Appropriation, Shirking and Hiding: Spousal Disagreement among Ugandan Maize farmers

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Abstract

To gain a better understanding of intra-household bargaining processes, surveys increasingly collect data from co-heads individually. Answers provided by spouses on the same set of questions often differ substantially, and while this is partly due to measurement error, there is also some signal in the noise. Some studies argue that cultural context may lead to systematic bias that may be due to a different meaning attached to concepts being elicited. Others suggest that at least part of the disagreement originates from spouses strategically hiding information from each other. Using detailed data on a large sample of monogamous smallholder maize farming households in eastern Uganda, we document patterns in spousal disagreement in reporting related to decision making, labour time and sales. We also implement two interventions to test if we can reduce disagreement by increasing cooperation between spouses and reducing information asymmetries.

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1 Introduction

Increased attention for the inner workings of agricultural households by both researchers and practitioners led to various innovations in data collection (Doss and Quisumbing, 2020). One example is the Women's Empowerment in Agriculture Index (WEAI), a comprehensive and standardized measure to directly measure women's empowerment and inclusion in the agricultural sector (Alkire et al., 2013). The focus on intra-household decision-making processes has also substantially increased the availability of data that is collected at the individual household member level, especially from the co-heads of the households. Studies that collect data from male and female co-heads separately find that spouses often provide different answers on even the most basic questions (Ambler et al., 2021; Annan et al., 2021; Acosta et al., 2020; Twyman, Useche, and Deere, 2015).

Ambler et al. (2021) demonstrate that while part of this may be due 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, Ambler et al. (2021) argue that the fact that spousal disagreement in reporting is larger for assets that can be hidden more easily than for others suggests that, to some extent, spouses exploit these information asymmetries by deliberately hiding assets and decisions from each other. A number of lab-in-the-field experiments indeed confirm that, in many cases, household members conceal part of their resources from one another (eg. Ashraf, 2009; Fiala and He, 2016; Castilla and Walker, 2013; Hoel, 2015).

We contribute to this line of research by documenting spousal disagreement in reported behaviour among a large sample of semi-subsistance maize farming households in Uganda. First, on a range of decisions that are crucial to increase maize yields such as timely planting, seed spacing, and weeding, we ask both spouses separately to indicate who made each of these decisions on each plot of the household farm. Spouses can indicate they took the decision alone, that their spouse took the decision alone, or that the decision was taken jointly. These answers are then combined to assess the extent and direction of disagreement with respect to decision making. Second, we ask each spouse separately how much time he or she spent on five different important maize farming related activities (land preparation, planting, weeding, spraying, and harvesting) on each plot. We also ask each co-head

to provide an estimate of how much time his or her spouse spent on these same activities. We similarly combine these answers to assess the extent and direction of disagreement with respect to labour time allocation. Finally, we ask each co-head how much maize was sold jointly with his or her spouse, and how much maize he or she sold unilaterally (as opposed to joint sales). We also ask each co-head to provide an estimate of how much his or her spouses sold by him/herself. These answers are again combined to assess the extent and direction of disagreement with respect to maize marketing.

An additional contribution of our study consists of testing the impact of two interventions on spousal disagreement. Inspired by recent research on behavioral change communication and social marketing, the first intervention consists of a treatment that promotes a mental model of maize farming as a joint venture, with both spouses having an equal role in decision making, activities, and rewards. The second intervention aims to reduce information asymmetry with regard to good maize farming practices between spouses. By making sure both spouses have similar information about eg. what decision need to be made, what labour is required, and what yields can be expected, spouses are expected to be better able to monitor each other and provide better estimates of each other's efforts.

We find substantial disagreement between spouses. For instance, we find that co-heads exaggerate their own decision making power on almost one in four plots. We find that the intervention where we promote cooperation using a couple role model reduces the likelihood that co-heads overestimate own influence on decision making. We find similar effects from reducing information asymmetry between spouses. For labour, we find that spouses seem to relatively overstate their own labour and understate their spouses labour. However, we also find a substantial part of the sample where a co-head reports to work less than what the other thinks. We find that, to some extent, the likelihood that spouses overstate own labour contributions reduces as a result of providing spouses with information that allows them to better monitor each other. Finally, for marketing, spouses tend to overstate own sales. Promoting cooperation within the household reduced the likelihood and degree of one spouse reporting lower sales than what the other spouse assumed.

The remainder of the paper is organized as follows: The next section gives a brief overview of the literature on spousal disagreement. We then present the experimental design and explain the rationale underlying the intervention. Next is a brief section describing the context and the characteristics of

3

the households in our sample. We then turn to the results, first looking at the extent and direction of spousal disagreement about decision making, followed by an assessment of the impact of the two interventions on spousal overstated and understated disagreement about decision making. This is followed by a section on spousal disagreement on labour time allocation and the impact of the interventions, and a section on extent and direction of spousal disagreement about maize marketing and impact of the interventions. The findings are then used to reflect on some of the mechanisms that have been proposed to explain patterns of spousal disagreement. A final section concludes.

2   Literature

In this section, we review related literature. We mainly focus on the empirical literature on intra-household resource allocation and decision-making in rural development contexts that uses observational data from surveys in which both spouses are interviewed separately and are asked the same set of questions. Such studies are often interested in learning about 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 a range of places, the wife's capacity to decide on children's affairs, if the wife is allowed to have a job, her role in deciding on the number of children and some household expenditure related decisions.

A common finding in studies that ask the same set of questions to different individuals within the household is substantial disagreement between spouses, even on questions that would seem straightforward to verify objectively such as the number of children or type of material used for house construction. This may indicate that part of this divergence is simply due to measurement error. Ghuman, Lee, and Smith (2006) suggests that disagreement is also partly due the fact that the response categories do not have the same cognitive or semantic meanings to men and women, leading to the somewhat pessimistic conclusion that survey questions are of limited utility for understanding differences in gender stratification across context.

In Seymour and Peterman (2018), the primary focus is on testing if sole decision making correlates differently to a measure of autonomy than joint

decision making. However, they note that spouses often give inconsistent answers when asked about who made a particular decision. This leads them to check if female sole decision making is equally empowering if the male co-head disagrees that the women took the decision alone than when spouses agree. 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. Becker, Fonseca-Becker, and Schenck-Yglesias (2006) study decision making patterns among 500 couples in western Guatemala and correlate this to preventive health behaviour. They find that, relative to their husbands' report, wives tend to under-report their decision-making power. Anderson, Reynolds, and Gugerty (2017) investigate variation in husband and wife perspectives on the division of authority over agriculture-related decisions within households in rural Tanzania. They conclude that lack of "intra-household accord" may be problematic for interventions seeking to use survey data to develop and inform strategies for reducing gender inequalities or empowering women in rural agricultural households.

One particularly insightful study that tries to separate signal from noise is Ambler et al. (2021). They develop a conceptual model that differentiates between three explanations for spousal disagreement. First, they note that if disagreement solely derives from measurement error, disagreement should be symmetric, and the female co-head's responses should not differ systematically from the male co-head's responses. Secondly, they test for asymmetric measurement error, where men and women interpret questions differently. In this case, answers may differ systematically between spouses, but disagreement should be similar for the different questions asked in the survey. Finally, they argue that finding differing rates of disagreement across survey questions, and higher disagreement for assets and activities that are easier to hide in particular, points to asymmetric information. Using observational data on decision making and asset ownership in Bangladesh, they find that asymmetric information in the form of hidden assets and decisions is present in the households. However, we feel that information asymmetry does not always have to be the result of one spouse intentionally deceiving another. There may be other systematic biases that manifest more in one asset or decision category than others that may be shaped by prevailing gender roles and norms. For example, Acosta et al. (2020) find that, in a careful case study in northern Uganda, 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 between information asymmetry stemming from intentional hiding and other gender related systematic bias and disagreement.

Annan et al. (2021) is another powerful illustration of the conceptual and analytical value of intra-household contention over decision-making. The primary contribution of that paper is that it does not simply consider disagreement as a binary variable, but argues that the direction of the disagreement may also be important for assessing agency and empowerment. More in particular, they differentiate cases in which men disagree that women are involved in decision making from cases where men disagree that women are not involved in decision making. The former is interpreted as women "taking power", while in the second case women are said to be "given power".

While most studies focus on disagreement with respect to decision making, diverging questions on asset ownership are also very common. For example, Twyman, Useche, and Deere (2015) document gender differences in perceptions about land ownership in Ecuador. Assets, including savings and income, are also easier to quantify than decision making. As such, instead of simply recording if an asset is owned by a spouse using a yes/no question, some studies go further and try to put amounts on this. For example, Castilla (2012) uses the husband's own reporting of his own farm income and compares this to the wife's reporting of the husband's farm income to identify income hiding by men. She finds that women's estimate of farm income is on average 28 thousand Cedis lower than what men report, representing 14 per cent of household income. In Malawi, Fisher, Reimer, and Carr (2010) finds that in 66 per cent of households in their sample, the husband understated his wife's income by an average of 47 per cent of what the wife reports.

Most of the above studies are descriptive in nature, exploring patterns in agreement and disagreement in spousal decision making, asset ownership and income. Annan et al. (2021) show that spousal agreement and different directions of disagreement correlate differently with important outcomes for households, women, and children. Ambler et al. (2021) and Seymour and Peterman (2018) observe association with intra-household information asymmetry and power dynamics. The emerging consensus is that spousal disagreement indicates intra-household dynamics with impact on important outcomes. Therefore, we agree with Annan et al. (2021) that more research is needed to understand which interventions can change spousal disagreement and the intra-household dynamics that drive it. Therefore, in the next section, we describe two interventions designed to change intra-household

dynamics and disagreement among spouses.

3 Experimental design and Interventions

The emerging literature on spousal disagreement suggests at least two underlying mechanisms. First, to some extent, spousal disagreement may reflect different cognitive understanding of the responses categories and what the appropriate response should be (Ghuman, Lee, and Smith, 2006). This problem is compounded by the cultural context in which these questions are asked and answered (Acosta et al., 2020). A first treatment therefore attempts to challenge pre-conceived 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 growing activities is seen as a joint responsibility. Second, the literature also establishes that spousal disagreement reflects information asymmetry between spouses (Ambler et al., 2021). A second intervention tests if this informational asymmetry can be influenced by giving spouses equal ex-ante knowledge on best practices in maize farming.

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 was to increase knowledge of the viewer with respect to best 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 where a farmer (or farmers) recount how he/she/they used to be poor but managed to increase yields over time by applying a set of techniques and inputs. It also encourages farmers to view maize growing as a business that needs investment to develop over time and includes some simple inter-temporal cost-benefit calculations to illustrate this. Viewers are encouraged to follow the example of the model farmer(s) in the video. The first intervention consists of an adapted casting for the video and the second intervention of a variation on who within the household the video was shown to. These variations and the rationale behind them are explained below.

3.1 Gender roles within the household

Within households, individual members often have differing spheres of influence reflecting prevailing gender roles (Lundberg and Pollak, 1993). In

agricultural households, women often have a stronger voice in the cultivation of food security crops such as cassava or sweet potato and other crops that are predominately grown for home consumption. Men usually focus more on crops that are also marketed. 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, and customs and traditions (Nordhagen, Pascual, and Drucker, 2021; Iradukunda et al., 2019). While the existence of such gendered patterns are widely acknowledged, it is not always easy to capture in 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 will make all important decisions such as on what plots to plant maize, how to prepare the land, when to start planting and what seeds to use. Men also generally decide on how much labour is needed, and women assist men, often with weeding.

We expect that such a separation in spheres of influence between male and female co-heads contributes to spousal disagreement. Therefore, we devised an intervention consisting of an adaptation of the video featuring male and female actor-farmer role models to promote a worldview where both spouses participate equally in maize farming. Recent research has shown that role models may be important to increase women participation in otherwise male dominated sectors (Porter and Serra, 2020; Beaman et al., 2012). One way in which large groups of people can be exposed to role models is through engaging media content (La Ferrara, Chong, and Duryea, 2012; Riley et al., 2017). In the context of smallholder agriculture, Bernard et al. (2015) find that exposure to video that show aspirational life stories of successful farmers affected both viewers' investment in their children's education and other future-oriented behaviors.

To test the hypothesis that spouses disagree less if they view farming as a joint spousal activity, we randomly selected 261 households from our sample and showed them (male and female co-heads together) a version of the video where a couple is depicted. This group functions as the treatment group. In another random sample of 240 households, the control group, we showed exactly the same video (again to male and female co-heads together), except for the fact that it only featured a single male actor-farmer. As the only difference between the two videos was the fact that in one video a couple was shown and in the other a single male actor appeared , any difference in outcomes between the two groups should be attributed to a couple role

model effect.

3.2 Information asymmetry

Smallholder agricultural households consist of different individuals, each with their own preferences, skills and access to assets. At the same time, individuals also need to invest in common goods for the survival of both the household as a unit and its members. In households, there are also various shared assets and resources from which individual household members draw. 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 over-extraction of resources also apply within the household (Doss and Meinzen-Dick, 2015).

One way in which collective action problems can be attenuated is through increased mutual monitoring. For instance, if one co-head can better assess the actual time that the other co-head worked on preparing the field, the latter is expected to be less likely to engage in labour shirking. Or, if it becomes easier to check how much each co-head earned through the sale of maize, instances of income hiding can be expected to decrease. However, in order for mutual monitoring to work, co-heads need to have a good idea of what to compare against, as merely observing an outcome may be insufficient to determine if a co-head cheated. For instance, it may be difficult for the female co-head to check if her spouse over-reports 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, we therefore make sure both co-heads start off with symmetric information with respect to best agronomic practices for maize farming, as this facilitates mutual monitoring. To do so, we show the video that showcases best practices in maize farming to both spouses in a random sample of 261 households.[1] This group acts as the treatment group. In another random sample of 540 households, the control group, the same video was shown, but only to one of the two co-heads.[2] As the only difference between the two groups is related to whom the video was shown

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[1]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.

[2]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.

to, any difference in outcomes between the two groups should be attributed to reducing information asymmetry between spouses.

4 Study context

The study involved a random sample of maize farmers in eastern Uganda, an area that is know for its maize production. Two-stage cluster sampling was used to obtain a representative sample of this population. In particular, from five districts (Bugiri, Mayuge, Iganga, Namayingo, and Namutumba), 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 the 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 an 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 focus on the second maize growing season of 2017, which runs from about August 2017 when fields are prepared, to January 2018 when maize is 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 some information on household characteristics and on the previous harvest, which was the first harvesting season of 2017.

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 the Fall Armyworm invasion. The baseline data also shows that the average household head is 40 years old and about 60 per cent did not finish primary education. The average household consists of almost 8 individuals. Only 11 per cent of households report that they had access to agricultural extension in the year prior to the survey. Only 17 per cent used fertilizer on at least one plot, and 34 per cent reported to be using hybrid maize seed or an open pollinated variety. About three quarters reported that the household owned a mobile phone.

5 Results

We now turn to an in depth analysis of the data that was collected at endline. The focus is on spousal disagreement using own and cross-reporting (that is, what one spouse thinks the other spouse would report). We start by looking at patterns in decision making about a series of important maize cultivation practices. We then turn to time use, again disaggregated over a set of important tasks in maize cultivation. Finally, we look at decisions related to maize marketing. Under each heading, we provide a detailed descriptive analysis of disagreement based on the entire sample of 2,548 households, and then report on the findings from the two treatment in the respective sub-samples.

5.1 Decision making

We start by exploring patterns of decision making related to maize growing within the household. We asked the head of the household to list all maize plots that the household was cultivating during the season preceding the survey, which was the second agricultural season of 2017. We then cycle through the different plots and repeat a series of questions for each plot. The same questions were asked separately to each co-head. We asked, for a range of key decisions that need to be made and that are known to significantly affect maize yields, who made the decision on that particular plot. Respondents could answer that decisions were made by the person that was interviewed alone; by the spouse of the person interviewed alone; by the person interviewed and his or her spouse jointly; by someone else inside or outside the household; by the person interviewed together with someone else inside or outside the household; or by the spouse of the person interview jointly with someone else inside or outside the household. Respondents could also indicate that they did not know who made the decision.

   We start by looking at the responses given by the male co-heads within the household (Figure 1). The first decision we consider was simply who decided that maize should be planted on the particular plot. A second decision is related to timing of planting. Timely planting of maize is very important for subsequent maize yields. Maize planting should start immediately after the first rains of the season, resulting in significant time pressure when large areas need to be planted. A third important decision that maize farmers have to make is related to the spacing of seed and seed rate. There is a wide range of
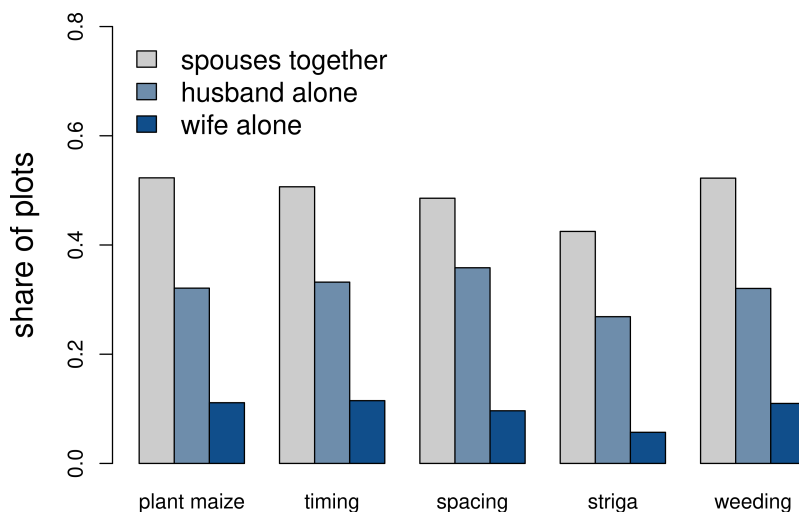
Figure 1: Decision making on different practices and inputs as reported by the male co-head

seed methods used by farmers. Some simply broadcast the seeds. However, row planting leads to significantly higher yields as plants have optimal space to obtain sufficient sun and 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 may also increase competition for light and nutrients, leading to stunted 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. We also asked who made 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 general.

Figure 1 shows that, at least according to the male co-head, joint decision making is the norm. For example, on the 3,723 maize plots on which data was collected, men indicate that on 1,947 plots the decision to start planting maize was taken together with the wife. This corresponds to about 52 percent of plots. The pattern seems to be rather consistent across the different decision
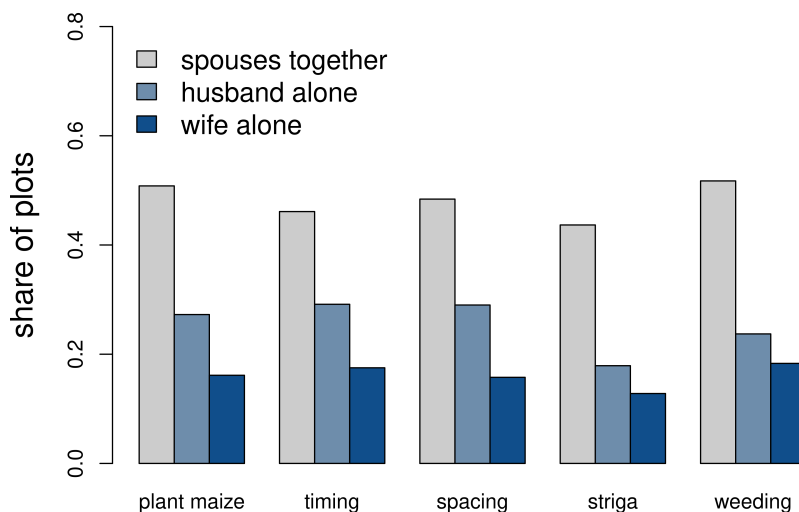
Figure 2: Decision making on different practices and inputs as reported by the female co-head

spheres. For the decision on how to fight striga, the percentage drops to 42 percent, but this is due to the fact that on some plots striga was not a problem and so no decision needed to be made.

The figure also shows that on one out of three plots, the male co-head states that decisions are made by him alone, without consulting his wife. Also here, the percentages remain stable across the decision makings spheres, with a slightly higher incidence of male co-head unilateral decision making on spacing and slightly less unilateral male decision making on weeding. Finally, the figure also shows that, according to men, women decide to plant maize without consulting their husband on 414 out of the total 3,723 plots, corresponding to about 11 percent. This share is also stable over the five decision spheres considered in the figure, with slightly more decisions taken by women on weeding and slight less on seed spacing.

Figure 2 is similar to Figure 1, but now shows responses as provided by the female co-head. Also here, we see that women report that decisions are generally made jointly: on the 3,723 maize plots in the sample, the woman

co-head indicates that on 1,892 plots the decision to start planting maize was taken by the male and female co-head together. Also for the other decisions, on about half of all plots women say the decision was made jointly.

Women also report that it is more common that men take decisions alone than that women take decisions alone. For instance, women report that on 1,015 out of the 3,723 maize plots, man took the decision to start planting without consulting anyone else. However, there is less consistency over the different decision spheres. Men are relatively less likely to unilaterally decide on weeding related activities. Finally, women report that they make decisions unilaterally on about 15 percent of the plots.

A comparison between Figure 1 and Figure 2 suggest some degree of disagreement between spouses. For instance, while male co-heads indicated that they alone took the decision to plant maize on about 32 percent of the plots, women say that man unilaterally took the decision to plant maize on only 27 percent of the plots. At the same time, female co-heads say they alone decided to plant maize on 16 percent of the plots. Men indicate that women unilaterally decided to plant maize on only 11 percent of the plots.

To investigate this disagreement further, we construct measures based on answers of both spouses. As there are a large number of potential response combinations, it is customary to collapse responses into a few meaningful categories to reduce noise and facilitate analysis. For example, Ambler et al. (2021) define a variable for cases where the wife says that she is involved (alone or jointly as part of the couple), but the husband says she is not, and a variable for cases where the husband says the wife is involved but she reports that she is not.

In this study, we follow Annan et al. (2021) and differentiate disagreement by the relative locus of decision making and define plots on which co-heads over- or understate their own role in decision making. Cases where co-heads place most weight on the self as the locus of decision making, and so tend to overstate their own roles, are indicated in the dark shaded area at the right of the agreement diagonal in Figure 3. These are instances where one co-head claims that decisions are made by him or her alone, but the spouse disagrees and claims that she or he took the decision alone or was at least involved in it. Figure 3 shows that for the decision to plant maize on the plot, following this definition, co-heads overstate their own role in decision on 23.3 percent of the plots in our sample: on 5.3 percent of plots the male or female co-head says he or she made the decision to plant maize but the other disagrees and claims it is her or him who decided unilaterally; on 5.9

percent of plots the male co-head says he was involved in the decision but the female co-head says she took the decision alone; and on 12.1 percent of plots the female co-head says she was involved in the decision but the male co-head says he took the decision alone. Overstating thus means that at least one spouse says he or she took the decision alone.

We further define instances where co-heads understate their own role in decision making and the locus of decision making is placed in the other. These are cases in the light shaded area to the left of the diagonal in Figure 3. Here, one co-head says his or her spouse decided unilaterally, but the spouse disagrees and says the co-head took the decision alone, or was at least involved in the decision. Figure 3 shows that for the decision to plant maize on the plot, following this definition, co-heads under-report their own decision power on 17.6 percent of the plots in our sample: on 2.7 percent of plots the male or female co-head says the other co-head made the decision to plant maize but the other co-head disagrees; on 4.0 percent of plots the male co-head says his spouse took the decision alone but the wife says he was involved; and in 10.9 percent of the cases the female co-head says the husband took the decision to plant maize unilaterally, but the husband disagrees and claims his wife was involved. Understating thus means that at least one spouse says that the other spouse took the decision alone.[3]

Figure 4 shows the frequency of overstating and understating of decision power for the five decision categories. The first two bars refer to the decision to plant maize and correspond to the information also provided in the agreement matrix of Figure 3: on 23.3 percent of the plots spouses overstate and on 17.6 percent of the plots spouses understate their contribution to the decision to plant maize. The Figure further shows that spouses are more likely to exaggerate their role in decision making than to understate their contribution. Especially for weeding (and related striga weeding) the locus of decision making inclines to the self.

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[3]Annan et al. (2021) refer to the first measure as instances where the female co-head "takes power" and the second measure is interpreted as the male co-head "giving power" to the female co-head. These terms are somewhat one-sided, as such an interpretation rests on additional assumptions. For instance, in cases where both spouses indicate that they themselves took a particular decision unilaterally, the interpretation that the women "takes power" is only valid if we assume all power rests with the male co-head to begin with, and we believe that the female co-head is correct while the male co-head is not (assuming that they can not both have taken the decision unilaterally). Also, if in Figure 3 in 5.9 percent of cases women claim power, it seems that in the absence of additional assumptions, by symmetry in 12.1 percent of cases men are "taking power".

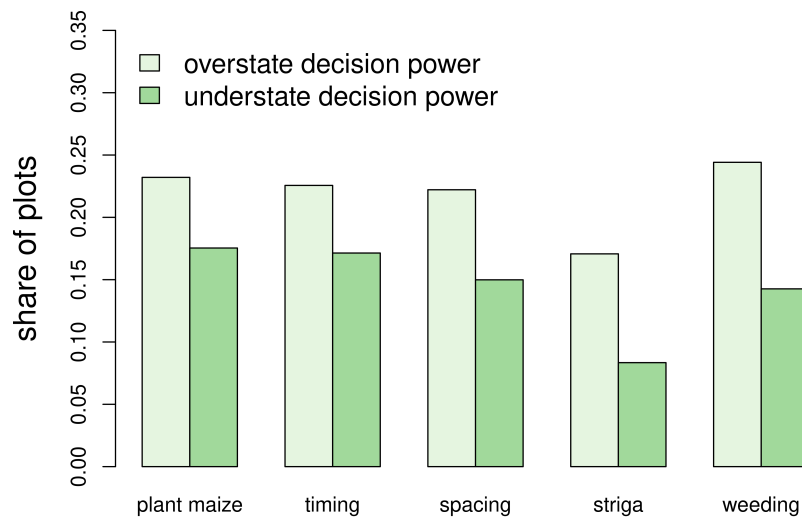| Who made the decision to plant maize on this plot?		Wife' response:		
		Husband	Joint	Wife
Husband's response:	Wife	2.7	4.0	3.8
	Joint	10.9	33.1	5.9
	Husband	12.4	12.1	5.3

Figure 3: Agreement matrix

Figure 4: Disagreement in decision making

We will now check if the two intervention described in Section 4 affect the likelihood that spouses over or understate own decision making power. Results are in Table 1. The first column in table 1 shows that among household where a video was shown where a male actor provided the information (the control group), on about 23.5 percent of the plots co-heads overstate their own contribution in the decision to plant maize.[4] The second column shows the average treatment effect of the first treatment and reveals that there is no effect of the couple role treatment on the likelihood that spouses overstate their won role in the decision to plant maize on plot.

The comparison between those who saw the couple video and those who saw a video with a single actor is repeated for all five decision spheres. We find significant reductions in the likelihood that co-head overstate own influence as a result of the couple role model intervention for the decisions on when to start planting and on weeding. For the timing on planting, we see that among households where the video featuring only a male farmer was shown, co-heads overstate their involvement in this decision on 22.5 percent of plots. In households that were exposed to the couple role model video, the share of plots where co-heads overstate their involvement in this decision is only 16.9 percent. For the decision related to weeding, we see that in the control group, overstatement of own influence affects 25.6 percent of the plots, but this happens on only 19.3 percent of the plots in the group that was exposed to the couple role model video treatment. Average treatment effect estimates for all other decision categories are also negative, but not significantly different from zero.

In the third column, we report control group means for the share of plots on which spouses understate own decision making power. We see that in the control group the decision to plant maize is affected by this type of disagreement on 13.7 percent of the plots. The fourth column shows the difference in this type of disagreement between households that received the couple role model treatment and those who did not. Overall, we do not find that the treatment reduced the likelihood that spouses understate own decision making.

We next turn to the second treatment and compare disagreement on decision making between co-heads in households where only one co-head viewed the video and households where the video was shown to both co-heads. Col-

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[4]This is essentially the same information as depicted in Figure 4, but now in the smaller sample of (control group) households included in our experiment.

Table 1: Impact on disagreement in decision making

| | couple role model | | | | reducing information asymmetry | | | |
| | overstate decision power | | understate decision power | | overstate decision power | | understate decision power | |
	ctrl mean	ATE	ctrl mean	ATE	ctrl mean	ATE	ctrl mean	ATE
plant maize	0.234	-0.048	0.137	0.032	0.235	-0.050$^+$	0.172	-0.003
	(0.424)	(0.033)	(0.440)	(0.028)	(0.425)	(0.027)	(0.440)	(0.025)
timing	0.225	-0.056$^+$	0.151	0.007	0.219	-0.050*	0.184	-0.026
	(0.418)	(0.032)	(0.457)	(0.027)	(0.414)	(0.025)	(0.462)	(0.024)
spacing	0.236	-0.054	0.131	0.000	0.223	-0.040	0.164	-0.034
	(0.426)	(0.033)	(0.452)	(0.026)	(0.416)	(0.027)	(0.465)	(0.023)
striga	0.197	-0.012	0.087	-0.014	0.162	0.023	0.088	-0.015
	(0.398)	(0.033)	(0.384)	(0.021)	(0.369)	(0.028)	(0.391)	(0.018)
weeding	0.256	-0.063$^+$	0.151	-0.017	0.248	-0.055*	0.147	-0.014
	(0.437)	(0.033)	(0.439)	(0.027)	(0.432)	(0.028)	(0.434)	(0.023)

Note: First column reports means for overstatement in the control group for the couple role model treatment (and standard deviations below); Column 2 reports differences in overstatement between treatment and the control group for the couple role model treatment (and standard errors below); cloumn 3 reports means for understatement in the control group for the couple role model treatment (and standard deviations below); column 4 reports differences in understatement between treatment and the control group for the couple role model treatment(and standard errors below); column 5 shows means for ovestatement in the control group for the information asymmetry treatment (and standard deviations below); Column 6 reports differences in overstatement between treatment and the control group for the information asymmetry treatment (and standard errors below); cloumn 7 reports means for understatement in the control group for the information asymmetry treatment (and standard deviations below); column 8 reports differences in understatement between treatment and the control group for the information asymmetry treatment (and standard errors below); **, * and + denote that the difference is significant at the 1, 5 and 10 percent level, respectively.

umn 5 of Table 1 show that in households where only one of the co-heads was exposed to the video, spouses overstate their own influence on the decision to plant maize on the plot on 23.5 percent of the plots. Column 6 indicates that this percentage was 5.0 percentage points lower among households where both spouses were shown the video, and this reduction is statistically different from zero at the 5 percent significance level. We also find that on decisions related to the timing of planting and weeding, making sure spouses start off with the same information leads to a reduction in the likelihood that one spouse assigns him or herself more decision power than the other spouse claims.

In the last two columns, we look at the impact of providing both spouses with the same information on the likelihood that one spouse gives too much credit to the other spouse. Control group means, shown in column 7, are again close to what we find in the entire sample depicted in Figure 4. The last column shows that the likelihood that spouses understate their own contribution reduces as a result of providing both spouses with the same information, but the effect is never significant. Overall, we conclude that both treatment are effective in reducing the likelihood that spouses overstate their own role in decision making.

5.2   Labour time

We also collected detailed information on labour time. On each maize plot, we ask each co-head how much time, expressed in labour days, he or she worked on a particular activity. We also ask 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.

Figure 5 shows time spent on different activities as reported by the male co-head. We see that the male co-head spends about 8 days preparing the plot, 2 days planting, almost 15 days weeding, one day spraying, and another 2 days harvesting. The figure also shows that the male co-head reports that his wife spends one day less in preparing the land and also half a day less in weeding. Men think women almost never engage in spraying of insecticides, herbicides or fungicides. The average male co-head in our sample thus reports to work about 28 days on the average plot over the entire agricultural season. He reports that his wife works about 26 days on that plot over the entire season.

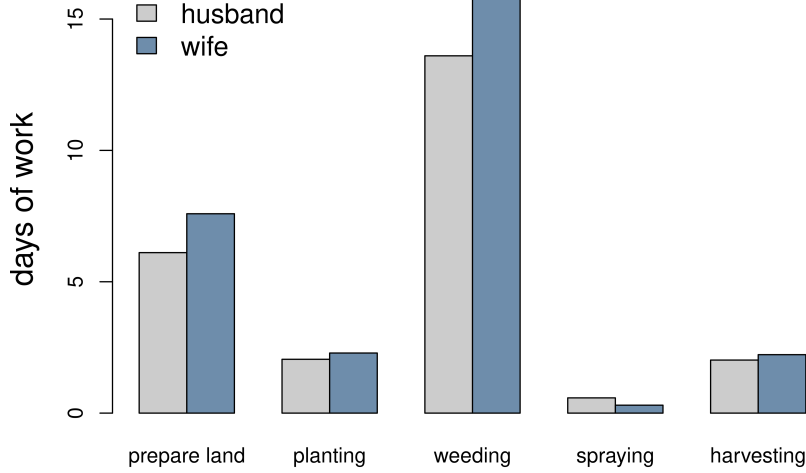Figure 5: Time spent on different activities as reported by the male co-head

Figure 6: Time spent on different activities as reported by the female co-head

Figure 6 shows a graph similar to Figure 5, but now as reported by the female co-head within the household. Interestingly, while male co-heads think they spent more time on all activities, female co-heads are also of the opinion that they work harder than their spouse on all activities, the only exception being spraying. Female co-heads claim they work on average about 7 to 8 days on field preparation, while they think the male co-head only works 6 days on field preparation. Female co-heads also indicate that they spend 16.5 days on weeding, while they report that their spouse spent only 13.5 days on that activity. According to women, male and female co-heads spend about the same time on planting and harvesting. Only for spraying, co-heads agree that the male co-head provides most of the work. According to the female co-head, she works almost 30 days, while the male co-head works about 25 days over the entire season.

Comparing Figures 5 and 6 again suggests substantial disagreement between spouses on time worked. For instance, we see that male co-heads report that they work on average about 8 days to prepare the land, yet women indicate that men only work 6 days to prepare the land. Women on the other

hand report that they work on average 16 days on the field to weed, while men think that women only work 14 days on the field for weeding. And while on average spouses seem to relatively overstate their own labour and understate their spouses labour, there is also a substantial part of the sample where a co-head reports to work less than what the other thinks.

For the analysis, we thus define measures of spousal over- and understatement of labour time similar to what we did for decision making in Section 5.1. To do so, we compare own reported time of the spouse to the time that was estimated by the other spouse. For each activity, we thus sum the time that the male co-head reported he spent on that activity and the time that the female co-head reported she spent on the activity and compare this to the time that the male co-head estimated that his wife spent on this activity plus the time that the female co-head estimated her husband spent on the activity.[5] Based om this, we define 2 categories (and associated indicator variables of the categories): i) plots on which spouses overestimate own labour contributions, and ii) plots on which spouses underestimate own labour contributions.

Figure 7 shows that on more than half of the plots, spouses overstate the labour that was allocated to land preparation. At the same time, we also find that on 30 percent of the plots, spouses indicate that they actually spent less time on land preparation than his or her spouse thinks. This means that only on about 15 percent of the plots, spouses agree on the time spent on the activity. The figure also shows that, while spouses overstate labour contributions more frequently than they understate labour contributions, there is substantial difference depending on the activity. For instance, with respect to spraying, these seems to be agreement on almost 60 percent of the plots. Higher levels of agreement on planting, spraying and harvesting are partly explained by the fact that less hours are reported (see Figures 5 and 6) and so there is less scope for difference in cross reporting. For spaying in particular, many households report not spaying and so both spouses report zero hours and know their spouse also spent zero hours. However, this is only part of the explanation as disagreement on land preparation is similar to disagreement on weeding despite the fact that about twice the amount of labour was allocated to weeding than what was allocated to land prepara-

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[5]While we could also look at over- and understatement of labour time for the male co-head and the female co-head separately, we decided to aggregate these measures at. This is because we are mainly interested in (reducing) disagreement as opposed to eg (increasing) women empowerment.
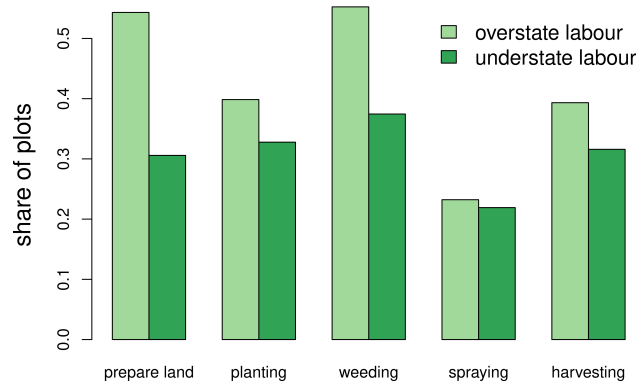
Figure 7: Shirking

tion. The gap between over and understatement of labour is also larges for land preparation.

Table 2 reports on the impact of the role model intervention (left panel) and the intervention aimed at increasing information symmetry (right panel) on the likelihood that spouses overstate and understate own labour efforts, disaggregated by the different tasks. We see for instant that in the control group of households that got to see the video where a male actor is providing all the information, on about 52 percent of the plots spouses indicate that they spent more time on preparing the plot than the other co-head thinks he or she did. This is again in line with what is reported in Figure 7.

The second column reveals that the couple role model intervention did not affect the rate at which spouses overstate own labour contribution to land preparation. In fact, we do not find an effect of this intervention on any type of labour. The third column shows control group means for the rate at which spouses understate own labour contribution, again consistent with Figure 7. In the fourth column, we report treatment effects for the couple role model intervention on the likelihood that spouses underestimate own contributions. The intervention also did not affect this outcome.

In the fifth column of Table 2, we show again control group average rates of overstatement of spousal labour contributions. In the control group for the treatment aimed at reducing information asymmetry, spouses overstate

Table 2: Impact on disagreement related to labour contribution

| | couple role model | | | | reducing information asymmetry | | | |
| | overstate labour contribution | | understate labour contribution | | overstate labour contribution | | undestate labour contribution | |
	ctrl mean	ATE	ctrl mean	ATE	ctrl mean	ATE	ctrl mean	ATE
prepare land	0.521	-0.015	0.302	0.042	0.592	-0.086*	0.272	0.072*
	(6.672)	(0.043)	(6.672)	(0.041)	(7.358)	(0.038)	(7.358)	(0.035)
plant maize	0.397	0.004	0.337	-0.023	0.386	0.015	0.332	-0.018
	(1.331)	(0.042)	(1.331)	(0.040)	(1.430)	(0.037)	(1.430)	(0.034)
weeding	0.480	0.000	0.419	0.018	0.528	-0.048	0.370	0.067+
	(12.834)	(0.044)	(12.834)	(0.043)	(10.634)	(0.038)	(10.634)	(0.037)
spraying	0.202	0.025	0.234	-0.058	0.218	0.010	0.244	-0.068*
	(1.118)	(0.038)	(1.118)	(0.036)	(1.044)	(0.033)	(1.044)	(0.029)
harvesting	0.372	-0.016	0.350	-0.022	0.415	-0.059+	0.308	0.020
	(1.605)	(0.041)	(1.605)	(0.039)	(1.903)	(0.035)	(1.903)	(0.032)

Note: First column reports means for overstatement in the control group for the couple role model treatment (and standard deviations below); Column 2 reports differences in overstatement between treatment and the control group for the couple role model treatment (and standard errors below); cloumn 3 reports means for understatement in the control group for the couple role model treatment (and standard deviations below); column 4 reports differences in understatement between treatment and the control group for the couple role model treatment(and standard errors below); column 5 shows means for overstatement in the control group for the information asymmetry treatment (and standard deviations below); Column 6 reports differences in overstatement between treatment and the control group for the information asymmetry treatment (and standard errors below); cloumn 7 reports means for understatement in the control group for the information asymmetry treatment (and standard deviations below); column 8 reports differences in understatement between treatment and the control group for the information asymmetry treatment (and standard errors below); **, * and + denote that the difference is significant at the 1, 5 and 10 percent level, respectively.

own labour contributions on almost 60 percent of the plots. However, as shown in column six, this percentage is 8.6 percentage points lower among couples that both got to see the video, and this difference is significant at the 5 percent level. We also find that reducing information asymmetry reduces the likelihood that spouses overstate own labour contributed to harvesting.

Finally, in the seventh and eighth column, we report control group means and average treatment effects on the propensity to under-report own labour contribution as a result of reducing information asymmetry. Here effect are mixed, with significant increases in the likelihood that spouses overstate labour allocated to land preparation and weeding, but a significant reduction in the likelihood that spouses understate own labour allocated to spraying.

5.3 Income hiding

Finally, we look at decisions regarding maize marketing. We asked each spouse separately how much maize was sold from the season under consideration. In particular, we asked each of the spouses separately to estimate how much was sold by (1) him or her alone, (2) by his or her spouse alone, and (3) jointly[6]. We also asked both co-heads to indicate the revenue that was derived from these sales.

Overall, just as in the case of decision making related to maize cultivation, most maize marketing happens jointly as a couple. Figure 8 shows in the left panel that men report that on average 1.4 bags of maize was sold jointly[7]. Women report that just under one bag was sold jointly. The right panel of Figure 8 looks at income derived from these sales. Averaged over the entire sample, joint sales amounted to about 23 dollars, at least as reported by the male co-head. Women estimated this amount much lower at 13 dollars.

Figure 8 further shows in the left panel that men reported they sold half a bag of maize by themselves. Women reported that they think the male co-head only sold 0.25 bags of maize. Women, on the other hand, report that they sold only about 12 kilograms of maize alone. Men think that the female co-head unilaterally sold about 6 kilograms. As such, in percentage terms, quantities hidden is similar between male and female co-heads.

The left panel of Figure 8 also shows male co-heads indicate that they received about 7.6 dollars on average from their unilateral sales of maize.

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[6]We specify that sales by an individuals means all decisions regarding quantity, price and to whom to sell were taken by that individual without involving anyone else.

[7]A typical bag contains about 120 kilograms of maize.

Figure 8: Maize sales

Women estimate this revenue to be only about 2 dollar. Finally, women report that they received 1.5 dollar from unilateral sales. Male co-heads estimate that the female co-head got on average 60 cents from what she sold alone. Note that the difference between spouses' own reporting and cross reports increases when moving from quantities to revenues, indicating not only disagreement with respect to quantities sold but also with respect to prices obtained. For male co-head unilateral sales in particular, men seem to assume significantly higher sales prices than women do.

As in previous sections, we look at the impact of the two interventions on disagreement related to maize sales. Also for sales, while on average spouses tend to overstate own sales, there are instances where spouses report to have sold less than what the other co-head thinks. We thus construct indicators of spousal over- and understatement of sales. As was the case for labour, we will not differentiate between female co-head and male co-head over- or under-reporting of sales, but create an aggregate measure that evaluates the difference between male and female co-heads own reported sales and what the other co-head thinks he or she sold. We conjecture that encouraging coop-

eration through the use of a couple as role models and reducing information asymmetries between spouses may lead to a reduction in income hiding.

Results are in Table 3. The three rows in the table correspond to three different outcomes that reflect disagreement in market participation. The first is a simple binary indicator that takes the value of one if spouses indicate they sell more (less) than what the other spouse thinks. The second considers actual quantity overstated (understated) by spouses. In the third row, we consider disagreement in value reported derived from these sales, as we have seen in Figure 8 that there may be disagreement about prices received for maize sold in addition to quantity sold.

In the first column of the first row, we see that in the control group for the couple role model treatment, in 15 percent of households, spouses report that they sold more than what the other spouse think. The likelihood that spouses overstate is similar in the treatment group. We also find that, as reported in the second row, average quantities over-reported is about half a bag. The second column finds no evidence of significant couple role model effect as judged by the coefficient estimate of the treatment indicator using tobit model. We also find no impact of the couple role model treatment on over-reporting of revenue (third row column two).

In the third column of the first row of Table 3, we see that in 12 percent of households, spouses under-report own sales relate to what the other co-head says. In the fourth column, we see that the couple role model intervention decreases this type of disagreement by almost 6 percentage points. The role model effect is also reflected in a reduction in understatement of actual quantities: in households where the video was shown to both spouses, the quantities under-stated reduced by almost 1.5 bags. While the third row also shows a reduction in the value associates with the effect, the effect is not statistically different from zero.

In the right panel of Table 3, we show results for the second treatment aimed at reducing information asymmetry between spouses. We do not find that this treatment affected disagreement related to maize marketing.

6 Discussion

Above we have documented substantial spousal disagreement in decision making, labour contribution and marketing. We further found that the likelihood that spouses overstate their own role in decision making can be reduced

Table 3: Impact on disagreement related to maize marketing

| | couple role model | | | | reducing information asymmetry | | | |
| | overstatement | | understatement | | overstatement | | understatement | |
	ctrl mean	ATE	ctrl mean	ATE	ctrl mean	ATE	ctrl mean	ATE
sold (yes/no)	0.150	0.025	0.120	-0.058*	0.122	0.031	0.070	-0.012
	(0.357)	(0.033)	(0.325)	(0.026)	(0.328)	(0.026)	(0.255)	(0.019)
quantity	0.401	0.441	0.253	-1.486*	0.185	0.712	0.070	-0.334
	(1.400)	(0.676)	(0.857)	(0.665)	(1.350)	(0.610)	(0.493)	(0.427)
amount	4.591	12.463	1.937	-19.379	3.861	11.585	0.775	-2.897
	(19.758)	(11.133)	(9.335)	(13.150)	(19.157)	(10.269)	(6.894)	(6.480)

Note: First column reports means for overstatement in the control group for the couple role model treatment (and standard deviations below); Column 2 reports differences in overstatement between treatment and the control group for the couple role model treatment (and standard errors below); cloumn 3 reports means for understatement in the control group for the couple role model treatment (and standard deviations below); column 4 reports differences in understatement between treatment and the control group for the couple role model treatment(and standard errors below); column 5 shows means for ovestatement in the control group for the information asymmetry treatment (and standard deviations below); Column 6 reports differences in overstatement between treatment and the control group for the information asymmetry treatment (and standard errors below); cloumn 7 reports means for understatement in the control group for the information asymmetry treatment (and standard deviations below); column 8 reports differences in understatement between treatment and the control group for the information asymmetry treatment (and standard errors below); **, * and + denote that the difference is significant at the 1, 5 and 10 percent level, respectively.

by reducing information asymmetry and to a lesser extent by promoting cooperation within the household through a role model intervention. Results were less clear for over- and understatement of labour contributions, but results are more encouraging for the treatment that attempts to provide spouses equal access to information. For marketing, promoting cooperation within the household reduced the likelihood and degree of one spouse reporting lower sales than what the other spouse assumed. In light of this, we now reflect on some of the mechanisms that have been proposed to explain patterns of spousal disagreement.

With respect to differences in reporting related to decision making, in societies with strong gender norms and customs, spouses may overstate their own role in decision making due to role congruity (Acosta et al., 2020). It may also indicate that spouses claim a larger role within the household, in effect claiming recognition for responsibilities taken (Annan et al., 2021). The case of spouses understating their own role in decision making may also be consistent with a range of possible explanations. On the one hand, cultural factors may again mean that one spouse plays down his or her role and discounts own contribution. At the other extreme, one could even imagine situations where the locus of decision making is shifted to the other, "blaming" poor decision making on the other spouse (for example when ex-post the decision turned out to be a very bad decision).

The results from our intervention suggests that cultural factors play an important role in disagreement related to decision making. The intervention that promotes a cooperative approach to role models is expected to challenge traditional views in the region that men are assumed to take responsibility for maize growing. At the same time, the fact that we also find significant effects from arming both spouses with equal information may mean that increased monitoring reduced the likelihood that spouses take decision behind each other's back.

For labour, cultural factors may also result in one spouse claiming to do the bulk of the work, while in reality work burden is shared. However, it may also indicate imbalance within the relationship, in that one spouse performs the bulk of the work without being recognized for it. This may often be the case with tedious work such as weeding or domestic work and household chores. Disagreement characterized by one spouse under-reporting own labour contribution may point to some degree of shirking. For example, it may be that the female co-head does not have a clear idea of how long it takes to spray a particular plot and the male co-head exploits this information

asymmetry by making her believe that it took much longer than the time it actually took; the time difference is then used for private activities by the male co-head that do not directly contribute to the household as a whole.

Results from our intervention show that only the second intervention has an impact on disagreement related to spouses' labour contributions. This suggests that cultural factors are less important. While the effect of facilitating mutual monitoring on shirking is not clear, we do see that arming spouses with information reduces the likelihood that spouses provide more labour than they get credit for.

We have seen that some studies interpret cases of over-reporting related to marketing behaviour and income derived from farming activities as signs that spouses are hiding income from each other (Castilla, 2012). In this case, we would have expected that the second intervention would be most effective in reducing disagreement. The fact that we only find an impact from the couple role model video suggests that disagreement related to sales is caused by cultural factors. For instance, our findings would be consistent with a situation where a male co-head exaggerates sales to his spouse because he wants to be seen as the provider, but after seeing a video where both spouses are equally providing for the household, the male co-head reports sales that are more in line with what the female co-head thinks the male co-head sold.

7   Conclusion

Household surveys that are serious about capturing gender related heterogeneity will, at least for part of the survey, interview both male and female co-heads separately, as opposed to only the household head or most knowledgeable person. 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.

Studies on spousal disagreement often use a simple binary variable indicating that the answer of one co-head differs (to some degree) from the answer of the other co-head. In some cases, the direction of disagreement is also considered, differentiating for instance between cases where husbands report higher levels of consumption than wives, and cases where husbands

report lower levels of consumption than wives. Often, these questions relate to household level data, such as consumption expenditure of investment in household public goods. However, studies interested in women autonomy and women empowerment go further and ask more personal questions on behaviour and personal belongings, and spouses are typically asked to answer these questions about themselves but also about their spouse. This own and cross reporting allows for a range of interesting indicators of disagreement to be constructed based on what one co-head claims about his or her own behaviour (or asset ownership), and what his or her spouse thinks he or she did (or owns).

In this study, we focused mostly on directional disagreement indicators that exploit questions about individual spouses obtained from both co-heads. In addition to documenting patterns in spousal disagreement in this way, we also tested two simple interventions aimed at reducing disagreement related to decision making, labour contributions and marketing. Both interventions consisted of showing short engaging video's to co-heads within the household. More in particular, in a first intervention we tested if promoting a cooperative approach to maize farming (by showing a couple farming together) reduced disagreement. In a second treatment we vary who gets to see the video to test if reducing information asymmetry between spouses also reduced disagreement.

We found substantial disagreement between spouses. For instance, we found that co-heads exaggerate their own decision making power on almost one in four plots. We found significant reductions in the likelihood that co-heads overstate own influence as a result of the couple role model intervention for the decisions related to timing of planting and weeding. We did not find that the couple role model treatment reduced the likelihood that spouses understate own decision making. We found that reducing information asymmetry between spouses led to a reduction in the likelihood that one spouse assigns him or herself more decision power than the other spouse claimed. The likelihood that spouses understated their own contribution also reduced as a result of providing both spouses with the same information, but the effect was never significant.

For labour, we found that spouses seem to relatively overstate their own labour and understate their spouses labour. However, we also found a substantial part of the sample where a co-head reported to work less than what the other thinks. We find that, to some extent, the likelihood that spouses overstate own labour contributions reduced as a result of providing spouses

31

with information that allows them to better monitor each other.

For marketing, spouses tend to overstate own sales, suggesting some degree of income hiding. Promoting cooperation within the household reduced the likelihood and degree of one spouse reporting lower sales than what the other spouse assumed. The fact that we did not find an impact on over-reporting of sales suggests disagreement does not stem from deliberate income hiding.

The fact that we find similar effects from both interventions suggest that two distinct mechanisms are likely at play. On the one hand, some of the disagreement may be because one spouse overestimates his or her own role or position to make it appear in line with expectations within communities. Reducing this disagreement will involve longer run efforts to challenge perceptions and gender stereotypes. Recent research has found that role models may be particularly effective for this (Beaman et al., 2009; Porter and Serra, 2020). On the other hand, some disagreement may reflect deliberate appropriation of decisions, shirking, or income hiding. Here, interventions aimed as reducing the information disadvantage of one spouse, may be effective.

Acknowledgments

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