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Beslutningsmakt i husholdningen målt med et økonomisk eksperiment

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I denne artikkelen ser vi på hvordan ektepar i jordbrukslandsbyer i Peru tar beslutninger som har med risiko og usikkerhet å gjøre og hvem av ektefellene som har storst beslutningsmakt. 287 ektepar fra 15 landsbyer i det Peruanske høylandet har deltatt I undersøkelsene. I dette området er mannen tradisjonelt sett på som familiens overhode og hovedsakelige beslutningstager. Kvinner deltar lite i organisasjonslivet og i styringsorganer i landsbyene, og det er ofte mannen som snakkker på vegne av familien. Det blir ofte argumentert med at når kvinner får økt beslutningsmakt så bruker familien mer ressurser på utdannnelse, mat og klær til barna. Økt innflytelse for kvinner over viktige beslutninger er i tillegg et mål i seg selv, og derfor jobber politiske organisasjoner for å øke kvinners status og beslutningsmakt. Det finnes likevel lite empiriske basert kunnskap om hvordan beslutninger faktisk blir tatt innad i husholdningene og hvilke typer beslutninger hvor menn og kvinnner har ulik innflytelse. I denne studien måler vi beslutningsmakt i husholdningen gjennom et økonoimsk eksperiment.

Hvert ektepar har deltatt i eksperimentet og svart på en større spørreundersøkelse. Det økonomiske eksperimentet har bestått av to ulike spill: et risikospill (hvor deltagerne velger mellom lotterier med kjente sannsynligheter) og et usikkerhetsspill (hvor deltagerne velger mellom lotterier med ukjente sannsynligheter). Gjennom å spille disse to spillene får vi et mål på deltagernes villighet til å ta risikable valg (risikovilje) og usikre valg (usikkerhetsvilje). Hver ektefelle deltar først i disse to spillene enkeltvis, for deretter å gjøre de samme beslutningene sammen. Når vi kjenner den enkeltes individuelle preferanser, kan vi bruke den felles beslutningen til å måle hvem som har størst innflytelse over fellesbeslutningen. Den ektefellen hvis individuelle valg ligger nærmest fellesbeslutningen antar vi at bestemmer mest i det aktuelle spillet. Eksperimentet gir oss altså to mål på beslutningsmakt for hvert ektepar: beslutningsmakt i et risikovalg og beslutningsmakt i et usikkerhetsvalg.

Resultatene fra eksperimentet viser at beslutningsmakt er relativt jevnt fordelt mellom menn og kvinner. Av de parene som har tatt ulike individuelle valg (det er kun disse vi kan si noe om beslutningsmakt for) er det 45% hvor kvinner bestemmer og 55% hvor mannen bestemmer, både i risikospillet og i usikkerhetsspilllet. Dette utgjør ingen stastistisk signifikant kjønnsforskjell i beslutningsmakt. I stedet ser vi at den som er minst villlig til å ta risiko (mest risikoavers) oftest er den som får størst innflytelse i risikospillet. Den mest risikoaverse har størst innflytelse hos 70% av parene som vi kan si noe om beslutningsmakt for. Vi får det samme resultatet i usikkerhetsspilllet, hvor den som er minst villig til tå usikre valg (mest usikkerhetsavers) får størst innflytelse i 65% av parene med ulike individuelle valg.

Studien konkluderer med at beslutningsmakt i de to valgene vi har sett på har mer med individuelle preferanser enn med kjønn å gjøre. Den som er mest forsiktig i sine meninger har størst sannnsynlighet for å få gjennomslag i beslutningsprosessen. Gjennom data fra spørreundersøkelser viser vi også at beslutningsmakt i husholdningen er svært differensiert mellom ulike oppgaver, og at det ikke nødvendigvis er slik at den som bestemmer i et valg også bestemmer i andre valg.

Experimental measures of household decision power

Ragnhild Haugli Braaten[A] and Peter Martinsson[B]

Abstract

In this paper, we investigate intra-household decision power in Peruvian peasant couples. We determine decision power by conducting risk and uncertainty experiments, first individually and then jointly with spouses. The results reveal that it is the most risk or uncertainty averse spouse who has the higher decision power in the experiments, not a specific gender. We compare experimental measures of decision power with self-reported measures of decision power in different aspects and find only weak correlations. The results reveal that intra-household decision power varies substantially with the specific task.

Key-words: household decision power; female empowerment; risk; uncertainty experiment; Peru.

JEL code: C91; C92; C93; D10; D81.

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1. Introduction

Many important household decisions are not made by individuals alone, but are rather products of a joint decision making process. Collective models of household decision making assume that the joint decision is a result of a bargaining process over the individual preferences of the spouses (e.g., Manser and Brown 1980; Lundberg and Pollak 1993; Browning and Chiappori 1998; Bourguignon et al. 2009). This is in contrast to the frequently used unitary model, which assumes that households consist of one unique decision maker. Thus, an important question in order to understand how household decisions are made is whether one of the spouses has more decision power in the household. One possibility is that power is related to the gender of the spouses, taking into account that a particular gender is seen as the dominant decision maker in many societies (in patriarchal societies it tends to be the man, while in matriarchal societies it tends to be the woman). In the collective models of household decision making, the wife's decision power is assumed to increase when she obtains larger resources in terms of income and assets, by increasing her threat point utility in case of divorce or non-cooperative behavior within the household (Lundberg and Pollak 1993; Browning and Chiappori 1998). Empirical studies have found support for improved children's health and increased household investment in children when income is in the hands of women rather than in the hands of men (e.g., Thomas 1990; Hoddinott and Haddad 1995; Lundberg et al. 1997; Phipps and Burton 1998; Thomas et al. 2002; Duflo 2003). These findings indicate the importance of women's decision power for children's outcomes and are often taken as support of the collective household bargaining models. Next to gender, another potential driver of decision power in the joint setting is the specific preferences of the spouses. With a Nash bargaining model, Roth and Rothblum (1982) show that the least risk averse player has a bargaining advantage when two players bargain over lotteries and there is no disagreement solution making players better off than either lottery outcome.[1] These theoretical and empirical studies provide, however, very little empirical evidence on how decisions are actually made within the household. There is by now a growing literature on household decision making using economic experiments to better understand how decisions are made within the household (which we discuss in detail below).

[1] The opposite holds if there is a positive probability that the lotteries leave one of the players worse off than in the disagreement solution (Roth and Rothblum 1982).

A common characteristic for many household decisions, especially the more important ones, is that they contain an element of risk (known probabilities) or uncertainty (unknown probabilities). Peasant households are particularly exposed to uncertainty, for example in household decisions such as crop choices, use of fertilizers and credit uptake. The objective of the present paper is to investigate decision power within households in situations characterized by risk and uncertainty using an experimental approach. The experiments were conducted among 287 established couples in small-scale peasant communities in the Peruvian highlands. While previous experimental studies within households have focused on risk, we also include uncertainty since a situation with unknown probabilities is more relevant for most household investments than known probabilities. Research shows that people tend to have a higher tolerance for risky situations than for uncertain situations (Ellsberg paradox).[2] In the experiment, we first elicit preferences of the spouses individually and then jointly. We assume that the spouse whose individual decision is closer to the joint decision has more decision power. Furthermore, we compare this experimental measure of decision power with self-reported decision structures in different situations involving uncertain outcomes.

There is a growing literature on household decision making using economic experiments and many of these studies have focused on household decision making under risk (e.g., Peters et al. 2004; Bateman and Munro 2005; Munro et al. 2008; Ashraf et al. 2010; de Palma et al. 2011; He et al. 2011; Abdellaoui et al. 2012; Carlsson et al. 2012; Carlsson et al. 2013; Beblo et al. 2014; Cochard et al. 2014; Kebede et al. 2014). A general finding when comparing attitudes towards risk is that women often tend to be more risk averse than men (e.g., Croson and Gneezy, 2009).[3] Bateman and Munro (2005) compare individual and joint decisions of 76 British couples. Their results indicate that joint decisions are on average more risk averse than

[2] Ellsberg (1961) argued that people prefer a risky situation over an uncertain situation in a situation where indifference is predicted by expected utility (see also Savage (1954)). Many experiments have shown support for Ellsberg's claim, recognizing such preferences as ambiguity aversion (for recent contributions in this area, see, e.g., Borghans et al. (2009); Abdellaoui et al. (2011); Trautmann et al. (2011); Trautmann and Zeckhauser (2013)). As in most experiments, there is limited knowledge about behavior beyond university students. However, the few exceptions we are aware of, using samples of professionals, generally confirm ambiguity aversion (Viscusi and Chesson 1999; Maffioletti and Santoni 2005; Cabantous 2007).

[3] Some studies explicitly investigate the effect of gender on risk aversion and competitive appetite in matrilineal and patriarchal societies. Gong and Yang (2012) show that the gender gap in risk preferences is less in matrilineal than patriarchal societies in China, but overall women are more risk averse. Gneezy et al. (2009) find that women are less competitive than men in the patriarchal society in Tanzania, while women are more competitive than men in the matrilineal society in India. Overall they do not find any differences in risk preferences.

when the spouses make the choices individually. The joint decisions deviate from the predictions of expected utility theory to a similar extent as the individual decisions. In contrast, de Palma et al. (2011), using 22 cohabitating German couples, find joint choices to be less risk averse than individual ones. They also find that joint decisions are closer to the individual choices of the husbands than the wives and interpret this as greater decision power of men. Carlsson et al. (2013) report no difference between individual and joint levels of risk aversion in their study of 117 rural Chinese couples. Again, joint decisions are closer to men's than to women's individual decisions, yet women with a higher level of education, a higher share of household income, and communist party membership are more likely to pull the joint decision in their own direction. Abdellaoui et al. (2012) investigate risk preferences among French spouses assuming prospect theory. They find that couples' risk preferences follow prospect theory in a similar manner to individual preferences and that women have more decision power in lotteries with small probabilities of winning, while men have more decision power in lotteries with high probabilities of winning. However, the experimental evidence on group decision making under risk provides mixed results. Rockenbach et al. (2007) and Masclet et al. (2009) find groups to be more risk averse than individuals. Rockenbach et al prescribe this cautious shift to excess-risk vetoing, i.e. that any team member could veto a risky choice if it was not compensated by substantial expected gains. A cautious shift in groups decision making may also be explained by increased regret aversion in groups when other group members may suffer negative consequences of one's decisions (see Loomes and Sugden (1982) for the theoretical outline of regret aversion in an individual setting). Contradicting the findings of a cautious shift, Sutter (2009) and Zhang and Casari (2012) find that groups are *less* risk averse than individuals. Both Baker et al. (2008) and Shupp and Williams (2008) find that groups are on average more risk averse in high-risk cases, while the opposite holds when risks are low.

Complementary to household decision making experiments are studies using self-reported data on household decision power. For example, empirical studies have found that women's self-reported decision power over household purchases, daily activities, and investments increases with income, land rights, and participation in credit programs (Hashemi et al. 1996; Friedberg and Webb 2006; Allendorf 2007; Anderson and Eswaran 2009; Wiig 2013; Wang 2014). The advantage of survey data is the possibility of obtaining large data sets relatively easily. On the other hand, experiments have the ability to control the decision process and specifically elicit both individual and joint preferences. In this paper, we test the

comparability of these two different approaches to the study of intra-household decision power. We also compare self-reported decision power in different domains. The comparability of decision power across tasks is important in order to learn to what extent decision power is domain specific, or whether a general predictor can be applied to household decision power in different aspects.

Several studies show that experimentally revealed preferences under risk and uncertainty can predict field investment behavior (Dohmen et al. 2011; Warnick et al. 2011; Liu 2013). In a study among small-scale peasants in Peru, Warnick, Escobal et al. (2011) find that the more risk averse peasants are more likely to use a diversity of crops, while the more ambiguity averse are less likely to take up new varieties of a specific crop. Similarly, among Chinese cotton farmers, Liu (2013) reports that more risk averse peasants adopt a new profitable crop at a later point in time. Investigating risk preferences in Germany, Dohmen et al. (2011) find positive correlations between risk attitudes elicited experimentally and self-reported risk behavior in different domains of life. They also show that there are strong correlations between different domains of self-reported risk behavior, implying that a general risk assessment provides a useful predictor of overall risk behavior. In a study covering 30 countries, Vieider et al. (2014) show that risk and uncertainty attitudes elicited experimentally correlate both within and across contexts and methods, when comparing to self-reported risk attitudes in different domains.

Our results reveal that decision power in the experiment is largely determined by relative individual preferences for risk and uncertainty aversion, more than by gender per se. A majority of joint decisions lie closer to the most risk or uncertainty averse spouse's decision. When controlling for this decision power effect of being the most risk or uncertainty averse spouse, we find that men on average are significantly more likely than women to push the joint decision in their direction. Furthermore, we show that self-reported decision power differs substantially between domains depending on gender-specific responsibilities. Additionally, experimental measures of decision power show surprisingly little correlation with self-reported decision power, suggesting that intra-household decision power differs substantially across specific tasks within the household.

2. Design

The experiments were conducted in 15 communities selected from two distinct regions in the southern highlands of Peru: Cusco and Apurimac. 287 established couples participated in separate sessions which were conducted in people's homes. The experiment consisted of two choice list tasks where subjects made choices under risk and uncertainty, respectively, and we used a similar design as Sutter et al. (2013). In the risk experiment, the respondents were asked to make 20 choices using a choice list (the list is included in the Appendix, Table A1) In the first choice situation, the participants chose between 0.5 Peruvian soles[4] for sure and a lottery with a 50% probability of winning 10 Peruvian soles and a 50% probability of getting nothing. The amount of soles in the certain option was increased by increments of 0.5 Peruvian soles in each of the 19 remaining choice situations, until it reached 10 Peruvian soles in the last choice situation. Thus, we expected the participant to choose the lottery in the beginning and then at some point switch to the certain amount. The earlier a participant switches to the certain amount, the more risk averse he/she is. The uncertainty experiment consisted of the same 20 choice situations, with the difference that the probabilities of the lottery were unknown as explained below. Thus, there were in total 40 choice situations.

The lotteries were described and conducted in the following way. As part of explaining the risk experiment, the participants were shown a bag consisting of 5 red and 5 blue chips. The participant determined the outcome of the risk lottery by calling a color and then drawing a chip. He/she won the prize of 10 soles if the drawn chip was of the called color and nothing if it was not. When explaining the uncertainty lottery, the participants were shown another bag. They were told it consisted of 10 chips with an unknown mix of red and blue chips. Again, the outcome of the ambiguous lottery was determined by the participant first calling a color and then drawing a chip from the bag. He/she won the prize of 10 Peruvian soles if the drawn chip was of the called color, and otherwise won nothing.

The experimental session started with a short introduction given to both spouses at the same time. The couple was told they were going to make choices over economic outcomes and that the money they would earn would depend on their decisions. They would make the choices individually, and could choose between themselves who should start. Then one of them left

[4] 10 soles equaled around $3.6 US at the time of the experiment. A standard daily wage was around 20 soles in the area where the experiments took place.

the room, while the individual experiment was conducted with the remaining spouse. Once the individual part had been conducted with the remaining spouse, the other spouse was called back into the room and the first one left. The individual and joint parts each consisted of three games: a trade game and a public good game in addition to the risk and uncertainty game explained here.[5] The order of the games was randomized across but was held constant within households. Each game was paid separately, hence each individual was paid for 6 games for which earnings were added and paid together. When both spouses had finished the individual parts, the first spouse was called back into the room, and the joint part was conducted. The couple was then presented with the three games once again, and was asked to make joint decisions in all of them. The instructors were trained not to interfere in the decision making process and to pay similar attention to both spouses. A final answer from either spouse was taken as the joint decision, unless the other spouse expressed disagreement or answered differently. In such cases, the instructor left the couple alone until they had agreed on an answer, in order to obtain a more natural setting for the joint decision making.

The experiment was set up so that each individual's incentives should be exactly the same in the individual and the joint parts, such that we could use the choices made in the individual part as the individual's preferences in the joint part. In the individual part, it was emphasized that the decision would never be revealed to the other spouse, in order to avoid participants thinking about what their spouse would have wanted them to do. Only one of the 40 choice situations was paid for real from the individual part and the joint part, respectively. The participant determined which situation to be played out for real by drawing a card from a pile of 40 cards, each representing one of the choice situations. The outcomes were drawn upon completion of both the individual and joint part, in order to prevent learning and wealth effects. When the couple had finished the joint part, one spouse left the room while the other drew a card to determine the paid situation for his or her individual part. If a situation was drawn in which the lottery had been chosen, the participant then called a color and drew a chip from the right bag to determine the lottery outcome. The individual outcomes were drawn without the presence of the spouse in order to keep the individual decisions private. After both spouses had drawn their outcomes in the individual game, they joined again, and then one of them, according to their own choice, drew a card to determine their joint outcome.

[5] In the public goods game, participants were matched in anonymous groups within the community, but it was particularly made clear that spouses were never in the same group. The experiment and the results are described in Braaten (2014).

If they then for example drew a card representing choice situation number 10 in the risk experiment and they had chosen the safe amount of 5 soles in that situation, they each received 5 soles for the joint part. If they had chosen the lottery, one of them called a color and then drew a chip from the brown bag. If the chip was of the winning color, each spouse won 10 soles. If not, none of them won anything for the joint part. Their individual earnings from the joint part were added to what they earned from the individual part. Shortly after all couples in the community had conducted the experiments, the total payments were distributed in private to each individual in a sealed envelope. Instructions for the risk and uncertainty games can be found in the Appendix.

In most cases, one instructor performed both the joint and the two individual parts in order to keep all factors within the household constant.[6] Only female instructors were used, 8 in total, to keep possible instructor gender effects constant. Due to a high fraction of illiteracy among the participants, we conducted the experiment orally. Instructions were performed in the language preferred by the participant, i.e., either the local Quechua language or Spanish, due to language differences in the sample. Written instructions (for the instructors) were provided only in Spanish. Since Quechua is an oral language only, the instructors translated instructions from Spanish when Quechua was needed.[7]

The instructions were explained thoroughly to each participant. The participants could ask questions and receive further explanations if there were aspects that they did not understand. In order to reduce the problem of participants switching inconsistently between the safe amount and the lottery, we used the method of Dohmen et al. (2010). In the first choice situation where the participant chose the safe amount, the instructor asked *"Does that mean that you want the safe option in all the choices with a higher safe amount?"* If the participant answered affirmatively, the instructor filled in all remaining choice situations accordingly. If

[6] In 60 out of 269 households in the final sample, two instructors performed the individual experiments at the same time in different locations of the household. This was a result of time constraints of the participating couples. Both instructors were present during the joint part in order to reduce the possible instructor bias. Of these 60 households, the husband's instructor led the joint part in 27 cases and the wife's instructor led the joint part in the remaining 33 cases. We test whether the spouse whose instructor in the individual part led the joint decision was more likely to decide in the experiments, but we do not find any such effects. Specifically, the gender of the spouse whose individual instructor led the joint part does not correlate with experimental wife decision power ($p=0.66$ in the risk experiment and $p=0.40$ in the uncertainty experiment), nor with preference-adjusted experimental wife decision power, which will be discussed in section 3.5 ($p=0.96$ in the risk experiment; $p=0.59$ in the uncertainty experiment).

[7] The results reveal no significant difference in the level of risk or uncertainty aversion depending on the preferred language of the participant.

not, she continued asking in each choice situation. In spite of this method, a few individuals and couples insisted on switching back and forth, and the instructors then did not force them to choose consistently. 11 men, 6 women and 4 couples switched inconsistently between the safe and the risky option and all these households (18 in total) were removed from the sample.[8]

The data collection was carried out in each of the 15 communities at a time. It started by a survey team entering the community. Accompanied by the community leader, the team went from house to house and registered all households in a map. They then selected 10-30 households with an even geographical distribution within the community.[9] These couples were invited to answer an in-depth survey, conditional on being married or cohabiting, being the head couple in the household and at least one of the spouses holding land to ensure that the household is established in the community. Couples that were not available or rejected participation were replaced with the neighboring household. The survey was performed in the couples' homes. It started with a part answered jointly by both spouses regarding general household and land issues, and continued with two equal parts answered by each spouse privately. The private parts of the survey were conducted without the presence of the spouse and included questions about household decision making. After all sampled couples had been surveyed in one community, the experimental team entered and invited the same couples to participate in economic experiments as well. In total 32 out of the 320 surveyed couples either rejected participation in the experiments or were not accessible at this later stage, and they were not replaced.

3. Results

A total of 287 couples participated in the survey and the experiments. Our sample consists of 269 couples after omitting 18 couples on rationality grounds due to inconsistent switching from the safe to the risky option by either the man, the woman, or the couple jointly.

[8] When probed after the experiment about why they preferred to switch back and forth between the safe option and the lottery for small amounts of the lottery, one participant explained her choice by being indifferent between the two options when the safe amounts were very small. She therefore randomized her responses in that part of the choice list.

[9] For example, if the community consisted of 100 households and 20 were to be selected, the community team selected every fifth household, going geographically from household to household according to the map.

3.1. Sample description

The participating couples all reside in peasant communities in the rural highlands of Peru at altitudes ranging from 2,300 to 4,000 meters above sea level. They grow vegetables and maize in the more fertile land at lower altitudes and potatoes at the highest altitudes. Crops are mainly harvested once a year, but the most fertile and irrigated land may yield two yearly harvests. Agricultural production is mostly used for household consumption, and any surplus is normally traded at local markets. Communities are managed by a community assembly, where all land-possessing households are represented. Since the man is generally seen as the household head, he traditionally represents the household in the assembly and public work. Women are underrepresented in all community assemblies, and only rarely make their voices heard in these traditionally male-dominated arenas. However, women are to an increasing extent also gaining access to these arenas. The division of labor within the household is normally gender specific. Agriculture is seen as a male responsibility, although women typically assist during labor-intensive periods of the year. Meanwhile, women are responsible for children and housework, and also often for animal breeding if they hold livestock.

The socio-economic survey data on the 269 couples reveals that they are generally poor and low educated, with significant gender differences. The men have more education than the women, and only 14% of the men are illiterate, compared to 40% of the women. 54% of the households classify themselves as poor or very poor. Participating couples were asked to jointly estimate the contribution of each spouse to household income, and responded on average that men contribute 60%. This gender difference in perceived contribution is related to the gender-separated working spheres; 92% of men report that agricultural work is their main activity, which is also the most important income-producing activity in the sample, while only 32% of women report the same. Women's main activities are otherwise animal breeding (54% of households) and housework (7% of households). A vast majority, 83% of women and 80% of men, report that the woman keeps control over household money. Sample descriptive variables are summarized in the Appendix (Table A2 and Table A3).

3.2. Experimental results

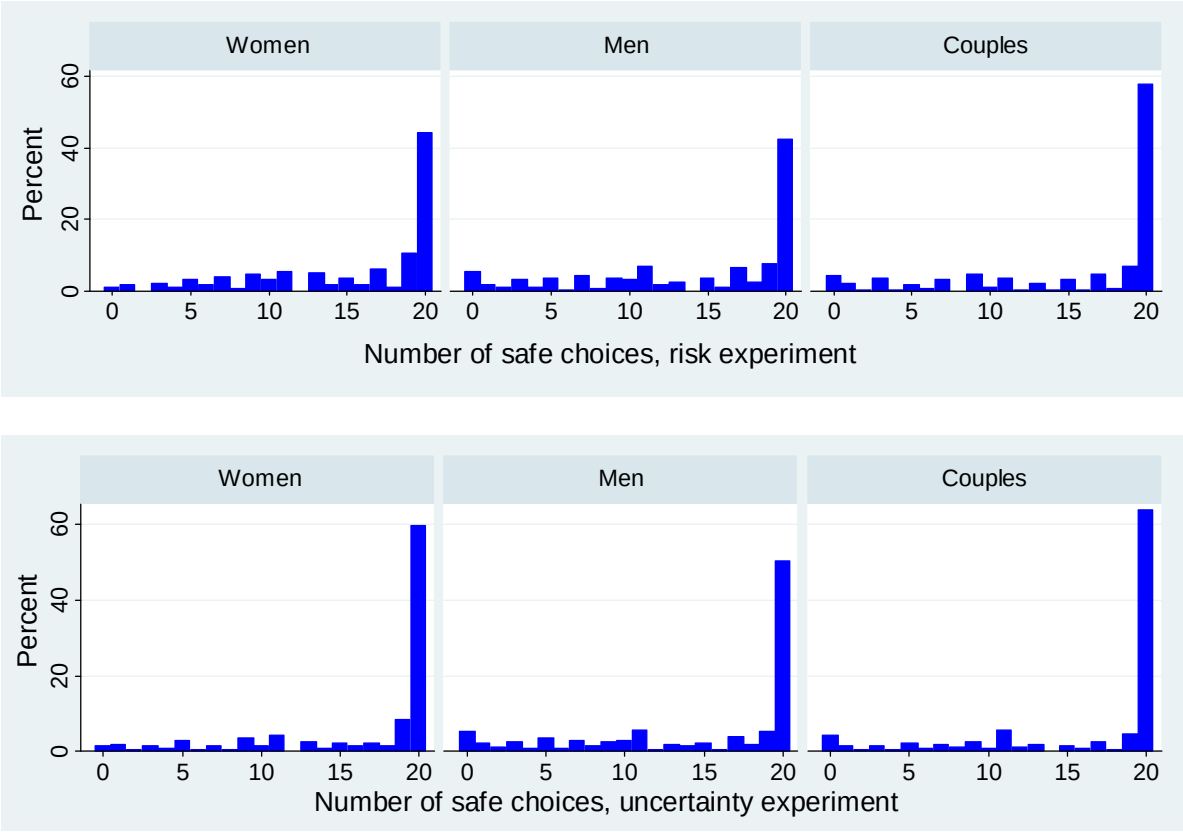
Figure 1 shows the number of safe choices made by the participants both in the individual and the joint experiments. Notably, large fractions of the participants are extremely risk averse, choosing the safe option in all 20 choices (42% of men, 44% of women, and 58% of couples).

The proportion of participants with extremely averse attitudes are even greater in the uncertainty experiment, in which the shares choosing the safe option in all 20 choices are 51% for men, 60% for women, and 64% for couples. At the other end, i.e., extreme risk taking, we find that, in both experiments, 5% of the men, 4% of the couples, and 1% of the women chose the risky option in all 20 choices.[10]

The high frequency of extreme risk and uncertainty aversion is in line with most studies of farmers in developing countries (e.g., Yesuf and Bluffstone 2009; Akay et al. 2012). However, this result is difficult to explain with standard expected utility theory or prospect theory. We argue that the risk-as-feelings perspective from psychological literature offers a more plausible explanation of the observed conservatism. This literature emphasizes how risky prospects may induce emotional anxiety and fear of the worst possible outcomes, resulting in extreme resistance often unrelated to the actual probabilities and outcome values (Slovic and Peters 2006). People with previous experiences of devastating risky outcomes are more likely to respond to risk with such emotional opposition (Loewenstein et al. 2001). Our participants are highly exposed to severe climatic uncertainty in their agricultural investment choices. Previous shocks with large negative consequences may have resulted in such a rule-of-thumb aversion, based on negative emotional reactions to uncertain outcomes. Aversion to risk and uncertainty as a rule-of-thumb is supported by participants' comments following the experiments. When asked why they chose the safe amount in all options, a recurring argument was "I dislike risk and I always avoid it when I can."

[10] Participants with extreme risk or uncertainty aversion are not less educated than others, and they did not perform worse on a simple math test.

Figure 1. Number of safe choices in risk and uncertainty experiment, by women, men, and couples.



In the analysis, we determine risk aversion and uncertainty aversion by looking at the number of safe choices made in the risk and uncertainty game respectively. These are discrete variables ranging from 0 to 20, a higher number indicating more risk aversion and 10 implies risk neutrality. We find that women are the more risk averse gender, with a mean of 15.6 safe choices in the risk game compared to 14.6 among men. However, this difference is not significant (p-value 0.201 with a Mann-Whitney test). The gender difference is larger and significant in the uncertainty game, with a mean of 16.6 safe choices among women and 14.9 among men (p-value 0.004 with Mann-Whitney test).

The average behavior of couples differs from that of individuals. By using a Wilcoxon sign-rank test, we utilize the fact that subjects were couples, and not only that the subject pool consisted of men and women. The increased frequencies of extreme risk and uncertainty aversion from the individual to the joint part of the experiment imply that couples are significantly more risk averse (p-value 0.0006, two-sided Wilcoxon sign rank test) and uncertainty averse (p-value 0.0604, two-sided Wilcoxon sign rank test). Additionally, both

individuals and couples are on average more averse in the uncertainty game than in the risk game, implying ambiguity aversion in general.

3.3. Decision power

The decision power within the household is determined based on the direction of the joint decisions relative to the individual decisions. However, since many couples make identical individual decisions, we are unable to explore the decision power in the joint decisions. In the risk and uncertainty experiment respectively, 28% and 37% of the couples make equal decisions individually. A main reason for this finding is the high share of extremely risk and uncertainty averse individuals, i.e., those choosing the safe option in all 20 choices. For 23% and 35% of the couples in the risk and uncertainty experiment respectively, both spouses are extremely averse in the individual part. With logit regressions, we test whether the households with identical individual preferences are different in terms of individual or household characteristics than others. The results, presented in the Appendix (Table A4), show that there are no significant effects of perceived poverty, literacy, health, gender specific activities, length of marriage nor intra-household income contribution that are consistent between the two experiments.[11] Among the households with non-identical individual decisions, we conduct more detailed analyses of decision power by investigating whether the joint decision goes in the direction of i) a specific gender or ii) a specific individual preference regarding risk and uncertainty. Tables 1 and 2 present tabulations from the two experiments.

The tables show the gender split in decision power in the rows and how decision power is split according to individual preferences in the columns. In the risk experiment (Table 1), 40% of the joint decisions are closer to the man's preference, while 32% are closer to the woman's preference. This implies an overall, but statistically insignificant, gender difference in decision power ($p=0.170$ with a binomial test). More striking is the decision power of the most risk averse spouse. The joint decision lies closer to the more risk averse spouse in 50% of the households and closer to the least risk averse in 22% of the households, implying significantly higher decision power of the most risk averse ($p<0.001$ with a binomial test).

[11] There is only one variable, women's organization level, with a significant and consistent effect on the likelihood of identical individual preferences of spouses. The variable states whether she is member of 0, 1 or 2 of the following organizations: defense committee and irrigator's committee. The more organized she is outside the household, the less likely it is that the couple makes identical joint decisions.

Table 2 shows the same analysis from the uncertainty experiment. We see that the overall picture in the uncertainty experiment is similar to the findings in the risk experiment, i.e., that a majority of couples make joint decisions closer to the most uncertainty averse spouse. Also in the uncertainty experiment, gender is less important than preferences in determining bargaining power.

When looking at both two experiments together, a proportional test reveals no significant gender effect on decision power. When wives are more averse than their husbands in both experiments (26% of the sample), the joint decisions in both experiments lie closer to the wife in 49% of these cases. When men are more averse than their wives in both experiments (16% of sample), the joint decisions lie closer to the husband in both experiments in 60% of the cases. This is not a significant difference at the 5% level using a proportional test, but the direction of the difference indicates that men in general have somewhat greater decision power.

The households whose joint decision lie closer to the most risk averse spouse in the risk experiment also tend to move in the direction of the most averse spouse in the uncertainty experiment ($p<0.001$ with proportional test). Of the households which move in the direction of the most risk averse in the risk game, 80% move in the direction of the most uncertainty averse in the uncertainty game (given non-identical preferences in both games). Of the households which move in the direction of the least risk averse in the risk game, 75% move in the direction of the least uncertainty averse in the uncertainty game. Comparing decision power of the specific genders between the two games, the relationship is found to be somewhat weaker, although still significant ($p<0.001$ with proportional test). Of the households which move in the direction of the wife in the risk game, 68% move in the direction of the wife also in the uncertainty game. Of the households which move in the direction of the husband in the risk game, 75% move in the direction of the husband in the uncertainty game as well. Hence, the decision power attached to a certain preference is more predictive of decision power in the next game than is the decision power attached to a certain gender.

Table 1. Bargaining power in the risk experiment.

Joint decision closer to the…	**Woman**	**Man**	**Total**
Equal individual decision	.	.	76 (28%)
Least risk averse	20 (7%)	38 (14%)	58 (22%)
Most risk averse	66 (25%)	68 (25%)	134 (50%)

Note: Only one couple made a joint decision exactly on the middle point between the male and female individual decisions (equal bargaining power), and is hence excluded here.

Table 2. Bargaining power in uncertainty experiment.

Joint decision closer to the…	**Woman**	**Man**	**Total**
Equal individual decision	.	.	100 (37%)
Least uncertainty averse	15 (6%)	44 (16%)	59 (22%)
Most uncertainty averse	60 (22%)	49 (18%)	109 (41%)

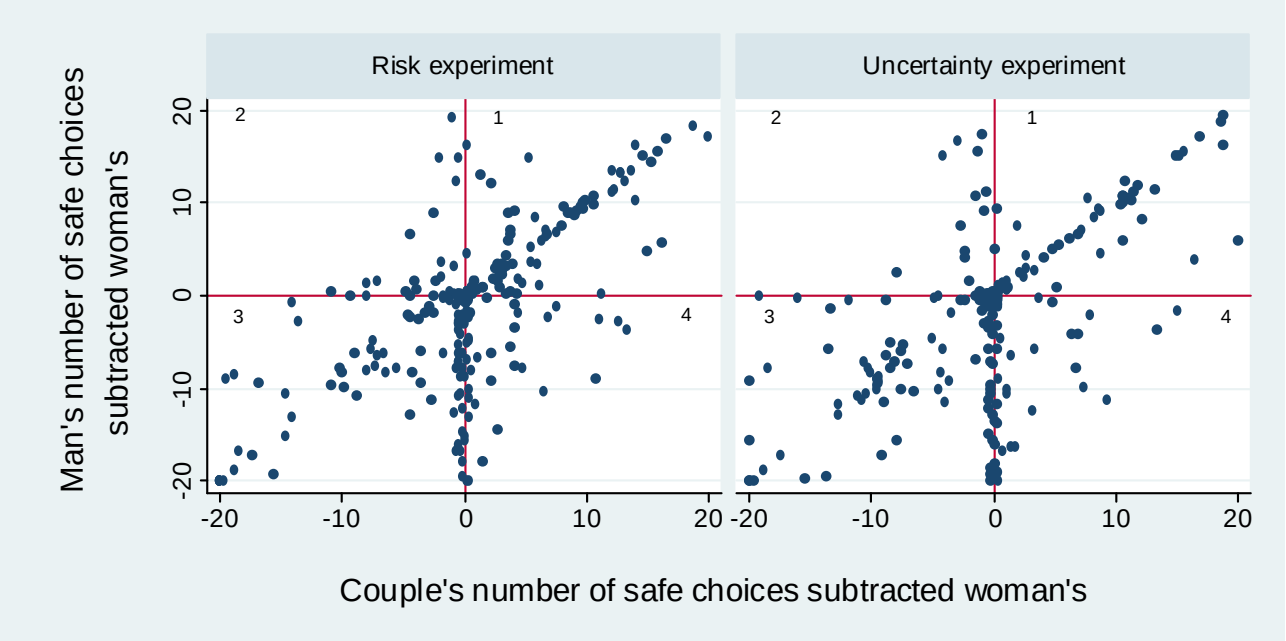
Note: Only one couple made joint decision exactly on the middle point between male and female individual decision (the same couple which show equal bargaining power also in the risk game), and is hence excluded here.

The relative decisions within each household are shown in detail in Figure 2 for both experiments. In these figures, each household is plotted according to the relative decisions of the wife, the husband and the couple jointly. The y-axis shows the absolute difference between the husband's and the wife's number of safe choices. The x-axis shows the absolute difference between the couple's and the wife's number of safe choices. Households plotted on the vertical line imply full decision power to the wife, because the number of safe choices made by the wife is the same as the number of safe choices by the couple. Households plotted on the rising diagonal (in quadrants 1 and 3) imply full decision power to the man, because the number of safe choices made by the husband is the same as the number of safe choices by the couple.[12] For all observations in quadrants 1 and 2, the husband is more risk/uncertainty averse than the wife. For all observations in quadrants 3 and 4, wives are more averse than their husbands.

[12] Note that y-axis measures the difference between number of safe choices between husband and wife and x-axis between wife and couple, thus the diagonal shows the case where number of safe choices by husband equals the number of safe choices by couple.

Figure 2 indicates a clustering of households at either full decision power to the husband or the wife. Full decision power to the woman, illustrated by the observations exactly on the vertical line in the figures, holds for 21% of the households with non-identical individual preferences in the risk experiment and for 23% of the households with non-identical individual preferences in the uncertainty experiment. Full decision power to the man, illustrated by the observations lying exactly on the horizontal line in the figures, holds for 30% of the households with non-identical individual preferences in the risk game and for 33% of the households with non-identical individual preferences in the uncertainty game.

Figure 2: Scatter plots of joint decisions versus the husband's and the wife's decisions, in each experiment (N=269).



Note: The observational unit is the household. In quadrants 1 and 2, the husband is more risk/uncertainty averse than the wife, and vice versa in quadrants 3 and 4. Observations exactly on the vertical axis imply joint decisions equal to the woman's decisions, i.e., full decision power to the woman. Observations exactly on the diagonal imply joint decisions equal to the man's decision, i.e., full decision power to the man. Note that jitters are used in the figure.

This clustering reveals two important structural facts about the data. First, the joint decisions tend to land exactly on either spouse's individual decision, and to a lower extent as a middle point between the two. Note that this is partly an implication of the high shares of extreme risk/uncertainty aversion among individuals and couples. Couples' choices tend to fall to extreme aversion, and thus the spouse who initially revealed extreme aversion gets full decision power. In the risk game, 66% of the households with full male decision power and

80% of the households with full female decision power reveal extreme joint risk aversion. For the uncertainty game, these numbers are 63% and 90%, respectively. Second, the clustering, and hence decision power, is not symmetric around individual preferences. In particular, the clustering around full decision power to the wife is mostly found when she is more risk/uncertainty averse than her husband, while men may obtain full bargaining power independently of preferences. One interpretation is hence that wives only get to decide when they opt for higher risk/uncertainty aversion, while men to a larger extent can push the joint decision in any direction.

As a robustness check, we also conducted regression analyses to examine whether intra-household decision power depends on household and individual characteristics. In the cases where spouses have non-identical individual preferences, the majority of joint decisions lie exactly at the decision of one of the spouses and very few lie in the range between the individual decisions, as shown in Figure 2. We therefore identify decision power as a binary variable, determined at the individual level, set to 1 if the joint decision lies closer to one's own than to the spouse's individual decision and to 0 if the joint decision lies closer to the spouse's individual decision. The variable is defined for all couples with non-identical individual decisions, except for one couple whose joint decision lies exactly on the middle point between the two individual decisions. Thus, we restrict the regression analysis to these 192 couples in the risk experiment and 168 couples in the uncertainty experiment. This includes the couples whose joint decision lies above or below both individual decisions.[13] Table 3 presents the results of logit regressions on individual decision power in the risk and uncertainty game respectively. Since both spouses are included as observations, we cluster at household level in the regressions. When we include controls for individual and household effects in the regressions, we observe that the gender effect on decision power becomes

[13] In the risk game, 19% of the couples with different individual preferences made a joint decision that was more risk averse and 16% made a joint decision that was less risk averse than both individual decisions. In the uncertainty game, these numbers were 15% and 11%, respectively. The lower shares in the uncertainty game are due to a higher share of individuals making 20 safe choices, leaving less room to exceed the scope of couples' individual decisions.

insignificant in both the risk and uncertainty experiment, while the decision power of the most averse spouse remains statistically significant in both cases.[14]

There are few statistically significant effects from the individual or household-specific control variables and they are not reported in the table. Interested readers can study how household characteristics are related to individual preferences in regressions presented in the Appendix, Table A5.

Table 3. Logit regressions: Individual level decision power.

	Individual decision power, risk	Individual decision power, risk	Individual decision power, risk	Individual decision power, uncertainty	Individual decision power, uncertainty	Individual decision power, uncertainty
Woman	-0.166**	-0.053	-0.053	-0.215**	-0.203	-0.206
	(0.079)	(0.152)	(0.155)	(0.085)	(0.142)	(0.145)
Most risk averse spouse	0.420***	0.447***	0.448***			
	(0.067)	(0.067)	(0.068)			
Most uncertainty averse spouse				0.357***	0.364***	0.364***
				(0.078)	(0.078)	(0.078)
Individual controls	NO	YES	YES	NO	YES	YES
Household controls	NO	NO	YES	NO	NO	YES
Observations	384	384	384	336	336	336

Marginal effects presented. Standard errors in parentheses, clustered on household level; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Individual controls include literacy, literacy relative to spouse, age, age relative to spouse, share of household income contribution, organization level, organization level relative to spouse, dummies for main work activity (livestock, trade, housework, paid and others, with agriculture as reference category), and health satisfaction. Household socio economic variables include perceived poverty level (we use this variable as a proxy for income, since it is difficult to obtain exact income data from these households as they consume a substantial part of their own agricultural production), years of cohabitation, household members under age 16, dwelling altitude and market distance.

[14] There are few statistically significant effects from the individual or household-specific control variables and they are not reported in the table. Interested readers can study how household characteristics are related to individual preferences in regressions presented in the Appendix, Table A5.

3.4. Self-reported household decision power

In this section we analyze self-reported perceptions of household decision making and decision structures in agricultural investments, and test the correlations with experimental decision power. All self-reported data was collected in an individual survey conducted by a different research team (without the presence of the other spouse) and in most cases several days before the experiment.

Table 4 presents perceptions of men and women separately regarding how decisions should preferably be made in the domains of minor expenditures and agricultural investments. The table shows that both women and men report a high extent of joint decision making as the ideal case. The ideal of joint decision making is more frequent the larger the economic stakes, as it is reported by 85% in the important area of agricultural decisions but only by 34% in the domain of minor expenditures of the couple.

Table 4. Self-reported perceptions: Who *should* decide about economic decisions, reported by women and men separately.

	Minor spending of the couple		**Minor spending of the household**		**Agricultural investments**	
Reported by	Women	Men	Women	Men	Women	Men
Woman	13 %	56 %	43 %	33 %	5 %	3 %
Man	50 %	13 %	2 %	8 %	9 %	12 %
Both	36 %	31 %	54 %	59 %	86 %	84 %
H_0: Men and women should decide to an equal extent	Reject p<0.001	Reject p<0.001	Reject p<0.001	Reject p<0.001	No rejection p=0.105	Reject p<0.001
Observations	269	269	269	269	269	269

Note. Hypothesis testing is performed with t-tests.

Table 5. Self-reported actual decision power.

	Who decides how household money is spent?		**Given investment in the last 5 years (for house) /12 months (for agricultural investments), who made the decision to…?**											
			Buy/construct house		**Buy fertilizers**		**Hire labor**		**Rent ox plow / tractor**		**Buy pesticides**		**Call for cooperative agr. work**	
Reported by:	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Woman	28%	26%	6%	4%	12%	7%	15%	10%	9%	6%	5%	3%	9%	3%
Man	5%	7%	22%	20%	38%	44%	32%	40%	32%	36%	32%	36%	36%	44%
Joint	67%	66%	72%	76%	50%	48%	53%	51%	58%	58%	63%	61%	54%	53%
H_0: Men and women decide to an equal extent	Reject p<0.001	Reject p<0.001	Reject p=0.006	Reject p=0.002	Reject p<0.001	Reject p<0.001	Reject p=0.002	Reject p<0.001	Reject p<0.001	Reject p<0.001	Reject p<0.001	Reject p<0.001	Reject p<0.001	Reject p<0.001
Observations	268*	269	82	79	187	187	153	156	159	169	100	107	213	232

The sample size is limited for the investment questions because the question was posed in the individual surveys and only to respondents confirming that the household had made the particular investment in the last 5 years (for house) or the 12 months (for the agricultural investments). The individual spouses may have answered differently to these questions, and the sample size may therefore also vary between the genders. Hypothesis testing performed with t-tests. *The total sample answered the household expenditure question. However, as one woman reports that another household member decides about household expenditures, this observation is excluded from the table.

We now turn to self-reported actual decision structures in household expenditure and in different domains of agricultural investment, which is particularly characterized by high uncertainty in outcomes. The first column in Table 5 presents female decision power over household expenditures in general, reported by women and men separately. The majority of both women and men, 67% in total, report that the couple decides jointly on household expenditures. For the remainder, a high share reports that the woman decides (27%), while very few report that the man decides on household expenditure (6%). This is related to the question of who manages the household money, which according to 83% of the women and 80% of the men is the woman.

The remaining columns in Table 5 present self-reported female decision power in house construction and specific agricultural investments made by the household. Since only the individuals who reported that the household had made the particular investment were asked about decision structures for the particular investment, the sample size is somewhat reduced in general. Moreover, since wife and husband do not necessarily answer the same to whether the investment has been made or not in the last 5 years, the sample size may differ between genders within a particular domain. We see that joint decision making seems to be the standard also in these highly uncertain investment decisions. However, although 85% state that agricultural decisions should be made jointly (see Table 4), the levels of joint decision making in practice for the particular agricultural investments are lower (between 49% and 62%). The rare and large investment decisions, such as house construction, are more frequently made jointly than the more common decisions, such as buying fertilizers. Only 30% report to have constructed a house in the given time period and 74% of them made that decision jointly. Meanwhile, as many as 70% had bought fertilizers and not more than 49% had made that decision together. Of those who do not report joint decision making for these investments, a majority report that the man decides. This is in line with cultural gender spheres in activities in the Peruvian highlands, as men generally are responsible for agriculture while women's domain is within the house as well as taking care of livestock.

3.5. Experimental measures of decision power and self-reported decision power in different domains

We now test how self-reported decision structures in investment domains with large uncertainty correlate with the experimental measures of decision power under risk and uncertainty. Table 6 presents the correlations between the experimental measures of decision power and indexes of self-reported decision power in different domains. We focus here only on the decision structures as reported by the woman, since this seems to be standard in the literature on female decision power (e.g., Hashemi, Schuler et al. 1996; Anderson and Eswaran 2009). In each reported domain, female decision power is categorized as follows. It takes the value 1 if the man decides alone, 2 if they decide jointly, and 3 if the woman decides alone. We then generate an index of reported female decision power in the domains of house construction and agricultural investments (for short, denoted agricultural investments) as well as an index of to what extent the woman reports that she is the one who should decide over minor couple expenditures and minor household expenditures (for short, denoted household expenditures). The indexes are simple means of the particular domains included.

Taking into account that experimental decision power is driven both by gender and relative individual preferences of the spouses, we define female decision power in the experiment in three different manners: i) pure decision power defined as whether the joint decision is closer to the woman, ii) preference-adjusted decision power, taking a positive value when the joint decision is closer to the woman's individual decision *and* the woman is the least averse spouse, and iii) whether the woman is the most averse spouse in the individual experiments. The preference-adjusted measure of female decision power is implemented since the joint decisions in the experiments generally go in the direction of the most averse or the man, indicating that the strongest women are those who manage to pull the joint decision in their own direction in spite of being the least averse spouse.

We expect experimental decision power under risk and uncertainty to be correlated particularly with reported decision power in domains with a high degree of uncertainty in outcomes. However, there is no such correlation with decision power in agricultural investments. If anything, the correlation is negative, significantly so with non-parametric tests of correlation. This indicates that the women who decide in the experiment are the ones who decide less in the typical male areas of decision making. Turning to self-reported decision power in household expenditures, it correlates positively and significantly with the

preference-adjusted experimental decision, in both the risk and the uncertainty experiment. It does not correlate significantly with being the most risk or uncertainty averse spouse (in the last two columns of Table 6), implying that the correlation between self-reported decision power in household expenditures and preference-adjusted female decision power is mainly driven by the women who win the experiment *and* are least averse.

Perceptions about the extent to which women *should* decide over minor household expenditure correlate positively with experimental bargaining power in the risk game. This is also the case for perceptions about agricultural investments, though only significantly so for the women who are least averse *and* win in the uncertainty game (preference-adjusted female decision power). Even if these women think they should decide over agricultural investments, they do not report that they do so to any larger extent than others.

One could suspect that there is some selection into particular investments based on preference-specific decision power, i.e., that the households with strong decision power of the most uncertainty averse spouse are less likely to make uncertain agricultural investments. Indeed, the households where the joint decision goes in the direction of the most uncertainty averse spouse are less likely to have bought fertilizers, as reported by both wife and husband ($p<0.06$ with proportionality tests). When the joint decision goes in the direction of the wife *and* she is more uncertainty averse than her husband, the household is less likely to have bought fertilizers (reported by both wife, $p=0.06$, and husband, $p=0.03$), built a house ($p=0.09$, reported by wife), and rented an ox plow ($p=0.05$, reported by husband). We do not find any such significant increase in the likelihood of making these investments when the husband has experimental decision power and is the most uncertainty averse spouse.

Another concern is how the households that have been left out of the analysis until now, i.e., those with identical individual decisions in the experiments, perform in terms of self-reported decision power. These households make up 28% and 37% of the households in the risk game and uncertainty game, respectively. It may be argued that women who reveal exactly the same preference as their husbands are less empowered than others, i.e. that it is a result of not forming a personal opinion but rather choosing according to the husbands assumed preferences. We run logit regressions on dummies identifying the identical-decision couples, with each of the indexes of reported decision power as explanatory variables in separate regressions. Since a vast majority of couples revealing equal preferences are extremely risk or

uncertainty averse, we control for mean number of safe choices in the particular individual experiment. None of the indexed reported bargaining power measures give significant coefficients in these regressions.

The internal correlations of the self-reported decision structures are presented in Table 7. It shows that perceptions about who should decide in different domains correlate positively with the other self-reported actual measures and perceptions of decision power in different domains. However, there is no significant correlation between self-reported actual decision power in agricultural investments, which is mainly a male arena, and self-reported actual decision power in household expenditures, which is mainly a female arena. This indicates that these are two distinct domains of decision power. Since the experimental measures of decision power only correlate somewhat with decision power in household expenditures and not with agricultural investments, it seems like the experiment does not reflect the decision process over agricultural investments, but that it rather mimics the distinct decision process for household expenditures. This may explain why we find relatively high degrees of female decision power, since women also display relatively high control over the spending of household money.

Finally, the experimental measures of risk and uncertainty aversion are negatively correlated with self-reported household investments. This shows that our experimental measures of risk and uncertainty preferences are good indicators of risky behavior in other domains. In the joint part of the survey, couples reported their expenditures in particular categories of agricultural and livestock investments made in the last 12 months. These categories as well as household loan uptake are listed in Table A6 in the Appendix, along with correlation with number of safe choices made by individuals and jointly in the two games respectively, identifying risk and uncertainty aversion. Men, women, and couples who are more risk and uncertainty averse in the experiments also report to have spent less money on these investments in general. Furthermore, household loan uptake in the last 12 months correlates significantly with the couples' joint risk and uncertainty aversion, suggesting that this important decision is to a greater extent made jointly by both spouses than by one of the spouses individually.

Table 6. Correlations between self-reported decision structures (reported by the woman) and experimental decision power.

		Obs.[a]	**Female decision power**			**Pref.-adjusted female decision power**			**Woman most averse**	
			Risk	Uncertainty	Games mean	Risk	Uncertainty	Games mean	Risk	Uncertainty
Frequency of experimental variables	1		45%	45%		10%	9%		54%	62%
	0		55%	55%		90%	91%		46%	38%
Reported female decision power										
Agricultural and house investments		191, 167, 217	-0.0311	-0.0908$^{S\ K}$	-0.0316	-0.1005	-0.0461	-0.0726	0.0299	-0.0168
			(0.6695)	(0.2432)	(0.6436)	(0.1667)	(0.5537)	(0.2869)	(0.6818)	(0.8294)
Household expenditure		All	0.0538	-0.0011	0.0466	0.1196*	0.1291*$^{S\ K}$	0.1464*$^{S\ K}$	-0.0831	-0.0624
			(0.4598)	(0.9883)	(0.4950)	(0.0993)	(0.0964)	(0.0312)	(0.2518)	(0.4220)
Reported extent to which women *should* decide										
Minor household expenditure		All	0.1432*$^{S\ K}$	0.1216	0.1488*$^{S\ K}$	0.0231	0.0239	0.0384	0.0438	-0.0762
			(0.0475)	(0.1162)	(0.0280)	(0.7500)	(0.7582)	(0.5730)	(0.5467)	(0.3260)
Agricultural investments		All	0.0632	0.0848	0.0892	0.0137	0.1715*$^{S\ K}$	0.0971$^{S\ K}$	-0.0101	-0.0463
			(0.3837)	(0.2744)	(0.1897)	(0.8502)	(0.0262)	(0.1531)	(0.8895)	(0.5512)
Observations		218	192	168	218	192	168	218	193	169

Notes: [a]The number of observations in the self-reported decision domain of agriculture and house investments is limited because it are only identified for those who reported a positive investment in the last 12 months for at least one of the items included in the index. The number of observations in these indexes is reported for the risk game, the uncertainty game, and the means of the two games. The experimental variables in this table report only from households with non-identical individual decisions. One household with joint decisions exactly on the middle point between the two individual decisions is also excluded. Experimental decision power is identified by the joint decision lying closer to the woman's initial decision. Pref.-adjusted experimental bargaining power identifies the couples for which the joint decision lies closer to the woman *and* she is the least risk/uncertainty averse spouse initially. Self-reported decision indexes are averages of the categorical decision structures reported by women listed in Tables 4-6 (each self-reported decision structure takes these possible values: 1-man decides, 2-couple decides together, 3-woman decides). Correlations coefficients are based on t-tests (p-values in parentheses), with * indicating significance at the 10% level. Note also that both Spearman's and Kendall's rank correlation tests are performed in each case, which are both nonparametric tests of correlation. Coefficients significant at the 10% level are indicated with ^{S} or ^{K} for these tests respectively.

Table 7. Pairwise correlation between reported decision structures (reported by the woman)

	Reported female decision power		**Reported extent to which women *should* decide**
	Agricultural and house investments	Household expenditure	Minor spending
Reported female decision power			
Household expenditure	0.0698		
	(0.2579)		
Reported extent to which women *should* decide			
Minor spending	0.1022*	0.1580*	
	(0.0964)	(0.0096)	
Agricultural investments	0.4001*	0.1745*	0.1637*
	(0.0000)	(0.0042)	(0.0071)

4. Conclusion

In this study, we examine decision power under risk and uncertainty among 269 Peruvian households. We investigate household decision power by letting the spouses first individually and then jointly conduct both a risk and an uncertainty experiment. We find that intra-household decision power is strongly determined by initial individual preferences. The joint decision goes in the direction of the most risk or uncertainty averse spouse in the majority of cases, and thus this is a stronger explanation of decision power than the gender of the spouse. One potential explanation that has been proposed by Rockenbach et al (2007) is excess-risk vetoing, i.e. that any participant of the group decision may veto risky choices which are not substantially compensated by expected gains. This vetoing may again be explained by regret aversion. The expected regret of bearing a loss when you initially had the option to safeguard may trigger risk aversion (Loomes and Sugden 1982). This regret may be stronger in a two-person setting, especially in a couple setting. If the more risk willing spouse gets his/her will in the joint decision making and the couple later loses in the lottery, he/she will not only feel personal regret for his/her own sake, but will also regret the outcome on behalf of the other

spouse, who may have argued for the safe option. He/she may fear this blame, in addition to his/her own regret, and therefore give in to the more risk averse spouse.

The experimental measures of decision power correlates with self-reported decision power in the domain of household expenditures, but not in the domain of agricultural investments and input decisions. These findings suggest that we may not be able to view decision power as a fixed component across different decision domains within the household. Intra-household decision power rather seems to depend on the relevance and strength of the particular arguments in each specific context. However, the stability of intra-household decision power may well vary between countries and cultures. In a global comparison of gender equality, Peru ranks in the middle of the distribution. In the highlands of Peru, women are often assumed to be less empowered than in the richer coastal areas. However, our data show that highland women actually enjoy strong decision power in economic decisions. The relatively high ability of these women to influence their households' economic decisions might be related to how tasks are segregated within the household in the highland culture. Men are mainly responsible for agricultural production, while women, in addition to housework and childcare, are often in charge of selling the harvest surplus and breeding livestock. This implies that she generally collects the income, holds the cash, and manages household expenditures. It might be that the role as household cashier in itself allows a bit of decision power over how the money is spent.

Our experiment may be considered as a new investment decision, distinctive to any situation the participants have faced before. We therefore hypothesize that it replicates a decision situation considering a new and unknown investment, for example the uptake of a bank account, rather than familiar investment decisions like application of fertilizers or hiring labor, where traditions and habits may play an important role for the joint decision. This line of research is important for the design of family and aid policies. The results of this paper suggest that family and aid policies, in order to affect women's decision power in any particular domain in the household, need to target that domain specifically, taking into account that decision power is not fixed, but may vary substantially across different tasks within a single household.

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Appendix A: Extra tables and figures

Table A1. Choice list.

Mark the decisions in each situation.

Brown bag *(risk)*

Safe amount	Safe option	Draw from the bag
0.5		
1		
1.5		
2		
2.5		
3		
3.5		
4		
4.5		
5		
5.5		
6		
6.5		
7		
7.5		
8		
8.5		
9		
9.5		
10		

Black bag *(uncertainty)*

Safe amount	Safe option	Draw from the bag
0.5		
1		
1.5		
2		
2.5		
3		
3.5		
4		
4.5		
5		
5.5		
6		
6.5		
7		
7.5		
8		
8.5		
9		
9.5		
10		

Table A2: Household descriptive variables .

Variable name	Variable explanation	Mean (Standard deviation)
Perceived poverty	1-not poor, 2-more or less poor, 3-poor, 4-very poor	2.6 (0.62)
Estimated income		14 261 (18 303)
Income stability	1-very unstable, 2-more or less unstable, 3-stable	1.7 (0.61)
Altitude	Kilometers above sea level at household residence	3.2 (0.38)
Market distance	Minutes by car from district center to community center	26 (32)
Women in community assembly	Categorized share of women in the community assembly; 1-none, 2-a few (~10%), 3-some(~25%), 4-half(~50%), 5-more than half (50-99%), 6-all	3.5 (1.17)

Table A3: Individual descriptive variables by gender.

Variable name	**Description**	**Women**	**Men**	**Chi 2 p-values testing gender differences (*t-test values in italics)***
No education	No education or incomplete primary school	0.66 (0.48)	0.48 (0.50)	0.000
Primary school	Primary school or incomplete secondary school	0.28 (0.45)	0.35 (0.48)	0.114
Secondary school	Completed secondary school or higher	0.06 (0.24)	0.17 (0.38)	0.000
Literacy		0.60 (0.49)	0.86 (0.35)	0.000
Spanish speaker		0.83 (0.38)	0.93 (0.26)	0.000
Age		44 (14)	48 (14)	*0.002 (t-test)*
Contribution to couple's income	Spouses' individual share of work contributions to household incomes, estimated jointly	0.40 (0.17)	0.60 (0.17)	*0.000 (t-test)*
Agriculture main activity		0.32 (0.47)	0.92 (0.27)	0.000
Livestock main activity		0.54 (0.50)	0.003 (0.06)	0.000
Trade main activity		0.03 (0.17)	0.003 (0.06)	0.019
Paid main activity		0.01 (0.11)	0.07 (0.26)	0.000
Housework main activity		0.07 (0.26)	0 (0)	0.000
Sometimes resides out of home		0.03 (0.16)	0.09 (0.29)	0.002
Organization level	Counted membership in; defense committee and irrigators committee	0.59 (0.67)	0.97 (0.67)	0.000
Verbally mistreated by spouse	One or more incidents last 12 months	0.25 (0.43)	0.07 (0.25)	0.000
Physically mistreated by spouse	One or more incidents last 12 months	0.13 (0.34)	0.01 (0.11)	0.000

Table A4. Logit regressions: What characterize couples with identical preferences?

	Spouses identical pref., risk	Spouses identical pref., uncertainty
Man literate	-0.602	0.0124
	(0.504)	(0.466)
Woman literate	0.0908	-0.244
	(0.413)	(0.357)
Share income contribution woman	0.538	0.927
	(1.056)	(1.052)
Organization level, man	0.187	0.370
	(0.230)	(0.227)
Organization level, woman	-0.815***	-0.579**
	(0.267)	(0.233)
Agriculture main activity, man	17.13***	-0.593
	(1.875)	(1.061)
Agriculture main activity, woman	-0.195	-1.347***
	(0.368)	(0.366)
Paid main activity, man	16.64***	-0.785
	(2.072)	(1.212)
Paid main activity, woman	2.263**	0.200
	(1.040)	(1.111)
Health perception, man	-0.336**	-0.220
	(0.166)	(0.175)
Health perception, woman	-0.290*	-0.0337
	(0.162)	(0.161)
Perceived poverty household	-0.321	0.301
	(0.245)	(0.247)
Altitude km	-0.430	-0.0799
	(0.420)	(0.414)
Market distance	3.738	3.975
	(4.922)	(4.477)
Household members <16 yrs	0.120	0.0264
	(0.125)	(0.123)
Years of cohabitation	-0.0342**	-0.00860
	(0.0150)	(0.0145)
Constant	-12.96	0.478
	(.)	(2.301)
Observations	269	269

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

Table A5. OLS regressions: What determines individual risk and uncertainty aversion? By gender

	Female risk aversion	Male risk aversion	Female uncertainty aversion	Male uncertainty aversion
Literacy	-0.504	2.350*	0.329	0.125
	(0.867)	(1.246)	(0.840)	(1.275)
Age	0.00271	0.0547	0.0537	0.0618
	(0.0373)	(0.0388)	(0.0362)	(0.0397)
Income contribution share	1.873	-5.566**	1.519	-6.915**
	(2.282)	(2.620)	(2.212)	(2.682)
Organization level	-0.659	0.181	-0.920*	0.487
	(0.561)	(0.629)	(0.544)	(0.644)
Livestock main activity	0.530	5.398	0.0862	6.419
	(0.854)	(6.687)	(0.827)	(6.847)
Trade main activity	2.378	-8.286	-0.296	-6.578
	(2.143)	(6.718)	(2.077)	(6.879)
Paid main activity	-1.764	-0.606	-6.221*	-1.916
	(3.387)	(1.635)	(3.281)	(1.674)
Housework main activity	2.952*	0	1.825	0
	(1.509)	(.)	(1.462)	(.)
Other main activity	0.578	0	2.013	0
	(2.291)	(.)	(2.220)	(.)
Health satisfaction	0.150	0.0404	0.312	0.0625
	(0.385)	(0.482)	(0.373)	(0.493)
Perceived poverty household	0.320	-0.675	0.391	0.204
	(0.590)	(0.676)	(0.572)	(0.692)
Altitude dwelling	-0.00122	0.00153	-0.000659	-0.000323
	(0.00109)	(0.00119)	(0.00105)	(0.00122)
Market distance	0.0104	0.0139	0.0207*	0.00490
	(0.0127)	(0.0139)	(0.0123)	(0.0143)
Household members <16 yrs	0.210	0.439	0.426	0.292
	(0.317)	(0.359)	(0.307)	(0.367)
Constant	16.82***	8.860*	12.79***	15.34***
	(4.947)	(5.234)	(4.793)	(5.358)
Observations	269	269	269	269

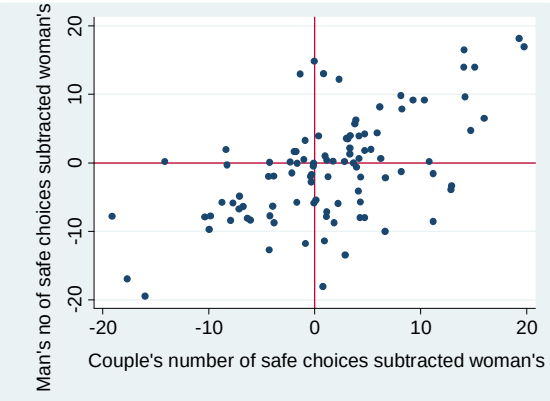
Risk and uncertainty aversion is determined as number of safe choices made in the particular game. Reference category for main activity is agriculture. Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A6. Correlations between reported household agricultural expenditures/credit uptake and number of safe choices in the experiments.

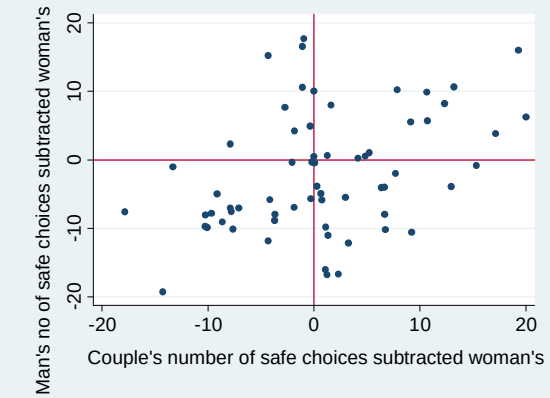
		Risk experiment			**Uncertainty experiment**		
EXPENDITURES	Mean expenditure last 12 months	**Men**	**Women**	**Couples**	**Men**	**Women**	**Couples**
Leasing land	75	-0.1580*	-0.1398*	-0.1557*	-0.1367*	-0.1692*	-0.1439*
		(0.0095)	(0.0218)	(0.0106)	(0.0249)	(0.0054)	(0.0182)
Seeds	108	-0.0032	0.0545	-0.0391	-0.0143	-0.0130	-0.0561
		(0.9589)	(0.3729)	(0.5227)	(0.8156)	(0.8323)	(0.3590)
Fertilizers	165	-0.0943	-0.1132*	-0.0794	-0.0448	-0.1047*	-0.0885
		(0.1229)	(0.0636)	(0.1944)	(0.4647)	(0.0867)	(0.1479)
Pesticides	45	0.0313	0.0849	-0.0188	0.0511	0.0722	0.0377
		(0.6098)	(0.1648)	(0.7591)	(0.4037)	(0.2379)	(0.5385)
Paid labor	291	-0.0139	-0.0800	-0.1234*	-0.0289	-0.1231*	-0.1159*
		(0.8204)	(0.1906)	(0.0431)	(0.6374)	(0.0436)	(0.0575)
Transport	31	-0.1178*	-0.1174*	-0.1287*	-0.0810	-0.1156*	-0.1665*
		(0.0537)	(0.0545)	(0.0349)	(0.1854)	(0.0584)	(0.0062)
Irrigation	27	-0.0318	-0.0579	-0.1045*	-0.0167	-0.0841	-0.1400*
		(0.6032)	(0.3442)	(0.0870)	(0.7846)	(0.1689)	(0.0216)
Total agriculture	909	-0.0933	-0.1098*	-0.1537*	-0.0818	-0.1548*	-0.1609*
		(0.1267)	(0.0721)	(0.0116)	(0.1812)	(0.0110)	(0.0082)
Livestock food	191	-0.0890	-0.1608*	-0.0125	-0.0907	-0.0450	-0.0119
		(0.1456)	(0.0082)	(0.8388)	(0.1378)	(0.4625)	(0.8464)
Livestock bought	324	-0.0249	-0.0694	-0.0605	-0.0802	-0.0571	-0.0846
		(0.6842)	(0.2565)	(0.3230)	(0.1899)	(0.3506)	(0.1667)
Total livestock	592	-0.0748	-0.1435*	-0.0546	-0.1263*	-0.0736	-0.0785
		(0.2215)	(0.0185)	(0.3723)	(0.0384)	(0.2290)	(0.1996)
CREDIT UPTAKE	Mean						
Household loan uptake	0.15	0.0328	-0.0555	-0.1191*	-0.0507	-0.0473	-0.1176*
last 12 months		(0.5921)	(0.3644)	(0.0511)	(0.4073)	(0.4394)	(0.0540)

Risk and uncertainty aversion is determined as number of safe choices made in the particular game. Correlation coefficients with significance levels in parentheses. Spearman's rank correlation tests reveal similar results, though not reported here.

Figure A1. Scatter plots of joint decisions versus male and female decisions, in each experiment. Sample is restricted to couples where neither of the spouses revealed extreme risk/uncertainty aversion individually (i.e., neither one chose the safe amount in all 20 options).



Risk game: N=99



Uncertainty game: N=65