status, suggesting further heterogeneity within the female informal insurance experience. Interviews will focus on perceptions and perceived drivers of relative access to and coverage by informal insurance by gender and marital status. Qualitative data will aid in understanding heterogeneity among female-headed households and support interpretation of findings related to the interaction of gender and informal insurance on IBLI demand.

Gender and IBLI information channels

Index insurance products are often unfamiliar to their targeted consumers and, given the low levels of education in Borana, education about the product is a major component of product marketing. Gender sensitivity in marketing and education is relevant where gender roles potentially result in different access to information channels and intensities. The extent to which this is the case in the study population is unknown. Quantitative data used for understanding how

information channels interact with gender are limited to the nature of marketing channels, but do not capture the intensity of exposure to information from each channel or the individual's relative difficulty or ease of accessing each channel. Interviews will reference reported sources of information about IBLI and elicit individual's experiences and preferences relating information channels. These data will contribute to basic understanding of information channel preferences by gender, as well as elicit richer description of households' information experience in terms of access and intensity. Information channel preferences will provide the basis for econometric specification of the information channel variable used in testing gender differences.

Qualitative Methodological Procedures

Sampling

The qualitative sample will be a sub-sample of the survey households. I propose to sample for heterogeneity along pertinent characteristics of the full household survey sample as diagrammed in Figure 1 below. Heterogeneous sampling generates detailed descriptions of unique categories as well as crosscutting patterns that derive their significance from having emerged out of heterogeneity (Patton 2002). Categories of interest in this study are IBLI purchase, gender of household head and marital status. IBLI purchase and gender of household head are the top characteristics of interest, therefore the full survey sample is divided into subgroups of those who purchased and those who did not and further subdivided by the gender of the household head. Adding marital status as a third sampling dimension allows us to better understand commonalities and differences among women based on the rationale that female-headed households may differ markedly depending on whether the female head is married, widowed or divorced. There is no variation in marital status of male-headed households, as men appear to remarry quickly after losing a spouse. Finally, given that wealth is associated, both

empirically and in the survey data, with gender, informal insurance and marital status, I consider wealth when selecting my sample.

The sampling scheme is depicted in Figure 1C. Distributions are stylized representations of relative distributions from the R2 data.[16] I sample eight individuals at the median wealth level in each cell, as illustrated by the solid stars.[17] As a measure of wealth, I used the household's herd size because of the centrality of livestock to Boran livelihoods. Given its importance, extra care and diligence is taken by enumerators when collecting herd size data and therefore they are hopefully measured with less error. Because wealth is a likely driver of many phenomena of interest in this study and wealth levels are significantly different in existing survey data between male and female household heads of different marital statuses, I have chosen to interview six additional women with wealth levels that correspond to the median wealth of the male interviewee of the same purchase category, as depicted by the blue lines and six transparent stars. Comparison of responses between men and women of the same wealth level may be suggestive of the extent to which wealth is a driver of the phenomena of interest.

Time and resources necessarily limit the sample size. The choice to oversample women is justified by existing evidence in the survey data that there is notable heterogeneity in female-headed households within the study population. Better understanding how this heterogeneity influences insurance access by women is a necessary step toward understanding whether IBLI is a gender-neutral intervention. Although generalization is obviously not possible with such a limited sample size, the qualitative findings derived from this study will provide an inductively grounded set of propositions that can direct future analysis in the present study and help formulate questions for future studies.

[16] The number of individuals (n) in each cell of Figure 1C was determined using the R2 survey data. In Figure 2C, n has been updated using R3 survey data.
[17] Median-based sampling is chosen due to the positively skewed nature of wealth distributions and outliers in the right tails.

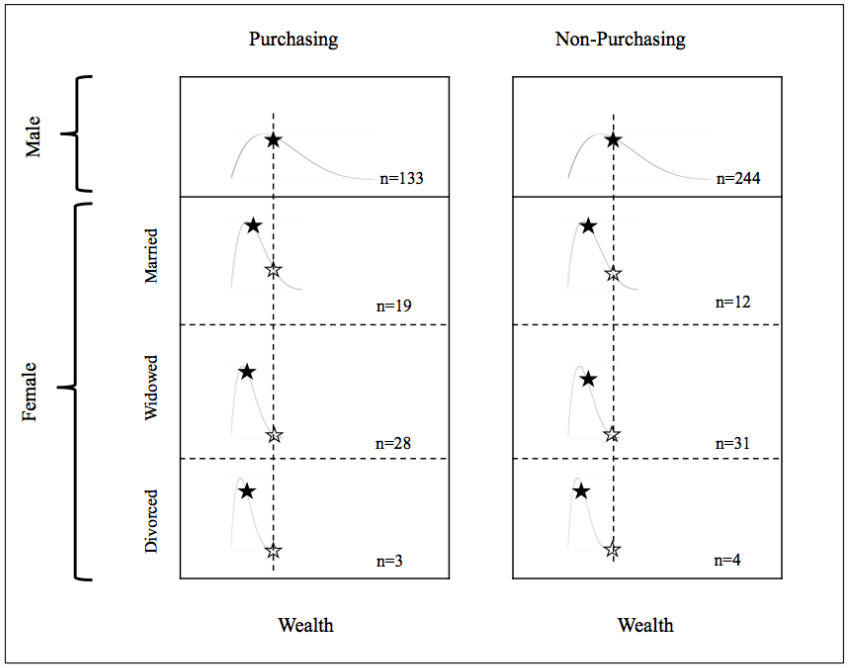

Figure 1C: Original Qualitative Sampling Design

The sampling scheme was confounded by measurement error in the IBLI purchase and marital status variables. After attempting to correct for and replace households with mis-measured key characteristics, the structure of the sample changed from what is depicted in Figure 1C to that depicted in Figure 2C. Additional time for interviews also allowed for two extra males to be sampled that had been excluded previously due to anticipated time constraints.

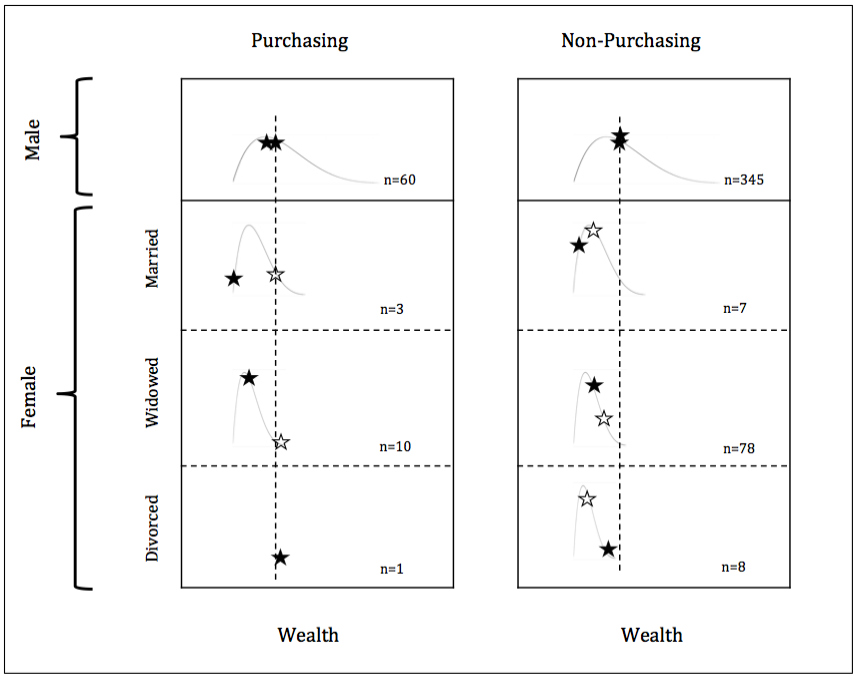

Figure 2C: Actual Qualitative Sample

Interview Procedure

The final interview guide is included below. There are several key features of the interview guide. First, a standardized set of probes inspired by Patton (2002) was developed for eliciting complete responses. Four types of probes were intended encourage the elaboration, clarification, justification and illustration of responses. These probes were intended to be used consistently throughout the interview to minimize bias induced by spontaneous phrasing of probes, however these efforts were thwarted by challenges involving interpretation in the actual implementation and standardized probes were rarely used. Other questions were designed to be initially open-ended, with pre-defined prompts associated with key concepts from previous empirical work. Prompts were used as needed when open-ended questions and probes failed to touch upon key topics. In order to connect the quantitative and qualitative data in a way that allows for meaningful inference, some interview questions were structured around quantitative data points for the household in question. For example, I used respondents' R3 data on transfers given, transfers received and network group participation to structure the informal insurance

section of the interview around discussions of specific transfers and groups the household was involved in. Discussions of information channels drew on data reported by the household on the sources of IBLI information that they reported in R3. This guide was refined in the field through pre-testing (out-of-sample) prior to the interviews.

Interviews were conducted over three weeks following collection of the R3 household survey data. Interviews were held in or near the respondents' homes, with the exception of three interviews that were held in a neighboring village due to inaccessibility of the respondents' home villages. Interviews were conducted using an experienced interpreter who underwent three days of training specific to the interview guide. Training included discussion of key terms and their interpretations in Oromiffaa, careful translation of questions, probes and prompts, and field-testing of interview guide. Oral consent was obtained using the IRB-approved consent script included below. The interview took between 2 and 4 hours and the respondents were compensated with ETB 100 for their time.

Analysis procedure

Transcription and analysis of interview data took place in the weeks following the interviews. Analysis took both deductive and inductive forms based on previous empirical findings, theory, and observed limits of theory. A pre-determined analytical framework for each theme (noted in the second column of tables in interview guide) was developed based on previous empirical findings. Where there was little or no previous work around which to structure a framework, a more inductive strategy was taken with the objective of exploring the range of responses.

Deductive analysis began with a coding process associated with each pre-determined analytical bins. I also residual responses that did not conform to the analytical bins in a more inductive manner. The second stage of analysis was to involve comparisons of response dominance between men and women (Sections A-E of interview guide), purchasers and non-

purchasers (Section B), lower and higher wealth households (Sections C and D) and among women of different marital statuses (Section D). Dominant responses are defined using a frequency threshold or those with low frequency but a direct relationship to theory or previous empirical findings. I define "strong dominance" as a response frequency of over 66% in any given category, weak dominance as less than 33% in a given category and moderate dominance as the interval in between. Some weak responses were meaningful and worthy of analytical attention, despite their infrequency, due to their alignment with theory and/or previous empirical findings.

Inductive analysis involved looking for response dominance and relational patterns within responses where there was weak or no empirical precedent for analysis and/or where individual experiences diverge from the analytical bins. Divergences and commonalities across responses were recorded, as well as comparisons between key groups discussed above.

Oral Consent Script

Thank you very much for your decision to participate in our study. The goal of this study is to understand how men and women view and manage risk. You are one of 16 individuals who were randomly selected to participate from the household survey participants. We intend to learn about risks that households currently face and about the different ways individuals deal with these problems. The household survey has given us some information about these topics, but we are interested to know more details so that we can better understand how women's and men's experiences are different.

We will ask your opinions on different ways of managing the risks you face, especially those relating to livestock. We will also ask you your opinions about IBLI and the way you decided whether to purchase IBLI. The interview will take approximately 2 hours. You will receive ETB 100 as a token of appreciation for taking time to participate in this interview today.

You may ask questions now or anytime during the interview. This interview will be recorded and transcribed and we will keep the recordings and transcripts in a locked place. All the information you give will be strictly confidential. Your name will not be associated with any of your responses or given to anyone outside our project. If you would rather not answer any questions, just say so. You may opt out of this interview at any time you wish. Your cooperation is greatly appreciated, as it will help us to understand the life, problems and attitude of pastoralists in this area.

May we proceed with the interview?

Final Interview Guide

Sections A-E of the interview guide correspond to planned interview themes. The first column contains questions and associated prompts, while the second column is blank and can be used for translation notes.

In addition to the questions listed below, I've developed a standard set of probes to be used individually as needed throughout the interview.

Elaboration:

- *I am beginning to understand. Can you say some more about X?*
- *When did X happen?*
- *Who was involved in X?*
- *Where were you at that time?*
- *Where did X happen?*
- *How were you involved in X?*
- *How did X come about?*

Clarification:

- *I want to make sure I understand what you're saying. Can you tell me what you mean by X?*

Illustration:

- *Can you tell me about a time when X happened?*
- *Can you give me an example of X?*

Justification:

- *Why do you believe X?*

Section A: Household Decision-Making	
I'd like to talk about your decision to purchase or not purchase IBLI *in the previous two sales period (previous year)?*	
1. Can you describe how the idea to [purchase or not purchase] IBLI first began? a. [Prompt] Who in your household first brought up the idea of IBLI? b. [Prompt] When did the idea first come up? c. [Prompt] What made [person] bring up the idea?	Inductive Head / Spouse / Grown Child When IBLI was introduced / Well after introduced

d. *[Prompt] Did you discuss within your household?*	Discussed / Didn't discuss
2. Were you involved in the decision to [purchase/not purchase] IBLI?	Yes/No
a. If yes, can you describe your involvement? i. [Prompt] Were you consulted by other household members? ii. [Prompt] Did you give your opinion without being asked? iii. [Prompt] Did you make the final decision? iv. [Prompt if purchased] Did you physically go purchase IBLI?	Involvement in different stages of decision-making:[18] Problem recognition / Pre-purchase information search (passive/active?) / Evaluation of alternatives / Decision to execute purchase / Post-purchase evaluation of relationship btw product expectations and performance.
b. If no, *what do you think the reason is that you were not involved?* i. Does being a [woman/man] have anything to do with why you weren't involved? If so, can you tell me about this?	By chance (e.g., was unavailable at time of decision) / Traditional role[19] / Uninterested / Other reason?
3. Of adults or grown children in household, who [else] was not involved in the decision? a. What is your relation to this person/people? i. [Prompts] Member of household? Gender of person? Parent, child, other relation?	Household members: Male/Female, Adult/Child
b. Why was this person [people] not involved in the decision? i. [Prompt] Can you think of any specific reason why they weren't involved?	Status / Traditional role / Other[20]

[18] Decision-making is conceptualized using these five stages as per Mitchell et al. (1994).

[19] The traditional role conceptualization is described by Davis (1976) as an arrangement where decision-making power resides in the position one occupies in the household rather than what he calls a comparative resources conceptualization in which power is assigned based on the characteristics of the individual household member (e.g., competence, ability to punish, etc). The traditional role framework is consistent with FGD responses from the Borana zone which describe gendered spheres of responsibility associated with the household division of labor.

[20] Drawing from Coppock's (1994) and McPeak et al's (2011) ethnographic descriptions of the study population, suggest that age and gender are closely associated with status within Boran society. These authors also describe gender-specific spheres of household production. More recent focus group discussions suggest that men and women have separate, but sometimes overlapping decision-making spheres wherein women tend to manage the household budget while men tend to make livestock management decisions.

ii. [Prompt] Does being a [woman/man] have anything to do with why they weren't involved?	
4. Of all those involved in the decision, who had the most influence? a. What is your relation to this person? i. [Prompts] Member of household? Gender of person? Parent, child, other relation?	Household members: Male/Female, Adult/Child
b. Why did this person have the most **influence** *over the decision to purchase IBLI*? i. [Prompt] Does this person have more influence on most household decisions than you do? ii. [Prompt] Does this person usually have the most influence on decisions about livestock? iii. [Prompt] Does this person usually have the most influence on decisions about what money is spent on? iv. [Prompt] Are there any other reasons why this person had the most influence *over the decision to purchase IBLI*?	Status (age, gender, other status-related reason) / Sphere of decision-making is associated with that person (livestock management, household management, budgetary, other) / Other
5. Of adults and grown children in the household, who had the least **influence**? a. What is your relation to this person? i. [Prompts] Member of household? Gender of person? Parent, child, other relation?	Household members: Male/Female, Adult/Child
b. Can you tell me why this person had the least influence? i. [Prompt] Does this person have less influence on most household decisions than you do? ii. [Prompt] Does this person usually have little influence on decisions about livestock? iii. [Prompt] Does this person usually have little influence on decisions about what money is spent on?	Status / Sphere of decision-making is not associated with that person / Other

iv. [Prompt] Are there any other reasons why this person had the least influence?	
6. From the beginning when the idea of IBLI was first introduced by [person described above] to the discussion of whether to purchase to the actual purchasing [if purchased], how did **the process of deciding to purchase** IBLI compare to other household decisions **such as decisions about the household budget or livestock management decisions**? a. [Prompt] Was your involvement and influence similar? b. [Prompt] Were the other people involved the same as those involved in most other decisions? c. [Prompt] Was the most influential person *in the IBLI decision* the same as in most other decisions? d. [Prompt] Was the least influential person the same as in most other decisions?	Involvement in different stages: Problem recognition / Pre-purchase information search (passive/active?) / Evaluation of alternatives / Decision to execute purchase / Post-purchase evaluation of relationship btw product expectations and performance. [21]

Section B: Perceptions of IBLI	
I would like to know how easy or difficult is it for you to believe that IBLI will pay you when there is a drought.	
7. Has there been a time when you experienced drought but IBLI didn't pay you or other people in the community who purchased? a. [Prompt] Can you give me an example of how drought for you is different than for IBLI?	Yes/No IBLI drought definition is more severe / IBLI drought definition is less severe / No differences
8. Sometimes NGOs or other people come with new ideas of how to help, but you don't really understand how their idea works so you're not sure it will be helpful.	
a. Do you feel you understand enough about IBLI to make a **confident** decision about purchase? i. [Prompt] Can you tell me more about this?	Yes/No Inductive

[21] See footnote 4 (Mitchell et al. 1994).

9. Sometimes NGOs or other people come with ideas of how to help, but then they don't do what they said they would do and you don't get the help you were **expecting**.	
a. Can you tell me about any time you've felt disappointed in the *people bringing insurance to you*? i. [Prompt] Have you felt this way about *any of the IBLI people?* ii. [Prompt] Have you felt this way about the *DAs or the cooperatives w*ho sold you insurance? (if applicable) iii. [Prompt] Have you felt this way about any other IBLI-related people or organizations?	Yes (associated with OIC, ILRI team members, cooperatives, other implementing partners) / No Inductive
b. Do you **worry** that something like this could happen with IBLI [again] in the future?	Yes/No
i. If so, what makes you worry about this?	Inductive
ii. If not, what makes you **feel confident** in IBLI?	Inductive
10. Can you describe any other reasons why you think that purchasing IBLI might not be a good idea for you?	Inductive
11. Taken together, do the **risks** you've just described [in questions 7-10] feel greater than the **risk** of drought? *a. [Prompt] Which risk would you rather take—drought or IBLI?*	Yes/No
12. *Which of the concerns about IBLI that we have discussed is the biggest for you*? [Referring to their responses to 7, 8, 9 and 10.	Trust in implementer / Trust in their own understanding / Trust in index / Other
a. Why is this the biggest concern for you?	Inductive

Section C: Information Channels	
I would like to hear from you about the ways that you learned about IBLI. I see that you reported hearing about IBLI through [list all sources reported	

in R3], and that [most important source] was the most important source of IBLI information for you.	
13. Of the [information sources reported], how many times did you engage with each one in the past year?	Frequency
14. Of the [information sources reported], which **ones taught you the most about IBLI?**	
a. What made these the most informative?	Inductive
15. In your opinion, is it easy or difficult for you to access **this channel of information**?	Perceived as easy / Perceived as difficult *One can prefer a channel but not have access to it.
b. What makes it [easy/difficult] to access this **channel of information**? i. [Prompt if difficult] what would make it easier for you to access this channel of information?	Inductive
16. Were you able to get all of the information you wanted through this channel or do you still wish you could get more information?	Got all info / Wants more info
c. If didn't get all information, what kept you from getting all of the information you wanted?	Inductive
17. Are there ways of learning about IBLI that really do not work for you?	Inductive
d. What makes these information channels unhelpful for you?	Inductive
18. What ideas do you have for ways that they could teach you about IBLI that would work well for you specifically?	Inductive
e. Why would these ways work well for you?	Increase access / Increase intensity / Other

Section D: Transfers

I want to ask you about some of the transfers you reported in the household survey. *First I will ask about transfers you received from others, and then I will ask about transfers you gave to others.*	
[Transfers Received—These questions will be asked about the two most recent cash or in-kind transfers received by the respondent. **]**	
19. I see that you received a transfer of [what] from [whom] in [season]. Can you tell me about the circumstances of this transfer? [If the transfer is for the purpose of ceremony, do not ask a, b, c, or d.]	Inductive Ex ante prep for shock / ex post response to shock / non-insurance purpose[22]
a. Did you ask for this transfer?	Yes / No
i. If so, why did you ask for this transfer? ii. If not, why did you receive this transfer?	Ex ante prep for shock / ex post response to shock / non-insurance purpose
b. What did you ask for exactly? i. [Prompt] Was it something specific?	Inductive
ii. Were you given something different from what you asked for?	Different / Same Inductive
c. Can you tell me what you thought about as you decided to ask this person for the transfer? i. [Prompt] Did you think about ways that you had helped them in the past? ii. [Prompt] Did you think about ways that you may help them in the future?	Inductive Direct reciprocity
d. Did you **worry** that the person would refuse to give you what you asked for?	Yes / No
i. If so, what in particular made you worry that the person might refuse?	Inductive
ii. If no worrying, why not? 1. [Probe if didn't worry that person might refuse] Can you tell me more about why you didn't expect this person to refuse?	Didn't expect them to refuse / Didn't desperately need transfer from that person / Other reason

[22] This typology is derived from McPeak's (2006) analysis of livestock transfers specifically. Here I apply his typology to cash, in-kind and livestock transfers. Non-insurance purposes include redistribution, rituals, breeding, herd-composition adjustment

e. Do you think the person who gave you this transfer could be expecting something from you in return?	Yes / No
i. *What are the person's expectations in the future*? 1. *Did you talk about the expectations or is it like the proverb, "The hands wash each other turn by turn."* 2. [Prompt] *The proverb says….[proverb], so does that mean* they **expect** you to give them the exact same thing in the future? 3. [Prompt] Or do they **expect** you to give them something equivalent in the future? 4. [Prompt] *Apart from what we have discussed above, is there something else you think the person expects from you?*	Explicit agreement / No explicit agreement Expectations associated with specific transfer / Expectations associated with relationship to person / Expectations associated with something else
ii. What **would you have done** if the person had refused to give you the transfer when you asked?	Recourse[23] / No recourse
iii. Who else **might you have asked** for a transfer if this person had refused?	Number of potential transfer links that could be activated.
[Transfers Given—These questions will be asked about the two most recent cash or in-kind transfers given by the respondent. **]**	
20. I see that you gave a transfer of [what] to [whom] in [season]. Can you tell me about the circumstances of this transfer?	Inductive Ex ante insurance for giver / ex ante prep for receiver shock / ex post response to shock / non-insurance purpose
a. Did they ask you for this transfer?	Yes / No
i. If so, what was the reason that they gave? ii. If not, why did you decide to give them this transfer?	Ex ante prep for shock / ex post response to shock / non-insurance purpose
b. What exactly did they ask for?	Inductive

[23] Clarke and Dercon (2009) suggest that one of the key features separating insurance from safety nets is the existence of an explicit and enforceable contract or agreement. Exchanges where there are few or no explicit consequences if one individual reneges are less representative of an insurance mechanism.

iv. [Prompt] Was it something specific?	
c. Did you decide to give them something different from what they asked for? i. If so, why?	Inductive
f. Are you expecting something in return from this person?	Yes / No
i. What are your expectations from this person in the future? 1. [Prompt] Did you talk about the expectations with this person *or is it like the proverb "The hands wash each other turn by turn"*? 2. [Prompt] *The proverb says….[proverb], so does that mean* you **expect** them to give you the exact same thing in the future? 3. [Prompt] Or do you **expect** them to give something equivalent in the future? 4. [Prompt] *Apart from what we have discussed above, is there something else you expect from the person?*	Explicit[24] / Not explicit Expectations associated with specific transfer / Expectations associated with relationship to person / Expectations associated with something else
g. Can you describe what you thought about when deciding whether to help or not?	Inductive
i. When you considered whether to give them the transfer, did you think about times that this person had helped you in the past?	Yes / No
ii. When you considered whether to give them the transfer, did you think about this person's potential to help you in the future? 1. [Prompt] Can you tell me more about what you thought about?	Did they consider the return on their investment, the person's capacity to make good use of the transfer?[25]
iii. Did you **consider** not giving the person anything?	Yes / No
1. If so, why? 2. If not, why not?	Yes / No

[24] See previous footnote (Clarke and Dercon 2009).
[25] Santos and Barrett (2011) suggest this is a driver of livestock transfers among members of the study population.

iv. What **would have happened to you if** you had decided to not help the person? 1. [Prompt] Would there be any consequences among your family or friends? 2. [Prompt] Would there be any consequences in the future if you fall into hard times?	Consequence[26] / No consequence
v. *Apart from the things we have discussed, what* other things did you consider when making the decision?	Inductive

Section E: Group Participation	
Now I would like to ask you about any cooperatives or other groups that you participate in.	
21. I see that your household members participate in [groups]. [*If no group participation, skip to 4.]*	
a. Which group is the most helpful to your household?	Inductive
b. Can you tell me about who is in this group and what it does?	
i. [Prompt] Who are the members? ii. [Prompt] What are [most helpful group]'s activites? iii. [Prompt] What are the conditions of membership?	Conditional membership / unconditional membership Activites: Ex ante prep for shock (idiosyncratic, covariate) / Ex-post response to shock (idiosyncratic, covariate) / non-insurance purpose
c. Can you tell me about the ways that participating in [most helpful group] helps your household? vi. [Prompt] Can you tell me about a specific time when the group has helped you?	Ex ante prep for shock (idiosyncratic, covariate) / Ex-post response to shock (idiosyncratic, covariate) / non-insurance purpose
h. Can you tell me about the ways that the group has helped its members? i. [Prompt] Can you describe a time when a group member asked for help and the group decided to help that person?	Ex ante prep for shock (idiosyncratic, covariate) / Ex-post response to shock (idiosyncratic or covariate) / non-insurance purpose

[26] See earlier footnote (Clarke and Dercon 2009).

ii. [Prompt] Can you describe what the group considered when deciding whether to help that person?	Person's previous contribution to group / Person's future potential contribution to group / Automatic decision—nothing to consider / Other reasons
i. Can you describe a time when a group member asked for help and the group decided not to help that person? i. [Prompt] What did the person want help for? ii. [Prompt] Why did the group decide not to help that person?	Ex ante prep for shock (idiosyncratic, covariate) / Ex-post response to shock (idiosyncratic, covariate) / non-insurance purpose Person's previous contribution to group / Person's future potential contribution to group / Automatic decision—nothing to consider / Other reasons
j. In your opinion, do some group members benefit more from the group than others? k. Can you tell me about the ways that participating in [most helpful group] **has helped other group members differently than the way you have been helped**?	Yes / No Ex ante prep for shock (idiosyncratic, covariate) / Ex-post response to shock (idiosyncratic, covariate) / non-insurance purpose
22. What groups, if any, do you feel you could join but you **choose not to**? [27] a. Why do you opt to not join these groups?	Inductive. Unable to meet conditions of membership / Would contribute more than receive / Other reasons
23. Is there a group you wanted to join but were **unable**? [28]	
l. If so, can you tell me the story of what happened? i. [Prompt] Why did you want to join? ii. [Prompt] Did you not have enough money to join? iii. [Prompt] Were you not close to the right people to be able to join?	Wealth / social connectedness / other reasons.

[27] Informal insurance groups may experience adverse selection where membership is voluntary and the wealthy have alternative means of coping with shocks. Alternately, poorer members may choose not to join informal groups where the conditions of membership are not affordable to the household (Bhattamishra and Barrett 2009, Morduch 1999).

[28] Vanderpuye-Orgle and Barrett (2011), Bhattamishtra and Barrett (2009), Santos and Barrett (2011), Morduch (1999) and others note that wealth and social connectedness are associated with access to informal insurance networks.

iv. [Prompt] What were other reasons why you couldn't join?	
24. Are there households that would like to join or **maintain participation in** [most helpful group], but are unable to do so? a. What do you think keeps them from joining or participating? i. [Prompt] Do they not have enough money to join? ii. [Prompt] Are they not close to the right people to be able to join? iii. [Prompt] What are other reasons why they can't join?	Wealth / Social connectedness / Other reasons?
25. Do you think it is most difficult to join [most helpful group] for people who are married, widowed or divorced?	Married / Widowed / Divorced / All are the same
b. What do you think are the reasons for this?	Wealth / Social connectedness / Other reasons?
26. Do you think it is easiest to join [most helpful group] for people who are married, widowed or divorced?	Married / Widowed / Divorced / All are the same
c. What do you think are the reasons for this?	Wealth / Social connectedness / Other reasons?
27. Do you think it is easier to join [most helpful group] for people who are rich or poor?	Rich / Poor / Neither
d. [Prompt, if rich] Is there something more than money that makes it easy for wealthy people to be part of this group? e. [Prompt, if poor] What makes it easier for poor people to join the most helpful group?	Wealth alone / Social connectedness / Other reasons? Inductive.
28. Compared to others, do you think it is relatively easy or difficult for members of your household to join and **maintain participation in** [groups]?	Easy / Hard
f. What makes you think this way? g. [Prompt] Can you give me an example of something that demonstrates that it is [easier/harder] for your household?	Wealth / Social connectedness / Other reasons?
[Questions below are for households that did not report participation in any groups in R3]	

29. Many households participate in different kinds of groups like women's groups, savings groups or others, but I see you reported that nobody in your household is involved in this. Is that still the case?	
30. If so, why is your household not involved in any of these groups? [If not, return to previous section]	Access difficulty (wealth, social connectedness, other) / No access difficulty
m. Have you wanted to join a group and **been unable?** If so, can you tell me the story of what happened? i. [Prompt] Why did you want to join? ii. [Prompt] Why were you not able to join? iii. [Prompt] Did you not have enough money to join? iv. [Prompt] Were you not close to the right people to be able to join? v. [Prompt] What were other reasons why you couldn't join?	Unable to meet conditions of group due to wealth / social connectedness / other reasons.
n. Are there groups that you feel you could join, but you **choose not to**?	Yes / No
i. Can you tell me a bit about why you choose not to?	Inductive

Section D: Perceptions of Informal Insurance	
I would like to hear about how easy or difficult it is to get help from others when facing hard times. *For example, during drought, famine or health problems or a death in the family….*	
31. *When you compare yourself to other households,* do you feel it is easier or harder for your household to get help from others during hard times?	Yes / No
h. Why do you think it's easier/harder for your household?	Wealth / Social connectedness / Other reasons?
i. [Prompt] Can you give an example of a time that that it was easier/harder for your household?	Wealth / Social connectedness / Other reasons?
i. *When you compare yourself to other households,* what kinds of problems are easier for your household to get help with?	Idiosyncratic / Covariate

j. *When you compare yourself to other households,* what kinds of problems are more difficult?	
32. Why do you think it is easier for some households and harder for others to get help during hard times?	Wealth / Social connectedness / Other reasons?
k. [Prompt] Can you describe types of households that appear to find it easier to get help?	Wealth / Social connectedness / Other reasons?
l. [Prompt] Can you describe types of households that appear to find it more difficult?	Wealth / Social connectedness / Other reasons?
m. Do you think it is most difficult to get help during hard times for people who are married, widowed or divorced?	Married / Widowed / Divorced / All are the same
i. What do you think are the reasons for this? 1. [Prompt] Do you think it is related to their money/livestock/wealth? [wealth=*qabann*] 2. [Prompt] Do you think it's related to their **social network**? 3. [Prompt] What other reasons might make it most difficult for them?	Wealth / Social connectedness / Other reasons?
n. Do you think it's easiest to get help during hard times for people who are married, widowed or divorced?	Married / Widowed / Divorced / All are the same
i. What do you think are the reasons for this? 1. [Prompt] Do you think it is related to their money/livestock/wealth? 2. [Prompt] Do you think it's related to their **social network**? 3. [Prompt] What other reasons might make it easiest for them?	Wealth / Social connectedness / Other reasons?
o. When a **generally more rich person** falls into hard times, is it easier or more difficult to get help **from others** than a **generally poorer person**?	Rich / Poor
i. What do you think are the reasons for this? 1. [Prompt, if they say it's easier for richer people] Is there something	Wealth alone / Social connectedness / Other reasons?

more than money that helps wealthy people get help **from others** during hard times?	

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APPENDIX D: Additional Results

Table D1: IBLI Purchase Decision (Coefficient Estimates)

	(1)	(2)	(3)
Female headed household	0.040	0.699*	1.028
	(0.096)	(0.357)	(0.787)
Female Head X HS at marriage			0.469
			(0.710)
HS at marriage			0.190
			(0.139)
Female Head X Home info		-0.0004	0.011
		(0.005)	(0.009)
Home-centered information		0.003	0.003
		(0.002)	(0.002)
Female Head X Transfers		-0.089	-0.250**
		(0.061)	(0.123)
ln Transfers		-0.005	-0.005
		(0.030)	(0.031)
Female Head X Moderate risk aversion		-0.309	-0.455
		(0.210)	(0.399)
Moderate risk aversion		0.039	0.039
		(0.099)	(0.102)
Female Head X High risk aversion		-0.067	-1.875
		(0.335)	(1.524)
High risk aversion		-0.113	-0.141
		(0.154)	(0.159)
IBLI knowledge		0.102***	0.091***
		(0.025)	(0.028)
Financial literacy		0.093***	0.118***
		(0.036)	(0.042)
Head Education		-0.031	-0.038
		(0.025)	(0.026)
ln Effective price per TLU	-0.522***	-0.550***	-0.553***
	(0.055)	(0.059)	(0.064)
Lagged IBLI purchase		-0.387***	-0.320**
		(0.127)	(0.139)
Assigned coupon	0.277**	0.266**	0.228
	(0.127)	(0.134)	(0.144)
Dependency ratio	-0.118	-0.098	-0.283*
	(0.094)	(0.099)	(0.153)
Expected rangeland above normal	0.027	0.084	0.042
	(0.149)	(0.157)	(0.181)
Expected rangeland below normal	0.309**	0.309**	0.357**
	(0.127)	(0.134)	(0.149)
Previous period losses	-0.178**	-0.217**	-0.233**
	(0.084)	(0.087)	(0.095)
Age		-0.195	-0.156
		(0.119)	(0.154)
Age-squared		0.001	0.001
		(0.001)	(0.001)
Asset index		-0.142	-0.106
		(0.090)	(0.097)
ln Total monthly income		-0.051	-0.121**
		(0.046)	(0.052)
Proportion of income from livestock		-0.007***	-0.007***
		(0.002)	(0.002)
ln Herd size		-0.029	0.071

		(0.140)	(0.165)
Savings > 5 TLU		0.076	0.135
		(0.200)	(0.213)
HA Dependency ratio	0.049	0.058	0.026
	(0.047)	(0.052)	(0.070)
HA Expected rangeland above normal	-0.036	-0.079	-0.015
	(0.206)	(0.219)	(0.247)
HA Expected rangeland below normal	-0.074	-0.156	-0.080
	(0.170)	(0.184)	(0.208)
HA Previous period losses	0.130	-0.030	-0.064
	(0.103)	(0.138)	(0.152)
HA Age		-0.011	-0.006
		(0.014)	(0.016)
HA Age-squared		0.000	0.000
		(0.000)	(0.000)
HA Asset index		-0.011	0.058
		(0.110)	(0.122)
HA ln Total monthly income		0.087	0.085
		(0.097)	(0.119)
HA Proportion of income from livestock		-0.002	-0.005
		(0.003)	(0.004)
HA ln Herd size		0.051	0.101
		(0.099)	(0.117)
HA Savings > 5 TLU		0.073	0.053
		(0.249)	(0.269)
Constant	1.074***	-0.000	-0.121
	(0.391)	(0.249)	(0.269)
Observations	1,824	1,824	1,510
Chi2	362.3	630.2	574.2
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table D2: IBLI Purchase Decision Using Reported Purchase (Coefficient Estimates)

	(1)	(2)	(3)
Female headed household	0.057	0.346	0.427
	(0.086)	(0.319)	(0.697)
Female Head X HS at marriage			0.524
			(0.546)
HS at marriage			0.181
			(0.120)
Female Head X Home info		-0.0004	0.006
		(0.004)	(0.008)
Home-centered information		-0.003	-0.003
		(0.002)	(0.002)
Female Head X Transfers		-0.064	-0.113
		(0.054)	(0.108)
ln Transfers		-0.002	0.003
		(0.026)	(0.026)
Female Head X Moderate risk aversion		-0.062	-0.044
		(0.184)	(0.348)
Moderate risk aversion		-0.059	-0.056
		(0.086)	(0.087)
Female Head X High risk aversion		-0.236	-1.019
		(0.292)	(1.035)
High risk aversion		-0.053	-0.072
		(0.131)	(0.134)
IBLI knowledge		0.146***	0.137***
		(0.022)	(0.025)
Financial literacy		0.030	0.020
		(0.031)	(0.035)
Head Education		-0.021	-0.021
		(0.021)	(0.022)
ln Effective price per TLU	-0.174***	-0.150***	-0.142***
	(0.034)	(0.036)	(0.037)
Lagged IBLI purchase		0.400***	0.391***
		(0.093)	(0.103)
Assigned coupon	0.329***	0.355***	0.379***
	(0.099)	(0.103)	(0.112)
Dependency ratio	-0.055	-0.042	-0.088
	(0.082)	(0.087)	(0.128)
Expected rangeland above normal	-0.185	-0.093	-0.138
	(0.129)	(0.136)	(0.152)
Expected rangeland below normal	0.024	0.017	0.033
	(0.110)	(0.116)	(0.126)
Previous period losses	-0.118	-0.118	-0.147*
	(0.074)	(0.076)	(0.081)
Age		-0.086	0.029
		(0.097)	(0.110)
Age-squared		0.001	-0.000
		(0.001)	(0.001)
Asset index		-0.080	-0.106
		(0.066)	(0.078)
ln Total monthly income		-0.016	-0.073
		(0.042)	(0.046)
Proportion of income from livestock		-0.004**	-0.002
		(0.002)	(0.002)
ln Herd size		0.012	0.041
		(0.122)	(0.138)
Savings > 5 TLU		0.071	0.045
		(0.170)	(0.179)
HA Dependency ratio	0.020	-0.005	-0.023
	(0.042)	(0.046)	(0.060)
HA Expected rangeland above normal	0.011	0.041	0.099
	(0.182)	(0.190)	(0.211)

HA Expected rangeland below normal	-0.014	-0.020	0.033
	(0.150)	(0.158)	(0.176)
HA Previous period losses	0.142	-0.033	-0.063
	(0.091)	(0.120)	(0.130)
HA Age		-0.014	-0.013
		(0.012)	(0.014)
HA Age-squared		0.000	0.000
		(0.000)	(0.000)
HA Asset index		0.079	0.030
		(0.087)	(0.101)
HA ln Total monthly income		-0.023	-0.069
		(0.081)	(0.098)
HA Proportion of income from livestock		-0.002	-0.004
		(0.003)	(0.003)
HA ln Herd size		0.082	0.139
		(0.086)	(0.099)
HA Savings > 5 TLU		0.320	0.444*
		(0.214)	(0.229)
Constant	-0.495*	-0.770	-0.633
	(0.277)	(0.214)	(0.229)
Observations	1,824	1,824	1,510
Chi2	65.83	128.0	105.7
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table D3: IBLI Purchase Decision Using Reported Purchase (AME)

	(1)	(2)	(3)
Female headed household	0.017	0.099	0.122
	(0.025)	(0.091)	(0.199)
Female Head X HS at marriage			0.150
			(0.156)
HS at marriage			0.052
			(0.034)
Female Head X Home info		0.001	0.002
		(0.001)	(0.002)
Home-centered information		-0.001	-0.001
		(0.001)	(0.001)
Female Head X Transfers		-0.018	-0.032
		(0.016)	(0.031)
ln Transfers		-0.001	0.001
		(0.007)	(0.008)
Female Head X Moderate risk aversion		-0.018	-0.012
		(0.053)	(0.099)
Moderate risk aversion		-0.017	-0.016
		(0.025)	(0.025)
Female Head X High risk aversion		-0.067	-0.291
		(0.083)	(0.295)
High risk aversion		-0.015	-0.021
		(0.038)	(0.038)
IBLI knowledge		0.042***	0.039***
		(0.006)	(0.007)
Financial literacy		0.009	0.006
		(0.009)	(0.010)
Head Education		-0.006	-0.006
		(0.006)	(0.006)
ln Effective price per TLU	-0.052***	-0.043***	-0.041***
	(0.010)	(0.010)	(0.011)
Lagged IBLI purchase		0.114***	0.112***
		(0.027)	(0.029)
Assigned coupon	0.098***	0.102***	0.108***
	(0.029)	(0.029)	(0.032)
Dependency ratio	-0.016	-0.012	-0.025
	(0.024)	(0.025)	(0.037)
Expected rangeland above normal	-0.055	-0.027	-0.039
	(0.038)	(0.039)	(0.043)
Expected rangeland below normal	0.007	0.005	0.009
	(0.033)	(0.033)	(0.036)
Previous period losses	-0.035	-0.034	-0.042*
	(0.022)	(0.022)	(0.023)
Age		-0.025	0.008
		(0.028)	(0.032)
Age-squared		0.000	-0.000
		(0.000)	(0.000)
Asset index		-0.023	-0.030
		(0.019)	(0.022)
ln Total monthly income		-0.005	-0.021
		(0.012)	(0.013)
Proportion of income from livestock		-0.001**	-0.001
		(0.000)	(0.001)
ln Herd size		0.003	0.012
		(0.035)	(0.040)
Savings > 5 TLU		0.020	0.013
		(0.049)	(0.051)
HA Dependency ratio	0.006	-0.002	-0.007
	(0.012)	(0.013)	(0.017)
HA Expected rangeland above normal	0.003	0.012	0.028
	(0.054)	(0.054)	(0.060)

HA Expected rangeland below normal	-0.004	-0.006	0.009
	(0.045)	(0.045)	(0.050)
HA Previous period losses	0.042	-0.009	-0.018
	(0.027)	(0.034)	(0.037)
HA Age		-0.004	-0.004
		(0.003)	(0.004)
HA Age-squared		0.000	0.000
		(0.000)	(0.000)
HA Asset index		0.023	0.009
		(0.025)	(0.029)
HA ln Total monthly income		-0.007	-0.020
		(0.023)	(0.028)
HA Proportion of income from livestock		-0.001	-0.001
		(0.001)	(0.001)
HA ln Herd size		0.023	0.040
		(0.024)	(0.028)
HA Savings > 5 TLU		0.092	0.127*
		(0.061)	(0.065)
Observations	1,824	1,824	1,510
LR Chi2	121.8	220.7	197.7
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table D4: Level of Purchase Using Reported Purchase

	(1)	(2)	(3)
Female headed household	-0.128	0.162	-0.270
	(0.126)	(0.383)	(0.928)
Female Head X HS at marriage			1.159*
			(0.660)
HS at marriage			0.106
			(0.151)
Female Head X Home info		0.001	0.007
		(0.005)	(0.011)
Home-centered information		-0.004	-0.004
		(0.003)	(0.003)
Female Head X Transfers		-0.016	-0.026
		(0.063)	(0.134)
ln Transfers		-0.037	-0.044
		(0.030)	(0.033)
Female Head X Moderate risk aversion		-0.199	-0.366
		(0.210)	(0.422)
Moderate risk aversion		-0.071	-0.087
		(0.099)	(0.107)
Female Head X High risk aversion		-0.066	-2.232*
		(0.346)	(1.243)
High risk aversion		-0.003	0.016
		(0.153)	(0.168)
IBLI knowledge		0.168***	0.170***
		(0.051)	(0.055)
Financial literacy		0.059	0.061
		(0.036)	(0.043)
Head Education		-0.042	-0.049*
		(0.026)	(0.029)
ln Effective price per TLU	-0.424***	-0.341***	-0.337***
	(0.088)	(0.060)	(0.065)
Lagged IBLI purchase		0.341**	0.329**
		(0.148)	(0.167)
Dependency ratio	-0.091	-0.065	-0.165
	(0.131)	(0.112)	(0.162)
Expected rangeland above normal	-0.235	-0.039	-0.142
	(0.202)	(0.160)	(0.196)
Expected rangeland below normal	0.102	0.125	0.116
	(0.160)	(0.133)	(0.155)
Previous period losses	-0.133	-0.171*	-0.168
	(0.115)	(0.094)	(0.110)
Age		-0.080	0.014
		(0.111)	(0.144)
Age-squared		0.001	0.000
		(0.001)	(0.001)
Asset index		-0.076	-0.107
		(0.094)	(0.118)
ln Total monthly income		-0.005	-0.053
		(0.049)	(0.062)
Proportion of income from livestock		-0.004	-0.003
		(0.002)	(0.003)
ln Herd size		-0.031	0.063
		(0.148)	(0.179)
Savings > 5 TLU		-0.377**	-0.359*
		(0.189)	(0.210)
HA Dependency ratio	-0.005	-0.041	-0.091
	(0.060)	(0.052)	(0.071)
HA Expected rangeland above normal	0.036	0.045	0.144
	(0.261)	(0.218)	(0.258)
HA Expected rangeland below normal	-0.146	-0.163	-0.132
	(0.216)	(0.181)	(0.219)

HA Previous period losses	0.371***	-0.149	-0.153
	(0.140)	(0.136)	(0.156)
HA Age		-0.025*	-0.025
		(0.015)	(0.017)
HA Age-squared		0.000	0.000
		(0.000)	(0.000)
HA Asset index		0.036	-0.029
		(0.118)	(0.147)
HA ln Total monthly income		-0.107	-0.111
		(0.095)	(0.121)
HA Proportion of income from livestock		-0.002	-0.001
		(0.003)	(0.004)
HA ln Herd size		0.390***	0.384***
		(0.099)	(0.123)
HA Savings > 5 TLU		0.262	0.455
		(0.259)	(0.312)
Constant	1.157**	1.314	1.239
	(0.579)	(0.847)	(0.965)
Observations	1,824	1,824	1,510
Chi2	65.83	128.0	105.7
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table D5: IBLI Purchase Decision Using Cases Where OIC Records=Reported Purchase (Coeff. Estimates)

	(1)	(2)	(3)
Female headed household	0.020	0.752*	0.934
	(0.106)	(0.390)	(0.871)
Female Head X HS at marriage			0.686
			(0.831)
HS at marriage			0.232
			(0.149)
Female Head X Home info		-0.0004	0.012
		(0.005)	(0.010)
Home-centered information		0.001	0.001
		(0.003)	(0.003)
Female Head X Transfers		-0.102	-0.230
		(0.067)	(0.153)
ln Transfers		-0.005	-0.001
		(0.033)	(0.034)
Female Head X Moderate risk aversion		-0.405*	-0.717
		(0.235)	(0.444)
Moderate risk aversion		0.056	0.065
		(0.110)	(0.113)
Female Head X High risk aversion		-0.271	-2.038
		(0.393)	(1.749)
High risk aversion		-0.208	-0.236
		(0.177)	(0.184)
IBLI knowledge		0.145***	0.133***
		(0.029)	(0.033)
Financial literacy		0.095**	0.100**
		(0.040)	(0.047)
Head Education		-0.053*	-0.052*
		(0.029)	(0.031)
ln Effective price per TLU	-0.581***	-0.604***	-0.617***
	(0.073)	(0.078)	(0.086)
Lagged IBLI purchase		-0.308**	-0.295*
		(0.151)	(0.167)
Assigned coupon	0.349**	0.354**	0.331*
	(0.151)	(0.160)	(0.173)
Dependency ratio	-0.123	-0.100	-0.276
	(0.103)	(0.110)	(0.174)
Expected rangeland above normal	-0.013	0.068	0.065
	(0.167)	(0.179)	(0.205)
Expected rangeland below normal	0.300**	0.312**	0.317*
	(0.140)	(0.150)	(0.167)
Previous period losses	-0.229**	-0.268***	-0.306***
	(0.095)	(0.099)	(0.108)
Age		-0.310**	-0.212
		(0.147)	(0.173)
Age-squared		0.002*	0.001
		(0.001)	(0.001)
Asset index		-0.127	-0.125
		(0.100)	(0.109)
ln Total monthly income		-0.029	-0.089
		(0.051)	(0.056)
Proportion of income from livestock		-0.007***	-0.007***
		(0.002)	(0.002)
ln Herd size		-0.027	0.045
		(0.154)	(0.179)
Savings > 5 TLU		0.104	0.162
		(0.225)	(0.239)
HA Dependency ratio	0.038	0.037	0.010
	(0.052)	(0.058)	(0.079)
HA Expected rangeland above normal	0.015	0.014	0.023
	(0.228)	(0.246)	(0.277)

HA Expected rangeland below normal	0.026	-0.025	0.061
	(0.191)	(0.210)	(0.237)
HA Previous period losses	0.120	-0.105	-0.139
	(0.117)	(0.156)	(0.173)
HA Age		-0.026*	-0.018
		(0.015)	(0.018)
HA Age-squared		0.000	0.000
		(0.000)	(0.000)
HA Asset index		0.018	0.074
		(0.122)	(0.136)
HA ln Total monthly income		0.068	-0.021
		(0.110)	(0.134)
HA Proportion of income from livestock		-0.004	-0.008*
		(0.003)	(0.004)
HA ln Herd size		0.125	0.238*
		(0.111)	(0.132)
HA Savings > 5 TLU		0.054	0.078
		(0.278)	(0.302)
Constant	1.137**	0.422	0.901
	(0.501)	(0.278)	(0.302)
Observations	1,581	1,581	1,305
Chi2	232.6	325.9	300.8
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table D6: Level of Purchase--Cases where OIC Records = Reported Purchase

	(1)	(2)	(3)
Female headed household	-0.125	0.316	0.035
	(0.078)	(0.253)	(0.609)
Female Head X HS at marriage			0.337
			(0.419)
HS at marriage			-0.046
			(0.077)
Female Head X Home info		-0.002	0.004
		(0.003)	(0.008)
Home-centered information		0.001	0.001
		(0.002)	(0.002)
Female Head X Transfers		-0.047	-0.051
		(0.042)	(0.095)
ln Transfers		-0.001	-0.009
		(0.022)	(0.023)
Female Head X Moderate risk aversion		-0.207	-0.450
		(0.150)	(0.282)
Moderate risk aversion		0.040	0.008
		(0.066)	(0.068)
Female Head X High risk aversion		0.148	-0.746
		(0.245)	(0.914)
High risk aversion		0.012	0.014
		(0.113)	(0.122)
IBLI knowledge		0.060**	0.067***
		(0.024)	(0.026)
Financial literacy		0.019	0.018
		(0.026)	(0.030)
Head Education		-0.053***	-0.056***
		(0.019)	(0.020)
ln Effective price per TLU	-0.515***	-0.395***	-0.393***
	(0.072)	(0.046)	(0.046)
Lagged IBLI purchase		-0.128	-0.151
		(0.092)	(0.100)
Dependency ratio	0.111	0.116	0.128
	(0.093)	(0.086)	(0.113)
Expected rangeland above normal	0.044	0.090	0.092
	(0.129)	(0.111)	(0.126)
Expected rangeland below normal	0.160	0.054	0.053
	(0.117)	(0.099)	(0.110)
Previous period losses	-0.118	-0.098	-0.085
	(0.080)	(0.069)	(0.075)
Age		-0.020	-0.075
		(0.070)	(0.097)
Age-squared		0.000	0.001
		(0.001)	(0.001)
Asset index		-0.142*	-0.175**
		(0.084)	(0.089)
ln Total monthly income		-0.018	-0.028
		(0.030)	(0.034)
Proportion of income from livestock		-0.002	-0.001
		(0.001)	(0.001)
ln Herd size		-0.058	-0.008
		(0.107)	(0.125)
Savings > 5 TLU		-0.132	-0.133
		(0.133)	(0.140)
HA Dependency ratio	0.035	0.009	-0.012
	(0.039)	(0.035)	(0.045)
HA Expected rangeland above normal	-0.083	-0.026	0.046
	(0.170)	(0.148)	(0.162)
HA Expected rangeland below normal	-0.236*	-0.220*	-0.206
	(0.140)	(0.121)	(0.137)

HA Previous period losses	0.330***	0.011	0.044
	(0.091)	(0.100)	(0.109)
HA Age		-0.017*	-0.022*
		(0.010)	(0.011)
HA Age-squared		0.000	0.000*
		(0.000)	(0.000)
HA Asset index		-0.083	-0.111
		(0.097)	(0.108)
HA ln Total monthly income		-0.018	-0.044
		(0.069)	(0.081)
HA Proportion of income from livestock		0.002	0.003
		(0.002)	(0.003)
HA ln Herd size		0.216***	0.223***
		(0.072)	(0.083)
HA Savings > 5 TLU		0.019	0.063
		(0.160)	(0.179)
Constant	2.870***	2.542***	2.868***
	(0.202)	(0.531)	(0.575)
Observations	1,581	1824	1510
Chi2	256.3	460.0	423.0
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table D7: IBLI Purchase Decision--Cases Where OIC Records = Reported Purchase (AME)

	(1)	(2)	(3)
Female headed household	0.004	0.136*	0.166
	(0.022)	(0.070)	(0.155)
Female Head X HS at marriage			0.122
			(0.147)
HS at marriage			0.041
			(0.027)
Female Head X Home info		0.0002	0.002
		(0.001)	(0.002)
Home-centered information		0.0002	0.0001
		(0.000)	(0.000)
Female Head X Transfers		-0.018	-0.041
		(0.012)	(0.027)
ln Transfers		-0.001	-0.0001
		(0.006)	(0.006)
Female Head X Moderate risk aversion		-0.073*	-0.127
		(0.042)	(0.079)
Moderate risk aversion		0.010	0.011
		(0.020)	(0.020)
Female Head X High risk aversion		-0.049	-0.361
		(0.071)	(0.308)
High risk aversion		-0.038	-0.042
		(0.032)	(0.033)
IBLI knowledge		0.026***	0.024***
		(0.005)	(0.006)
Financial literacy		0.017**	0.018**
		(0.007)	(0.008)
Head Education		-0.010*	-0.009*
		(0.005)	(0.005)
ln Effective price per TLU	-0.119***	-0.109***	-0.109***
	(0.016)	(0.015)	(0.017)
Lagged IBLI purchase		-0.056**	-0.052*
		(0.027)	(0.030)
Assigned coupon	0.072**	0.064**	0.059**
	(0.030)	(0.028)	(0.030)
Dependency ratio	-0.025	-0.018	-0.049
	(0.021)	(0.020)	(0.031)
Expected rangeland above normal	-0.003	0.012	0.012
	(0.034)	(0.032)	(0.036)
Expected rangeland below normal	0.062**	0.056**	0.056*
	(0.029)	(0.027)	(0.030)
Previous period losses	-0.047**	-0.048***	-0.054***
	(0.019)	(0.018)	(0.019)
Age		-0.056**	-0.038
		(0.026)	(0.031)
Age-squared		0.00004*	0.0003
		(0.000)	(0.000)
Asset index		-0.023	-0.022
		(0.018)	(0.019)
ln Total monthly income		-0.005	-0.016
		(0.009)	(0.010)
Proportion of income from livestock		-0.001***	-0.001***
		(0.000)	(0.000)
ln Herd size		-0.005	0.008
		(0.028)	(0.032)
Savings > 5 TLU		0.019	0.029
		(0.041)	(0.042)
HA Dependency ratio	0.008	0.007	0.002
	(0.011)	(0.011)	(0.014)
HA Expected rangeland above normal	0.003	0.002	0.004
	(0.047)	(0.044)	(0.049)

HA Expected rangeland below normal	0.005	-0.005	0.011
	(0.039)	(0.038)	(0.042)
HA Previous period losses	0.025	-0.019	-0.025
	(0.024)	(0.028)	(0.031)
HA Age		-0.005*	-0.003
		(0.003)	(0.003)
HA Age-squared		0.0001	0.00002
		(0.000)	(0.000)
HA Asset index		0.003	0.013
		(0.022)	(0.024)
HA ln Total monthly income		0.012	-0.004
		(0.020)	(0.024)
HA Proportion of income from livestock		-0.001	-0.001*
		(0.001)	(0.001)
HA ln Herd size		0.023	0.042*
		(0.020)	(0.023)
HA Savings > 5 TLU		0.010	0.014
		(0.050)	(0.054)
Observations	1,581	1,581	1,305
LR Chi2	232.6	325.9	300.8
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table D8: IBLI Purchase Decision--Alternative Bargaining Model Specifications (Coeff. Estimates)

	(1)	(2)	(3)
Female headed household	1.028	1.622*	1.383
	(0.787)	(0.910)	(0.935)
Female Head X HS at marriage	0.469		
	(0.710)		
HS at marriage	0.190		
	(0.139)		
Female Head X Current HS		0.058	
		(1.635)	
Percentage of cattle herd that is HS		-0.038	
		(0.269)	
Female Head X Lactating Herd			0.150
			(0.703)
ln Lactating herd proportion			-0.035
			(0.131)
Female Head X Home info	0.011	0.004	0.010
	(0.009)	(0.013)	(0.009)
Home-centered information	0.003	0.000	0.003
	(0.002)	(0.003)	(0.002)
Female Head X Transfers	-0.250**	-0.300*	-0.258**
	(0.123)	(0.159)	(0.122)
ln Transfers	-0.005	0.046	-0.005
	(0.031)	(0.048)	(0.031)
Female Head X Moderate risk aversion	-0.455	-0.404	-0.535
	(0.399)	(0.499)	(0.388)
Moderate risk aversion	0.039	0.090	0.031
	(0.102)	(0.135)	(0.101)
Female Head X High risk aversion	-1.875	-5.502	-0.959
	(1.524)	(0.000)	(0.960)
High risk aversion	-0.141	0.053	-0.118
	(0.159)	(0.196)	(0.156)
IBLI knowledge	0.091***	0.045	0.090***
	(0.028)	(0.036)	(0.028)
Financial literacy	0.118***	0.079	0.123***
	(0.042)	(0.053)	(0.041)
Head Education	-0.038	-0.022	-0.037
	(0.026)	(0.032)	(0.026)
ln Effective price per TLU	-0.553***	-0.613***	-0.561***
	(0.064)	(0.079)	(0.063)
Lagged IBLI purchase	-0.320**	-0.122	-0.317**
	(0.139)	(0.153)	(0.139)
Assigned coupon	0.228	0.173	0.210
	(0.144)	(0.193)	(0.143)
Dependency ratio	-0.283*	-0.151	-0.275*
	(0.153)	(0.191)	(0.152)
Expected rangeland above normal	0.042	-0.042	0.028
	(0.181)	(0.233)	(0.179)
Expected rangeland below normal	0.357**	0.230	0.350**
	(0.149)	(0.190)	(0.148)
Previous period losses	-0.233**	-0.331**	-0.227**
	(0.095)	(0.138)	(0.094)
Age	-0.156	-0.041	-0.161
	(0.154)	(0.204)	(0.156)
Age-squared	0.001	0.000	0.001
	(0.001)	(0.002)	(0.001)
Asset index	-0.106	-0.065	-0.103
	(0.097)	(0.104)	(0.097)
ln Total monthly income	-0.121**	-0.046	-0.115**
	(0.052)	(0.088)	(0.051)
Proportion of income from livestock	-0.007***	-0.004	-0.007***
	(0.002)	(0.004)	(0.002)

ln Herd size	0.071	0.016	0.101
	(0.165)	(0.218)	(0.166)
Savings > 5 TLU	0.135	0.101	0.132
	(0.213)	(0.270)	(0.209)
HA Dependency ratio	0.026	0.049	0.045
	(0.070)	(0.090)	(0.069)
HA Expected rangeland above normal	-0.015	-0.116	-0.040
	(0.247)	(0.316)	(0.244)
HA Expected rangeland below normal	-0.080	-0.073	-0.085
	(0.208)	(0.266)	(0.207)
HA Previous period losses	-0.064	-0.232	-0.041
	(0.152)	(0.203)	(0.151)
HA Age	-0.006	-0.006	-0.009
	(0.016)	(0.020)	(0.016)
HA Age-squared	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
HA Asset index	0.058	0.221	0.052
	(0.122)	(0.143)	(0.122)
HA ln Total monthly income	0.085	0.182	0.069
	(0.119)	(0.165)	(0.118)
HA Proportion of income from livestock	-0.005	-0.013***	-0.004
	(0.004)	(0.005)	(0.004)
HA ln Herd size	0.101	0.196	0.081
	(0.117)	(0.158)	(0.118)
HA Savings > 5 TLU	0.053	-0.150	0.046
	(0.269)	(0.343)	(0.262)
Constant	-0.121	-0.341	0.093
	(0.914)	(1.219)	(0.916)
Observations	1,510	1,134	1,526
chi2	574.2	385.9	597.3
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table D9: Level of Purchase--Alternative Bargaining Model Specifications

	(1)	(2)	(3)
Female headed household	-0.254	-0.354	-0.522
	(0.572)	(0.767)	(0.659)
Female Head X HS at marriage	0.325		
	(0.357)		
HS at marriage	-0.036		
	(0.072)		
Female Head X Current HS		0.606	
		(0.652)	
Percentage of cattle herd that is HS		0.020	
		(0.166)	
Female Head X Lactating Herd			-0.488
			(0.422)
ln Lactating herd proportion			0.166**
			(0.077)
Female Head X Home info	0.004	0.008	0.004
	(0.007)	(0.010)	(0.007)
Home-centered information	0.001	0.002	0.001
	(0.002)	(0.002)	(0.002)
Female Head X Transfers	0.003	0.008	0.015
	(0.073)	(0.109)	(0.073)
ln Transfers	0.003	0.025	0.004
	(0.020)	(0.030)	(0.019)
Female Head X Moderate risk aversion	-0.312	-0.314	-0.436*
	(0.238)	(0.330)	(0.233)
Moderate risk aversion	-0.029	-0.101	-0.029
	(0.058)	(0.072)	(0.057)
Female Head X High risk aversion	-0.678	(omitted)	-0.193
	(0.792)	(omitted)	(0.497)
High risk aversion	0.037	0.042	-0.009
	(0.103)	(0.118)	(0.099)
IBLI knowledge	0.041**	0.047*	0.034*
	(0.020)	(0.025)	(0.020)
Financial literacy	-0.004	0.065**	-0.007
	(0.027)	(0.032)	(0.026)
Head Education	-0.057***	-0.048**	-0.053***
	(0.017)	(0.022)	(0.017)
ln Effective price per TLU	-0.356***	-0.423***	-0.359***
	(0.040)	(0.052)	(0.041)
Lagged IBLI purchase	-0.059	0.033	-0.054
	(0.080)	(0.082)	(0.079)
Dependency ratio	0.093	0.102	0.122
	(0.101)	(0.133)	(0.101)
Expected rangeland above normal	0.111	0.182	0.122
	(0.103)	(0.122)	(0.101)
Expected rangeland below normal	0.017	-0.143	0.008
	(0.100)	(0.112)	(0.098)
Previous period losses	-0.030	-0.106	-0.024
	(0.061)	(0.088)	(0.060)
Age	-0.099	-0.120	-0.138
	(0.087)	(0.093)	(0.085)
Age-squared	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Asset index	-0.173**	-0.081	-0.162**
	(0.078)	(0.080)	(0.076)
ln Total monthly income	-0.016	-0.090	-0.015
	(0.032)	(0.066)	(0.031)
Proportion of income from livestock	0.001	0.002	0.001
	(0.001)	(0.003)	(0.001)
ln Herd size	-0.031	0.029	0.018
	(0.115)	(0.145)	(0.113)

Savings > 5 TLU	-0.165	-0.358**	-0.173
	(0.123)	(0.157)	(0.120)
HA Dependency ratio	-0.031	-0.054	-0.019
	(0.040)	(0.049)	(0.038)
HA Expected rangeland above normal	-0.006	-0.290	-0.019
	(0.143)	(0.187)	(0.140)
HA Expected rangeland below normal	-0.284**	-0.317**	-0.278**
	(0.118)	(0.154)	(0.117)
HA Previous period losses	0.023	-0.017	0.032
	(0.092)	(0.114)	(0.091)
HA Age	-0.009	-0.021*	-0.008
	(0.010)	(0.012)	(0.010)
HA Age-squared	0.000	0.0001*	0.000
	(0.000)	(0.000)	(0.000)
HA Asset index	-0.100	-0.182*	-0.080
	(0.093)	(0.110)	(0.092)
HA ln Total monthly income	-0.079	-0.156	-0.089
	(0.071)	(0.101)	(0.069)
HA Proportion of income from livestock	0.004	0.004	0.003
	(0.002)	(0.004)	(0.002)
HA ln Herd size	0.207***	0.207**	0.233***
	(0.074)	(0.102)	(0.073)
HA Savings > 5 TLU	0.240	0.430**	0.215
	(0.158)	(0.210)	(0.151)
Constant	3.083***	3.220***	3.323***
	(0.523)	(0.734)	(0.521)
Observations	1,510	1,134	1,526
chi2	574.2	385.9	597.3
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table D10: IBLI Purchase Decision--Alternative Bargaining Model Specifications (AME)

	(1)	(2)	(3)
Female headed household	0.209	0.226*	0.283
	(0.161)	(0.127)	(0.191)
Female Head X HS at marriage	0.096		
	(0.144)		
HS at marriage	0.039		
	(0.028)		
Female Head X Current HS		0.008	
		(0.228)	
Percentage of cattle herd that is HS		-0.005	
		(0.038)	
Female Head X Lactating Herd			0.031
			(0.144)
ln Lactating herd proportion			-0.007
			(0.027)
Female Head X Home info	0.002	0.001	0.002
	(0.002)	(0.002)	(0.002)
Home-centered information	0.001	0.000	0.001
	(0.000)	(0.000)	(0.000)
Female Head X Transfers	-0.051**	-0.042*	-0.053**
	(0.025)	(0.022)	(0.025)
ln Transfers	-0.001	0.006	-0.001
	(0.006)	(0.007)	(0.006)
Female Head X Moderate risk aversion	-0.093	-0.056	-0.110
	(0.081)	(0.070)	(0.079)
Moderate risk aversion	0.008	0.013	0.006
	(0.021)	(0.019)	(0.021)
Female Head X High risk aversion	-0.382	(omitted)	-0.196
	(0.309)	(omitted)	(0.196)
High risk aversion	-0.029	0.007	-0.024
	(0.032)	(0.027)	(0.032)
IBLI knowledge	0.019***	0.006	0.018***
	(0.006)	(0.005)	(0.006)
Financial literacy	0.024***	0.011	0.025***
	(0.008)	(0.007)	(0.008)
Head Education	-0.008	-0.003	-0.008
	(0.005)	(0.004)	(0.005)
ln Effective price per TLU	-0.113***	-0.085***	-0.115***
	(0.014)	(0.013)	(0.014)
Lagged IBLI purchase	-0.065**	-0.017	-0.065**
	(0.028)	(0.021)	(0.028)
Assigned coupon	0.046	0.024	0.043
	(0.029)	(0.027)	(0.029)
Dependency ratio	-0.058*	-0.021	-0.056*
	(0.031)	(0.027)	(0.031)
Expected rangeland above normal	0.009	-0.006	0.006
	(0.037)	(0.033)	(0.037)
Expected rangeland below normal	0.073**	0.032	0.072**
	(0.030)	(0.027)	(0.030)
Previous period losses	-0.048**	-0.046**	-0.047**
	(0.019)	(0.019)	(0.019)
Age	-0.032	-0.006	-0.033
	(0.031)	(0.028)	(0.032)
Age-squared	0.00002	0.0001	0.0001
	(0.000)	(0.000)	(0.000)
Asset index	-0.022	-0.009	-0.021
	(0.020)	(0.014)	(0.020)
ln Total monthly income	-0.025**	-0.006	-0.023**
	(0.011)	(0.012)	(0.011)
Proportion of income from livestock	-0.001***	-0.001	-0.001***
	(0.000)	(0.001)	(0.000)

ln Herd size	0.014	0.002	0.021
	(0.034)	(0.030)	(0.034)
Savings > 5 TLU	0.028	0.014	0.027
	(0.043)	(0.038)	(0.043)
HA Dependency ratio	0.005	0.007	0.009
	(0.014)	(0.013)	(0.014)
HA Expected rangeland above normal	-0.003	-0.016	-0.008
	(0.050)	(0.044)	(0.050)
HA Expected rangeland below normal	-0.016	-0.010	-0.017
	(0.042)	(0.037)	(0.042)
HA Previous period losses	-0.013	-0.032	-0.008
	(0.031)	(0.028)	(0.031)
HA Age	-0.001	-0.001	-0.002
	(0.003)	(0.003)	(0.003)
HA Age-squared	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
HA Asset index	0.012	0.031	0.011
	(0.025)	(0.020)	(0.025)
HA ln Total monthly income	0.017	0.025	0.014
	(0.024)	(0.023)	(0.024)
HA Proportion of income from livestock	-0.001	-0.002***	-0.001
	(0.001)	(0.001)	(0.001)
HA ln Herd size	0.021	0.027	0.017
	(0.024)	(0.022)	(0.024)
HA Savings > 5 TLU	0.011	-0.021	0.009
	(0.055)	(0.048)	(0.054)
Observations	1,510	1,128	1,526
LR Chi2	574.2	385.9	597.3
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.