Hiding, Shirking or Pleasing: Spousal Disagreement among Ugandan Maize Farmers

November 11, 2021

Abstract

To gain a better understanding of intrahousehold bargaining processes, surveys increasingly collect data from co-heads individually, especially on decision making, asset ownership and labour contributions. However, answers provided by spouses on the same set of questions often differ substantially. Recent research suggests that, while some of this disagreement is due to random measurement error and cognitive bias, spouses also seem to hide information from each other. In this paper, we document differences in answers between male and female co-heads in smallholder maize farming households in eastern Uganda. We first confirm that not all disagreement can be explained by measurement error or bias. Using a field experiment, we then test if disagreement is due to spouses strategically hiding decisions and actions from each other. We also test an alternative explanation where discord is attributed to spouses' tendency to respond in line with prevailing norms and customs in society. While the interventions did seem to reduce discord in survey response about about decision making, we do not find that decision hiding nor reporting in line with gender norms and customs are the primary drivers.

Keywords: gender, farm households, disagreement, information hiding, norms, Uganda

1 Introduction

Increased attention to the internal dynamics of agricultural households by both researchers and practitioners has led to various innovations in data col-

lection (Doss and Quisumbing, 2020; Alkire et al., 2013). Examples of best practice in data collection on intrahousehold decision-making processes include separate interviewing of male and female co-heads of the household using distinct survey instruments that may nonetheless contain common topics and questions. Studies using these instruments often find that spouses provide different answers on even the most basic questions (Ambler et al., 2021; Annan et al., 2021; Acosta et al., 2020; Anderson, Reynolds, and Gugerty, 2017; Twyman, Useche, and Deere, 2015).

Ambler et al. (2021) demonstrate that, while part of these divergent responses may be attributable to measurement error, there is also a systematic component that reflects asymmetric information within households where one co-head does not have accurate knowledge about the decisions made, actions taken, or assets owned by the other. Furthermore, they argue that the fact that disagreement is larger for assets and decisions that are easier to hide suggests this is due to spouses strategically hiding information. A number of lab-in-the-field experiments similarly confirm that, in many cases, household members conceal some of their resources from one another (for example, Ashraf, 2009; Fiala and He, 2016; Castilla and Walker, 2013; Hoel, 2015).

In this paper, we investigate spousal disagreement in survey response among monogamous smallholder maize farmers in eastern Uganda. Drawing on Ambler et al. (2021), we explore the same three types of explanation for discord—random measurement error, bias caused by men and women interpreting questions differently, and asymmetric information where men and women have only partly overlapping information sets. However, we go one step further and, using a field experiment, formally test if this asymmetric information between husband and wives should be attributed to spouses strategically hiding information from each other. This is done by randomly assigning a sample of households to a video based intervention designed to facilitate mutual monitoring and comparing disagreement to a control group. Furthermore, we test for an alternative explanation, where the discord is not the result of asymmetric information, but rather of spouses answering in line with prevailing gender norms in society. Inspired by recent research on the use of role models to change attitudes and behviour in traditionally male dominated sectors, we test the impact of an intervention that promotes a mental image of maize farming as a cooperative or joint venture in which both spouses play an equal role in maize farming.

We consider disagreement on the role of both female and male co-heads

in decision making and labour provision. For disagreement about the wife's role in decision making, the focus is on hiding, defined as the likelihood that the wife reports she was involved in decision making but the husband says she was not. For disagreement about the husband's role, we consider the likelihood that the husband reports he was involved in the decision but the wife says he was not. For labour provision, we focus on shirking, defined as instances where the female co-head reports to have worked less than what the male co-head thinks. We also analyze shirking by the male co-head.

We find that measurement error alone can not explain disagreement in survey response. We also reject that differences in how male and female co-heads interpret the questions is the main driver for observed disagreement. For decision making, we find that disagreement related to the role of the female co-head can be partly explained by spouses responding in line with what is expected by society. However, there is also some evidence that spouses hide decisions for each other. We do not find that disagreement related to labour provision is due to spouses reporting in line with what society expects, nor that spouses shirk.

The remainder of the paper is organized as follows. The next section provides a brief overview of the literature on spousal disagreement. Section 3 presents the experimental design and the rationale underlying the intervention. We then have a section that outlines the hypothesis and how they will be tested. Section 5 offers a brief description of the context and characteristics of the households in our sample, and describes the variables that will be used in the analysis. We then turn to the results in Section 6, with subsections for decision making and labour time allocations. A last section concludes.

2 Literature

Our review of prior work on spousal disagreement focuses mainly on the empirical literature on intrahousehold resource allocation and decision-making in agricultural households in developing countries, and draws primarily on analyses that use observational data from surveys in which both spouses are interviewed separately and are asked the same set of questions. Such studies often focus on research questions related to women's empowerment and autonomy. For example Jejeebhoy (2002) asks both spouses questions on the locus of decision-making on a variety of issues, as well as specific questions

concerning women's mobility and access to resources. Ghuman, Lee, and Smith (2006) collect data from both spouses on a range of autonomy items, including the need of the wife to obtain the husband's permission to go to different types of places, the wife's capacity to decide on their children's affairs, whether the wife is allowed to have a job, and her role in deciding on the number of children and household expenditure-related decisions.

A common finding in studies that ask the same set of questions to different individuals within the household is that substantial disagreement often arises between spouses, even on questions that would seem easily and objectively verifiable, such as the number of children, or type of material used for house construction. This divergence may simply be attributable to measurement error by the respondents. But Ghuman, Lee, and Smith (2006) suggest that such divergence may also partly be due to the fact that the response categories do not have the same cognitive or semantic meanings to women and men, leading to the somewhat pessimistic conclusion that survey questions are of limited use in understanding differences in gender stratification across multiple contexts. Anderson, Reynolds, and Gugerty (2017), in an investigation of variation in husband and wife perspectives on the division of authority over agriculture-related decisions in rural Tanzania, goes one step further by concluding that in the absence of "intrahousehold accords," it may be problematic for interventions informed by the analysis of survey data to reduce gender inequalities or empower women in agricultural households.

Seymour and Peterman (2018) note that spouses often give inconsistent answers when asked about who made a particular decision. They then test whether female unilateral decision-making is equally empowering if the male co-head disagrees that the woman took the decision alone, as compared to when the male co-head agrees. They conclude that disagreement may signal underlying power dynamics within the household that are likely to be relevant when assessing individual-level agency and empowerment. Annan et al. (2021) similarly look at underlying power dynamics by differentiating between instances where women are taking power and instances where women are given power. They find that taking power is positively correlated with a range of outcomes for women and children, but also argue that more research is needed to establish causality and identify which interventions induce women to claim power.

Ambler et al. (2021) provide a particularly insightful conceptual framework that teases out the various perspectives on spousal disagreement. First, they note that if disagreement solely derives from measurement error, dis-

agreement should be symmetric, and the female co-head's responses should not differ systematically from the male co-head's responses. Second, they point out that if disagreement results from asymmetric measurement error in which men and women interpret questions differently (as suggested by Ghuman, Lee, and Smith (2006) and Anderson, Reynolds, and Gugerty (2017)), then answers should differ systematically between spouses, but disagreement should be similar for different questions asked in a survey. Finally, they argue that finding differing rates of disagreement across survey questions, and higher rates of disagreement for assets and activities that are easier to hide in particular, points to the presence of intrahousehold information asymmetries. Using observational data collected in Bangladesh, they find evidence that such information asymmetries in the form of hidden assets and decisions are present in their sampled households.

Differential disagreement on different decisions, asset categories or activities need not reflect the act of one spouse intentionally deceiving another. There may be other systematic biases that manifest more in one activity, asset or decision category than others, and that may be shaped by prevailing gender roles and norms. For example, in a case study in northern Uganda, Acosta et al. (2020) find that men often report unilateral decision-making in areas where they are assumed to bear final responsibility, even if women had some degree of involvement. Women tend to view these scenarios as joint decisions. As such, it is important to understand the local cultural context to differentiate spousal disagreement as a function of information asymmetries stemming from intentional hiding versus other gender-related systematic biases.

3 Experimental design and interventions

In addition to random error and cognitive bias due to spouses in interpreting questions differently, the previous section shows that the emerging literature on spousal disagreement in survey response suggests two potential mechanisms. First, spousal disagreement may be due to cultural context in which these questions are asked and answered, with spouses responding in line with what would be expected in society (Acosta et al., 2020). A first treatment therefore attempts to challenge preconceived ideas of what decision-making of a spouse involves and who is expected to make decisions in a farm household by promoting a cooperative approach to maize farming, in which maize

cultivation and management activities are seen as a joint responsibility of both spouses. Second, the literature also suggests that spousal disagreement reflects information asymmetries between spouses, predominantly cause by spouses hiding decisions, actions and assets from each other (Ambler et al., 2021). A second intervention tests if these asymmetries can be influenced by providing spouses equal access to information about best practices in maize farming prior to the point in time when decisions are made on cultivation and management, as this would facilitate mutual monitoring.

At the heart of both interventions is a short video that is shown twice to individuals within households using tablet computers. The aim of the video is to increase viewers' knowledge of recommended practices in maize farming, such as timely planting, row planting, and the use of improved inputs such hybrid seed and inorganic fertilizer. It does this through an aspirational story in which a farmer (or farmers) recounts how he/she/they used to be poor but managed to increase yields over time by applying a set of techniques and inputs.[1] It also suggests that farmers view maize farming as a business that needs continuous investment over time and includes some simple intertemporal cost-benefit calculations to illustrate this, followed by encouragements to follow the example of the model farmer(s) featured in the video.

The first intervention, referred to as T1 in the remainder of the paper, involves varying the actors featured in the video and randomizing which version of the video is viewed by farmers. The second intervention, which we will refer to as T2, randomly varies the member(s) of the household who view the video. These variations and the rationale behind them are explained below.

We begin with a conceptual explanation that ties to our first intervention (T1): projecting a cooperative way of farming as a household, thereby challenging consensus that maize farming is a male activity. Consider that within households, individual members often have differing spheres of influence reflecting prevailing gender roles (Lundberg and Pollak, 1993). In many agricultural households, women tend to have a stronger voice in the cultivation of crops that are predominately cultivated for home consumption, while men have a stronger voice in the cultivation of crops that are marketed.

[1]The techniques and inputs that are demonstrated in the videos are the ones recommended by the National Agricultural Research Organization (NARO) and are also used by the public agricultural advisory system. More details can be found in [placeholder for reference removed for double blind review].

Gendered differences in crop choices may emerge from a variety of factors, including gender-related differences in knowledge about the crop, access to planting material, access to inputs and extension services, and customs and traditions (Nordhagen, Pascual, and Drucker, 2021; Iradukunda et al., 2019). While the existence of such gendered patterns are widely acknowledged, they are not always easily captured in household survey data, as gender is only one of the determinants of crop portfolio choice (Carr, 2008; Doss, 2002).

In Uganda, maize, which is in a part a cash crop, is considered to be mostly in the influence sphere of men. Generally, men make all important decisions such as what plots to plant maize on, how to prepare the land, when to start planting, and what seeds to use. Men also generally decide on how much labor is needed, while women assist men, often with weeding. While these are broad and stylized characterizations of Uganda's maize production system, their widespread acceptance as conventional wisdom makes maize farming a topic ripe for this study.

Specifically, we expect that such a separation in spheres of influence between male and female co-heads may contribute to spousal disagreement in survey response. Therefore, our first intervention randomly varies which version of our video is screened to our study participants. One version features a male-female couple who present themselves as role models to promote a worldview where both spouses participate equally in maize farming, while another version features only a male actor.[2] This approach capitalizes on recent evidence on the influence that role models can have on aspirations, investment choices, and other future-oriented behaviors (Bernard et al., 2015) and on increasing women's participation in otherwise male-dominated sectors (Porter and Serra, 2020; Beaman et al., 2012); and the influence of engaging media content to expose large numbers of people to role models (La Ferrara, Chong, and Duryea, 2012; Riley et al., 2017).

To test the hypothesis that spouses disagree less if they view farming as a joint spousal activity, we randomly assign 261 households from our sample to be shown the cooperative image version of the video, such that both the male and female co-heads watch the video together. This group functions as the treatment group. We also randomly assign 240 households from our sample to be shown the version of the video featuring only a male actor, again with both the male and female co-heads watching together. Because the only difference between the two videos is the composition of the actors featured (a

[2]A third version of the video features only a female actor, but is not used in this study.

male-female couple versus a male actor), any difference in outcomes between the two groups should be attributed to the role model effect of the cooperative image intervention.

Next, we turn to our second hypothesis that relates to asymmetric information within the household. Consider the farm household as a collection of individuals, each with their own preferences, skills, assets, and access to resources. In many contexts, the household's existence and the welfare of its members depend on their collective capacity to invest in common goods by drawing on each individual's skills, assets, and resources. As such, households can be considered as informal institutions, and many of the problems encountered in common pool resource management and collective action, such as free-riding and overextraction of resources, apply to the household (Doss and Meinzen-Dick, 2015).

One way in which collective action problems can be attenuated is through increased monitoring. For instance, if one co-head can assess the actual time that the other co-head spends on land preparation, then the latter is less likely to engage in labor shirking. However, for mutual monitoring to work, co-heads require information against which to compare information gained through monitoring, since merely observing an outcome may be insufficient to determine if a co-head is shirking, hiding, or otherwise mismanaging his or her collective obligations to the household. For instance, it may be difficult for the female co-head to check if her spouse overreports time spent preparing the field if she does not have a good understanding of what land preparation entails. If both spouses have a good understanding of what agricultural management entails, they are also in a better position to monitor each other.

In a second treatment (T2), we therefore make sure both co-heads start off with symmetric information with respect to recommended agronomic practices for maize farming, as this is assumed to facilitate mutual monitoring. To do so, we show the video that showcases recommended practices in maize farming to both spouses in a random sample of 261 households.[3] This group acts as the treatment group. In another random sample of 540 households, the control group, the same video is shown, but only to one of the two co-heads.[4] As the only difference between the two groups is related to whom the video is shown to (couple versus individual), any difference in outcomes

[3]We show the version of the video that features a couple (male and female actor-farmers), that is, the video used in the treatment group of the previous intervention.

[4]We made sure that in about half of the cases the video was shown to the male co-head alone and in the other half of cases to the female co-head alone.

between the two groups should be attributed to reducing information asymmetry between spouses.

4 Hypotheses and tests

In this section, we outline the different hypothesis and how they will be tested. While the focus will be on testing the impact of the interventions on spousal disagreement, we also use our data to test for random error and cognitive bias (due to spouses in interpreting questions differently) using the framework outline in Ambler et al. (2021).

A first hypothesis we will test is that disagreement between husband and wife is simply due to random noise. Ambler et al. (2021) show that if random measurement error is the only factor leading to disagreement, then disagreement should be symmetric. For instance, one would expect that the likelihood that the wife says she was involved in a particular decision while the husband says she was not is about the same as the likelihood that the husband says the wife was involved in that decision, while the wife says she was not. Or, one would expect that the likelihood that the husband says he worked harder on a particular task than what the wife believes is about the same as the likelihood that the husband indicates he spent less time on that task than what the wife thinks. Testing if disagreement between husband and wife is simply due to random measurement error is thus equivalent to testing if two proportions are significantly different from each other, which we will do using a Pearson χ-squared test for equality of proportions.

Once it is established that disagreement can not be fully explained by random noise alone, Ambler et al. (2021) test for what they term asymmetric measurement error. They define asymmetric measurement error as "...measurement error that occurs systematically and leads to different patterns of responses for men and women (p. 770)". They go on to explain that this could be due to differences in understanding or interpretation of the questions, or differences in perceptions of what it means to make a decision, what constitutes agricultural labour, or what it entails to own an asset. This type of disagreement is categorized as measurement error because it does not adequately reflect what happens in reality.

Testing for asymmetric measurement error is done by checking if the probability of disagreement about a spouse's role in decision making, labour provision, or marketing, is equal across the various decisions and activities

under consideration. Ambler et al. (2021) do this by performing a series of t-tests that test for the equality of disagreement between pairs of decisions or asset holdings. We employ a more principled and conservative approach, where we use a Wald test for joint significance (using a cluster robust and an Approximate Hotelling T^2 Test). In particular, we start from the following equation:

$$y_{i,d} = \alpha_d + \varepsilon_{i,d} \tag{1}$$

where, $y_{i,d}$ represents disagreement within the household i about a particular decision d.[5] We then test the joint null hypothesis that disagreement levels are equal across decisions, which amounts to constraining the intercepts (α_d) to be equal to each other. If we reject the null, this means that disagreement about decision making between spouses cannot be fully explained by symmetric measurement error.

It is important to note the implicit assumption that this type of error has its origin at the level of the individuals within the household (eg the wife has lower education leading her to systematically underestimate effort), and so should not lead to heterogeneity within the household. Therefore, instead of referring to this as asymmetric measurement error, we see this more as bias caused by factors that emanate from the individual level. Generally, this individual level variation will be due to differing cognitive capacities of spouses and difference in how questions are interpreted by husband and wife (Ghuman, Lee, and Smith, 2006). Obviously, this will also be affected by cultural factors,[6] but gender norms and customs also create variance at the level of the different decisions and activities, which we exploit to provide an explicit test below (equation 3).

Ambler et al. (2021) argue that rejecting both types of measurement error indicates that disagreement reflects a real difference in what spouses know from each other, a situation they refer to as asymmetric information within the household. While they admit that some of this disagreement may be unintentional, they also note that the fact that disagreement seems to be highest among assets that are more easily hidden (small livestock, poultry, and small durables) suggests that at least part of this hiding is strategic. Fol-

[5] We will refer to decision making here to keep the exposition simple, but in the analysis we also consider disagreement between spouses on labour contributions.

[6] Ambler et al. (2021) explicitly state that asymmetric measurement error could also be caused by cultural factors that lead to men under-reporting women's roles.

lowing this line of reasoning, we define H_d, a measure of how easy it is to hide decision making related to d, and explore correlations between disagreement and this measure. We further provide an explicit test for this hypothesis by comparing average disagreement between spouses in households that were exposed to a treatment designed to facilitate mutual monitoring to average disagreement between spouses (T2) in households that did not receive this intervention. This is done using the following OLS regression:

$$y_{i,d} = \alpha + \beta.T_i + \varepsilon_{i,d} \tag{2}$$

where T_i denotes the treatment status of household i, which is a dummy that takes the value of one for households that received the intervention and zero for the control group. We expect that providing both spouses with information that facilitates mutual monitoring will lead to a reduction in disagreement, and so $\beta < 0$.

Finally, if disagreement is due to strategically hiding, we expect that facilitating monitoring would be most effective for decisions that are easier to hide. We thus also estimate conditional average treatment effects by interaction the treatment indicator with the measure of how easy it is to hide decision or activity *d:*

$$y_{i,d} = \alpha + \beta.T_i + \gamma.H_d + \delta.T_i * H_d + \varepsilon_{i,d} \tag{3}$$

Finding that $\delta < 0$ can then be taken as further evidence that disagreement is driven by spouses strategically hiding decisions for each other.

We mentioned earlier that disagreement may also result from spouses responding in line with expectations. Ambler et al. (2021) consider this form of disagreement part of symmetric measurement error. We argue that disagreement that arises from spouses responding in line with expectations in society may differ between decision categories. For instance, disagreement between spouses on to the role of women in weeding may be very different from disagreement related to the role of women in land preparation. In the former case, as weeing is seen as a typical female activity, men may have no problems admitting that the woman did all the work. For the latter case, as society expects men to do the often heavy work of preparing the fields, men may be more reluctant to disclose that their wife also spent considerable time on this task. This is in line with what Acosta et al. (2020) find in in northern Uganda, where men often report unilateral decision-making in areas where

they are assumed to bear final responsibility, but women indicate that they were involved.

We thus test if part of the disagreement that Ambler et al. (2021) attribute to asymmetric information may actually be the result of spouses reporting in line with expectations, and estimate models similar to 2 and 3. Now, the treatment status of household i, T_i, is a dummy that takes the value of one if spouses were exposed to a couple role model video intervention (T1), and zero if a video was shown where only a man featured in the video. If cultural norms indeed drive disagreement, we expect the treatment to reduce disagreement ($\beta < 0$). For this hypothesis, we also define an indicator for who within the household is deemed responsible for decision d according to prevailing norms and customs (H_d), and again explore correlations between disagreement and this measure. We also interact it H_d with the treatment as we expect that relaxing norms will have the largest effect on activities or decisions that are most sensitive to gender norms and customs.

5 Study context and data collected

The study was conducted among monogamous maize-farming households in five districts in eastern Uganda, an area known for its maize production. Households that participated in the study were recruited using a two-stage cluster sampling approach to obtain a representative sample of this population. Specifically, we first selected 50 parishes randomly and in proportion to the number of villages within each parish. In the selected parishes, all villages were included in the study. Within each village, we then listed all households, and in each village we sampled 10 households to be included in the study. This resulted in a total sample size of 3,280 households. However, in about 23 percent of the households we were unable to interview both spouses separately, resulting in an effective sample of 2,548 households. The interventions described in Section 3 were implemented in random subsets of this sample.

We focused on the second maize-growing season of 2017, which ran from about August 2017, when fields were prepared, to January 2018, when maize was harvested. Treatments were administered twice, once in August 2017 when farmers were preparing fields, and one month later during planting time. Concurrent with the first treatment administration in 2017, we also collected information on household characteristics and on the previous harvest,

which was the first harvesting season of 2017. End-line data was collected after the harvest in February 2018.

Farmers in our study area cultivated on average about 1.5 plots of maize. Yields during the first season of 2017 were extremely low (about 270 kilograms per acre) as a result of a Fall Armyworm outbreak that significantly affected the maize crop. Baseline data indicated that the average household in our sample consisted of 8 individuals. Female co-heads in these households were on average 35 years old and only 30 percent have finished primary education. Male co-heads are on average 43 years old and 42 percent have finished primary education. Only 11 percent of households reported that they had access to agricultural extension in the year prior to the survey. Only 17 percent of households used fertilizer on at least one plot, and 38 percent reported using improved seed bought from a shop or agro-input dealer during the last cropping season (April-July 2017). About three quarters of households reported owning a mobile phone.

A first area in which we explore disagreement between husband and wife is in decision-making related to maize farming. In our survey, we asked the head of household to list all maize plots that the household was cultivating during the season preceding the survey (that is, the second agricultural season of 2017). We then cycled through the different plots and asked a series of questions for each plot, and repeated the same questions separately with the other co-head. For a range of key decisions that need to be made and that are known to significantly affect maize yields, we asked who made the decision on that particular plot. Respondents could answer that decisions were made by (1) the respondent him- or herself alone, (2) the respondent's spouse alone, (3) the respondent jointly with his or her spouse, (4) someone else inside or outside the respondent's household, (5) the respondent together with someone else inside or outside the household, or (6) the respondent's spouse together with someone else inside or outside the household. Respondents could also indicate that they did not know who made the decision.

The first decision we consider is simply who decided that maize should be planted on the particular plot. A second decision is related to timing of planting, recognizing that planting date is a strong agronomic determinant of yields.[7] The third decision relates to the spacing of seed and the seeding

[7]NARO recommends that maize planting start immediately after the first rains of the season. This often results in significant time pressure on household members' labor time, especially when large areas need to be planted.

rate, which reflects the fact that row planting at a rate of one seed per mound is also a strong determinant of yield.[8] We also consider decisions related to weed control. For weeding, we differentiate between decision-making related to strategies used to combat striga infestation (a parasitic weed that feeds off the roots of the maize plant) and weeding more generally. Finally, we look at decision making related to maize marketing, and ask who sold took the decision to sell (part of the) maize that was harvested.

We also collected detailed information on labor time. On each maize plot, we asked each co-head how much time, expressed in labor days over the entire agricultural season, he or she worked on a particular activity. We also asked each co-head to give an estimate of how much time his or her spouse worked on the plot on that particular task. The activities we inquired about are land preparation, planting, weeding, spraying, and harvesting.

In addition to the outcome variables and the treatment indicators, there are two additional important variables in equation 3. First, to test if strategic hiding is the main cause for disagreement, we also construct an indicator of how easy it is to monitor particular decisions, activities or actions. To do so, we asked 30 experts to score each activity (eg. time spend to weeding) in terms of ease of monitoring on a scale between 0 and 100, with 0 being impossible to find out actions of the spouse and 100 being very easy to find out. We only scored labour contributions, as we thought decision making is very hard to monitor anyway.

Second, to test if gender norms and customs are driving spousal disagreement, we also created a indicator for the extent to which a particular action or decision is culturally believed to be more in the male domain. This was done by asking the same 30 experts to indicate who, within the household, is typically (i.e. by prevailing norms and customs) expected to make the particular decision (eg. the decision on what seed spacing and seed rate to use) or perform a particular action (eg. weeding). This was again scored on a scale running from 0 (typically the wife alone) to 100 (typically the husband

[8]There is a wide range of seed methods used by farmers in Uganda. While some simply broadcast seeds, NARO recommends row planting because it results in significantly higher yields since it reduces competition between plants for sunlight and soil nutrients. Farmers also often plant more than one seed per hill because they fear some seeds may not germinate. However, planting more than one seed per hill also tends to increase competition for light and nutrients, leading to stunted plant growth. It is therefore recommended to use only one seed per hill and engage in gap filling when seeds do not germinate after one week.

alone).

6 Results

We provide separate analyses for disagreement between spouses related to decision making and disagreement between spouses related to labour contributions. We consider disagreement related to the role of the wife and the role of the husband separately.

6.1 Decision making

To investigate disagreement between answers reported by husbands and wives about who within the household made various decisions related to maize cultivation, we construct various indicators based on answers of both spouses. To assess (dis)agreement about the role of the wife in decision making, we define three different categories: (1) both spouses agree on the woman's role in decision making[9]; (2) the wife says that she was involved (either alone or jointly with the husband), but the husband says she was not; and (3) the husband says the wife was involved (either alone or as part of the couple), but the wife says she was not.[10] Similarly, to assess (dis)agreement about the role of the the husband, the three categories are: (1) spouses agree on the husband's role in decision making; (2) the husband says that he was involved (either alone or jointly with the wife), but the wife says he was not; and (3) the wife says the husband was involved (either alone or as part of the couple), but the husband says he was not. Categories (2) and (3) can be pooled to obtain an indicator for disagreement on the involvement in decision making of the spouse.

Table 1 shows agreement and disagreement about the wife's involvement in decision making (top panel) and the husband's involvement in decision making (bottom panel). The top panel shows that spouses mostly agree on the wife's role in decision making. Focusing on disagreement, we see that on

[9]This includes cases where neither spouse says that the wife was involved in decision making as well as cases where both spouses say that the wife was involved in decision making (either alone or as part of the couple).

[10]Annan et al. (2021) provide an alternative interpretation of categories 2 and 3. In particular, they refer to this as instances where the women "takes power", whereas category 3 is considered to be situations where the woman is "given power".

the average plot the likelihood that the female co-head says she was involved in a particular decision but the husband disagrees (category 2) is always higher than the likelihood that the husband says his wife was involved but the wife disagrees (category 3) except for the decision to sell maize. P-values based on a Pearson χ-squared test for equality of proportions for category 2 and 3 indicate that in all but one case, we reject the null of symmetric measurement error. We also find that we reject the null hypothesis that disagreement about the wife's role in decision making is equal across different decision categories, judged by a Wald test after estimating equation 1 (p-value = 0.012). This means that discord cannot be explained by cognitive differences between spouses alone.

The bottom panel shows that spouses agree even more about the role of the husband in decision making. Looking into disagreement, the likelihood that the husband claims he was involved in the decision and the wife disagrees is now always higher than the likelihood that the wife says the husband was involved but the husband says he was not. Also here, the p-values based on a Pearson χ-squared test for equality of proportions for category 2 and 3 indicate that we reject the null of symmetric measurement error. Comparing disagreement about the role of the husband across different decision making domains also leads us to reject the hypothesis that this disagreement is only due to cognitive bias (p-value = 0.000).

Table 1 also shows the male task score (H_d in equation 3 in Section 4). Disagreement related to the role of the husband is highest for the decision to sell (34 percent), which is also the task with the highest score on H_d (82/100). This suggests that the male co-head insists he made decisions about marketing because it is a typical male activity, even if the made the decision. We do not see a clear pattern for disagreement related to the role of the wife in decision making.

Table 2 reports results for the analysis of the field experiments using regression analysis (equations 2 and 3). The outcome variable $y_{i,d}$ used in the regression is disagreement whereby the spouse reports he or she was involved but the other spouse says he or she was not, which suggests the spouse who reports on his or herself made the decision secretly (category 2).[11]

[11] We confine attention to category 2 only (instead of total disagreement which pools category 2 and 3) because we consider decision making a good (as opposed to labour, which we will consider a bad below). If a decision, action, or consequence is considered desirable

The first column of the table corresponds to equation 2 and tests if the intervention designed to change the likelihood that spouses respond in line with gender norms (T1) had an impact on category 2 disagreement. The top panel in the table shows that on 22.6 percent of the decisions that were made, the wife says she was involved but the husband claims she was not. We also see that among households that were exposed to the treatment aimed at reducing the influence of gender norms and customs on survey responses, this type of disagreement reduced to 17.1 percent and the difference is statistically significant. This suggests that at least part of the disagreement is due to spouses responding in line with expectations.[12]

The second column in the table shows that disagreement also reduces in response to the treatment that tries to facilitate monitoring (T2): In the control group where spouses did not receive the same information, women reported they were involved but men disagreed on 19.8 percent of decisions. In the treatment group where both spouses start off with exactly the same information, disagreement was reduced by 2.7 percentage points. This suggests that spouses may also hide decision making from each other.

The third column regresses the indicator that captures sensitivity of the particular decision to gender norms on disagreement about the wife's role in decision making. We do not find that the indicator is correlated with disagreement.

The fourth column in Table 2 corresponds to equation 3 and includes both the treatment that challenges role incongruity, the indicator for susceptibility to gender norms, and an interaction between the two. We see that the treatment still leads to reduction in disagreement. However, contrary to expectations, we do also not find that the intervention reduced disagreement differently for decisions that are assumed to be in the male domain than for decisions that are less gendered. This goes against our hypothesis that the change in disagreement in response to the treatment is mediated by gender norms and customs.

The bottom panel repeats the analysis, but the dependent variable is now an indicator for instances where the husband says he decided but the wife

for the individual, spouses may want to hide information about it and under-report, in which case category 2 is the relevant outcome. If a decision, action, or consequence is considered undesirable for the individual, spouses may want things to make better than reality and over-report, in which case category 3 is the relevant outcome.

[12]The underlying assumption here is that the spouse that is farthest from the—unknown—truth adjusts most towards this truth, which seems reasonable.

says he was not involved in the decision. As we saw earlier, disagreement about the husband's role is lower; the first column confirms that in the control group where households were not exposed to the intervention that attempts to challenge gender norms (T1), in 16.9 percent of decisions men claim a larger role than women admit. This percentage is not significantly different in the treatment group, which suggests that the role of men in agricultural decision making is less socially contested.

In the second column, we do see that the intervention aimed at facilitating mutual monitoring (T2) reduced disagreement. In the control group where only one of the spouses was shown a video on what maize farming entails, male co-heads report they were involved but the wife disagreed in 18.8 percent of the decisions. In the treatment group where both spouses were exposed to the same information, disagreement was reduced by 3.1 percentage points. This suggests that also male co-heads may hide decision making from the wife.

The third column in the table shows that we find significant correlation between spousal disagreement related to the role of the male co-head and the indicator that attempts to measure how sensitive an activity is in terms of gender norms. Apparently, the likelihood that the male co-head reports he was involved while the wife claims he was not is significantly higher for decisions that were judged to be more in the male domain (the decision to sell, decision to plant maize, and decision to fight striga) than for decisions that were seen less a responsibility for the man (decision on when to weed). However, the fourth column again rejects the hypothesis that this disagreement is driven by gender norms and customs.

6.2 Labour Provision

For labour contributions, we define the three categories of (dis)agreement as follows: A first category (1) consists of cases where there is agreement on the wife's labour contribution. For disagreement, we differentiate between cases where (2) the wife reported to have spend more time on a particular task than the husband thinks she spent on it and (3) the wife reported spending less time than the husband thinks. Labour contribution (and hence disagreement about it) is also measured at the plot level. As for decision making, we consider disagreement related to the labour provided by the wife and disagreement related to labour provided by the husband separately.

As mentioned above, we consider labour to be a bad, with spouses prefer-

ring to work less rather than more. The category of interest here is therefore category (3), where spouses are shirking on their responsibilities, putting in less hours than what the other spouse thinks.

One complication here is that labour time is measured as a continuous variable: days spent on the activity. As a result, the margin of error will also depend on the activity. For example, for an activity such as spraying of insecticides, fungicides or herbicides, women report that they spend on average only 0.4 days. Women report that they spend considerably more time on weeding (23.8 days). These differences in magnitude will also have consequences for the likelihood that spouses agree. For instance, in the former case, there is agreement about the wife's labour time contribution on 77 percent of plots, while for weeding, this is only the case on 9 percent of plots. We try to mitigate this problem by defining agreement in relation to the underlying variable, indicating that there is agreement if estimates are "close enough" to each other. In particular, if labour time difference is within one standard deviation of the average time reported by wife and husband, we consider there is agreement.

The top panel of Table 3 shows that spouses again generally agree about the labour contribution of the wife. Agreement seems to be highest for the wife's role in spraying. This is not surprising because spraying insecticides, fungicides and herbicides involves carrying a heavy knapsack sprayer and handling of dangerous substances, and is generally considered to be the responsibility of the man in the household. As such, in most cases spouses agree that the wife had no role in this activity. This is also reflected in scores of the experts, who overwhelmingly state this is a typical male task (87/100).

The table further shows that agreement is lowest for women's labour provision in weeding, which the experts claim is predominantly a female task. Interestingly, we find a relatively high share of plots where the wife says she worked more than what the husband thinks. But there are also signs of shirking behaviour. For example, on 15 percent of the plots, there are indications that the wife shirks on her weeding activities. Pearson χ-squared tests comparing rows 2 and 3 shows that we reject equality of the two disagreement categories for all labour types, suggesting that disagreement on women labour time is not caused by random measurement error alone. We also find that we reject the null hypothesis that disagreement about the wife's labour contribution is equal across different labour categories, judged by a Wald test after estimating equation 1 (p-value = 0.000). This again means that discord cannot be explained by cognitive differences between spouses

alone.

The bottom panel shows results of disagreement about the husband's labour contribution. Agreement seems to be similar to agreement about the wife's labour contribution. Shirking by the husband is high for labour provided for spraying, a typical male activity that is also difficult to monitor. Surprisingly, male shirking is equally high for weeding, which is considered a typical female task. We again reject symmetric measurement error as driving disagreement, as well as the the hypothesis that disagreement is only due to cognitive bias (p-value = 0.000).

In Table 4, we proceed with a series of regressions to test if disagreement is due to strategically hiding labour contributions within the household, or whether disagreement reflects who, according to society, should do what activity. The top panel reports on regressions where the outcome variable is the proportion of activities on which the wife reports to have worked less than what the husband thinks; the bottom panel reports on regressions where the dependent variable is the proportion of activities on which the husband report to have worked less than what the wife thinks.

Neither treatment seems to have an effect on shirking behaviour. We find that shirking by the wife is lower for activities that are considered in the husband's domain. More surprisingly, we also find that shirking is lower for activities that are harder to monitor. We do not find any significant interaction effects.

In the bottom panel, we also do not find that our treatments affect shirking by the husband. We do find that shirking is lower for activities that are in the male domain. We do not find that shirking is correlated to ease of monitoring and also do not find any interaction effects.

7 Conclusion

Household surveys that are serious about capturing gender-related heterogeneity often try to interview both male and female co-heads separately for at least part of the survey. This is an important means of reducing biases introduced by the (typically male) household head or "most knowledgeable person" in the household, and represents an important advancement in the study of intrahousehold dynamics, especially in non-separable agricultural households where production and consumption decisions are so closely intertwined. A common finding in these surveys is that male and female co-

heads often give substantially different answers to the same questions. While some discordance is inevitable due to measurement error, recent studies have been searching for patterns in this disagreement, and suggest that systematic disagreement between spouses may be key in understanding intrahousehold power dynamics.

In this study, we follow Ambler et al. (2021) and reject that all disagreement between male and female co-heads of Ugandan maize farming households is due to random measurement error or bias due to spouses differently understanding or interpreting the questions. We then test if discord is mainly driven by spouses hiding information from each other, or if it is due to spouses responding in line with what society expects from them. This is done through a field experiment, with a video based intervention designed to facilitate mutual monitoring of spouses and an intervention that encourages spouses to view maize farming as a household enterprise rather than in the domain of the male co-head (as society does). We further explore impact pathways by looking at conditional average treatment effects, as we expect that the treatments would be most effective for decisions, activities and assets that are easier to hide or more susceptible to gender norms and customs.

We found that spouses generally agreed with each other. Disagreement could not be explained by measurement error alone, and cognitive bias is also not the main cause. We found that disagreement about the role of the wife in decision making was reduced after spouses were exposed to an intervention designed to reduce the influence of gender norms and customs. We also found that disagreement about the role of both male and female co-heads reduced in response to an intervention designed to facilitate mutual monitoring. Contrary to expectations, we did not find that the intervention designed to reduce the influence of gender norms and customs was more effective for decisions that are considered to be more in the male domain, which goes against our hypothesis that the change in disagreement in response to the treatment is mediated by gender norms and customs. When looking at shirking behaviour, we did not find that the treatment designed to increase mutual monitoring had an impact. We also did not find that the treatment that projects a cooperative approach to maize farming made a difference.

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Table 1: Agreement and disagreement about spouses' roles in agricultural decision making

	plant maize	timing of planting	spacing and seed rate	strategies to fight striga	timing and frequency of weeding	sell maize
	disagreement about wife's role in decsion making					
(1) Agree:	0.63	0.64	0.64	0.62	0.65	0.67
Disagree:	0.37	0.36	0.36	0.38	0.35	0.33
(2) Wife says she decided but husband says no	0.20	0.19	0.21	0.23	0.21	0.13
(3) Husband says wife decided but wife says no	0.17	0.17	0.15	0.15	0.14	0.20
p-value (2)==(3):	0.000	0.105	0.000	0.000	0.000	0.000
Number of plots:	3,723	3,723	3,723	3,632	3,723	2,548
	disagreement about husband's role in decsion making					
(1) Agree:	0.74	0.72	0.75	0.68	0.74	0.67
Disagree:	0.26	0.28	0.25	0.32	0.27	0.34
(2) Husband says he decided but wife says no	0.16	0.18	0.16	0.20	0.18	0.23
(3) Wife says husband decided but husband says no	0.10	0.10	0.09	0.12	0.09	0.11
p-value (2)==(3):	0.000	0.000	0.000	0.000	0.000	0.000
Number of plots:	3,723	3,723	3,723	3,632	3,723	2,548
Male task score (/100):	62	50	55	60	41	82

Table 2: Disagreement about decision making

	(1)	(2)	(3)	(4)
	disagreement about wife's role in decsion making			
constant	0.226	0.198	0.191	0.225
	(0.016)	(0.011)	(0.013)	(0.019)
challenge gender norms (T1)	-0.055**			-0.066***
	(0.022)			(0.026)
facilitate monitoring (T2)		-0.027*		
		(0.018)		
male domain (H1)			0.013	0.001
			(0.011)	(0.017)
interaction (T1*H1)				0.024
				(0.021)
Number of observations	4076	6477	4076	4076
	disagreement about husband's role in decsion making			
constant	0.169	0.188	0.153	0.166
	(0.014)	(0.010)	(0.011)	(0.018)
challenge gender norms (T1)	-0.012			-0.025
	(0.018)			(0.023)
facilitate monitoring (T2)		-0.031**		
		(0.016)		
male domain (H1)			0.020*	0.006
			(0.010)	(0.015)
interaction (T1*H1)				0.028
				(0.021)
Number of observations	4076	6477	4076	4076

Table 3: Agreement and disagreement about spouses' roles in labour contributions

	land prepare	planting	weeding	spraying	harvesting
	disagreement about wife's labour contribution				
(1) Agree:	0.66	0.67	0.61	0.79	0.69
Disagree:	0.35	0.33	0.4	0.21	0.31
(2) wife says she worked more than husband thinks	0.19	0.19	0.25	0.14	0.17
(3) husband says wife worked more than wife admits	0.16	0.14	0.15	0.07	0.14
p-value (2)==(3):	0.001	0.000	0.000	0.000	0.006
Number of plots:	3,181	3,373	3,096	3,377	3,350
	disagreement about husband's labour contribution				
(1) Agree:	0.61	0.68	0.62	0.60	0.70
Disagree: Disagree:	0.39	0.31	0.38	0.41	0.31
(2) man says he worked more than wife thinks	0.26	0.17	0.21	0.24	0.17
(3) wife says man worked more than man admits	0.13	0.14	0.17	0.17	0.14
p-value (2)==(3):	0.000	0.002	0.000	0.000	0.001
Number of plots:	3,217	3,373	3,137	3,383	3,376
Male task score (/100):	56	46	28	87	48
Ease of monitoring (/100):	57	74	57	45	65

Table 4: Disagreement about labour provision

	(1)	(2)	(3)	(4)	(5)	(6)
	disagreement about wife's labour contribution					
constant	0.130	0.128	0.146	0.143	0.143	0.141
	(0.012)	(0.008)	(0.011)	(0.009)	(0.016)	(0.011)
challenging gender norms (T1)	0.006				0.007	
	(0.017)				(0.022)	
facilitate monitoring (T2)		0.009				0.005
		(0.014)				(0.020)
male domain (H1)			-0.032**		-0.031*	
			(0.013)		(0.019)	
hard to monitor (H2)				-0.021**		-0.023*
				(0.010)		(0.012)
interaction (T1*H1)					-0.001	
					(0.026)	
interaction (T2*H2)						0.006
						(0.022)
Number of observations	3188	5037	3188	5037	3188	5037
	disagreement about husband's labour contribution					
constant	0.169	0.144	0.171	0.140	0.172	0.134
	(0.013)	(0.008)	(0.011)	(0.009)	(0.016)	(0.011)
challenge gender norms (T1)	-0.014				-0.001	
	(0.018)				(0.023)	
facilitate monitoring (T2)		0.011				0.020
		(0.014)				(0.020)
male domain (H1)			-0.024*		-0.008	
			(0.014)		(0.021)	
hard to monitor (H2)				0.012		0.016
				(0.011)		(0.013)
interaction (T1*H1)					-0.031	
					(0.028)	
interaction (T2*H2)						-0.015
	28					(0.024)
Number of observations	3184	5060	3184	5060	3184	5060