Contents lists available at ScienceDirect

World Development

Ask me why: Patterns of intrahousehold decision-making

Tanguy Bernard [a,b], Cheryl Doss [c], Melissa Hidrobo [b], Jessica Hoel [d], Caitlin Kieran [e,*]

[a] GREThA—University of Bordeaux, France
[b] International Food Policy Research Institute, United States
[c] University of Oxford, United Kingdom
[d] Colorado College, United States
[e] University of California, Davis, United States

ARTICLE INFO

1. Introduction

Households are sites of both cooperation and contestation. With more data available at the intrahousehold level, development researchers and practitioners have increasingly focused on household dynamics and decision-making and how these relate to outcomes of interest across many domains such as health and agriculture. Many researchers who wish to better understand power dynamics within households have focused on the question of who makes decisions in the household. A woman's participation in household decision-making is often used both as a proxy for empowerment, an end in its own right, and as a means to achieve better production and consumption outcomes. However, research on this topic pays less attention to *why* different household members may make different decisions, and whether this matters for individual or household welfare.

In this paper, we use an innovative methodology to look beyond the identity of the decision-maker to explore the reasons that may drive patterns of household decision-making. We then assess whether the rationale behind who makes household decisions helps explain variation in household outcomes, above and beyond what is explained by the identity of the decision-maker. Our approach uses vignettes, which are survey instruments used to measure concepts that are more easily defined by examples.[1] Vignettes have been used to measure subjective well-being (Ravallion, Himelein, & Beegle, 2016), women's agency (see Donald, Koolwal, Annan, Falb, & Goldstein, 2017 for a review), bias against women

politicians (Beaman, Chattopadhyay, Duflo, Pande, & Topalova, 2009), as well as risk aversion (Barter & Renold, 1999). However, this is the first time that they have been used to analyze the processes of household decision-making.

We develop a typology of households, based on their decision-making processes. We employ five vignettes, respectively illustrating: the "unitary" model wherein the same individual (or couple) makes all significant decisions in the household; the "contribution" model wherein each decision type is made by the person who contributes the most resources used for this activity; the "separate spheres" model wherein individuals within the household are in charge of separate domains; the "norms" model wherein one is entitled to take a particular decision because of local social norms; and the "most informed" model wherein each decision type is taken by the individual who has the most information regarding the herd or the household, based on the perceptions of the respondent. Using a set of vignettes, or stories, which present these distinct types of couples and their decision-making approaches, we ask respondents in rural Senegal which household they most closely resemble. We use this information to analyze why decisions are made by specific people.

In addition, we extend beyond a single domain, analyzing both a consumption and a production decision. We focus on milk which is a central component of households' income and diet in our study area. Specifically, we start by asking respondents who decides how to allocate food inputs among lactating cows (production decision) and who decides how to spend money obtained from milk sales (consumption decision). We then read the series of vignettes, tailored to who makes each decision in the respondent's household, in order to ascertain the household type (unitary, contribution, separate spheres, norms, or most informed). Finally, we collect outcome measures, including the respondent's assessment of whether the decision taken was in the interest of the household as well as objective measures of milk produced per cow (for production decisions) and child hemoglobin levels (for consumption decisions).

* Corresponding author at: Department of Agricultural and Resource Economics, 2116 Social Sciences and Humanities, One Shields Avenue, Davis, CA 95616, United States.

E-mail addresses: T.Bernard@cgiar.org (T. Bernard), cheryl.doss@qeh.ox.ac.uk (C. Doss), M.Hidrobo@cgiar.org (M. Hidrobo), jessica.hoel@coloradocollege.edu (J. Hoel), kieran@primal.ucdavis.edu (C. Kieran).

[1] See (Benini, 2018), (King, Murray, Salomon, & Tandon, 2004), and Gary King's website for discussions and examples: https://gking.harvard.edu/vign.

For each interviewed household, enumerators asked the same questions to the husband and his wife(s) separately.

These data allow us to perform a series of tests regarding the capacity of these vignettes to reliably assess 'why' certain individuals are responsible for specific decisions. We exploit random variations in the ordering of questions to investigate anchoring issues and assess respondent reliability by analyzing within household differences in answers to the same questions. We find no evidence of large anchoring effects or systematic gender biases in answering these questions – as opposed to questions regarding 'who decides,' where these biases are more evident.

We next assess the concurrent validity of the vignettes instrument.[2] Our results first suggest an imperfect correlation between the identity of the decision-maker (husband, wife, or both) and the type of household with which they identify. While men making decisions related to consumption or production are most frequently associated with a *unitary* type of household, they are also often associated with the *most-informed* model. Women making decisions are less often associated with the *unitary* model, and more often with the *most informed* or the *separate spheres* ones. Thus, while households may resemble one another regarding 'who' decides on a particular issue, they may differ as to 'why' this may be the case.

Last, we investigate whether vignettes help explain differences in outcomes across households, beyond the mere reliance on 'who' is the decision-maker. Measures of who decides suggest that households achieve worse child nutrition outcomes when couples make consumption decisions together, relative to the husband deciding alone. However, interacting who decides with household typology demonstrates that this finding is driven by couples who decide together because they make all decisions together (*unitary* type). Similarly, focusing on who decides for production decisions suggests that a wife deciding without her husband leads to worse milk output, however this is driven by wives deciding without their husbands either because they make all decisions (*unitary* type) or follow *norms*. We find that households in which husbands (wives) make production decisions because they are *most informed* produce more milk than households in which husbands (wives) make production decisions because they make all decisions (*unitary* type). Similarly, children from households where wives make consumption decisions because they are *most informed* have better hemoglobin levels than children from households where wives make the decisions because they make all decisions (*unitary* type). These findings highlight the importance of understanding the underlying reasons why specific individuals make decisions in different domains.

Our main contribution to the literature is to go beyond simply identifying who makes the decisions or identifying whether the sample of households demonstrates a pattern of cooperative or noncooperative outcomes. Instead, we seek to understand the reasons why particular individuals are involved in making decisions and relate this to outcomes. By considering both a production and consumption decision, we are able to demonstrate that the patterns vary across domains. This suggests that researchers should not interpret findings within one domain as indicative of how a household operates in all domains. Since the vast majority of the existing literature on intrahousehold bargaining issues focuses on the decisions of husbands and wives, we frame most of our analysis in this perspective. The method and instrument that we propose can however be extended to other individuals within the household.

The rest of the paper is organized as follows.

2. Intrahousehold decision-making: a literature review

The study of intrahousehold decision-making relates to two distinct strands of the literature: one that concentrates on intrahousehold bargaining issues and another that focuses on women's empowerment and agency. The conceptual links between these are however less clear than the literature implicitly assumes.

An early strand of the economics literature focused on challenging the unitary model of the household, in which the household acts as though it is a single decision-maker and pools all resources. This literature demonstrates, for example, that who earns the income or owns the assets affects the outcomes of household decisions.[3] The collective models of the household (Browning & Chiappori, 1998), of which the Nash bargaining models are a subset, assume that households reach Pareto efficient outcomes and they derive weights from the data to identify individual-level factors that affect these outcomes (McElroy & Horney, 1981; Manser & Brown, 1980). None of these models directly consider the processes of household decision-making, but the empirical evidence is convincing that individual-level factors do influence outcomes across a range of settings (Doss, 2013).

The noncooperative bargaining models, such as the separate spheres model (Lundberg & Pollak, 1993), do not assume Pareto Efficiency and instead test for it. A number of studies do not find efficient outcomes in field data (Udry, 1996; Dercon & Krishnan, 2000; Djebbari, 2005; McPeak & Doss, 2006; Duflo & Udry, 2004; Angelucci & Garlick, 2016; Hoel et al., 2018), or laboratory games (Munro, 2018 reviews the literature). Given that household members are presumed to be playing a repeated game with one another, it is a bit of a puzzle that they are not able to reach efficient outcomes. These analyses do not tell us why; only that potential gains within the household exist.

There is no direct link between obtaining cooperative or efficient outcomes and women's role in decision-making. A major challenge within the empirical literature is that bargaining power cannot be directly measured. Instead, researchers use a range of proxies. These include individuals' roles in decision-making, potential income, assets, assets brought to marriage, legal frameworks, education, and other measures of financial, economic, and legal power (Doss, 2013). The decision-making indicators are constructed from survey questions such as "who decides," "who has the final say," or "who makes most of the decisions" for a particular range of domains. These may be used individually or aggregated into an index of individuals' decision-making.

Using individuals' role in household decision-making as a proxy for bargaining power may be misleading for several reasons. First, they conflate the process of decision-making with the influence on the outcome of the decision (Donald et al., 2017). In some circumstances, individuals with more bargaining power or higher status may prefer to leave the decision-making process to others. A woman who makes decisions over what food to cook does not necessarily have higher bargaining power than her husband who assumes, without being involved in planning or preparing the meal, that the prepared food will cater to his tastes and preferences. Similarly, women with more bargaining power might choose not to be involved in agricultural decisions, preferring to

---

[2] In contrast to "predictive" validity, which refers to a test or score than can predict future outcomes, "concurrent" validity reflects the extent to which our vignettes effectively predict other contemporaneously-measured outcomes of interest that have been previously validated.

[3] Both (Doss, 1996; Strauss, Mwabu, & Beegle, 2000) review the early evidence on this.

focus on running a non-agricultural enterprise. It is thus important to measure *who* makes decisions as well as *why they are the decision-maker.*

Second, proxy measures typically equate independent decision-making with empowerment and agency. A common practice is then to code responses to questions about decision-making according to a linear ranking. In a normative sense, the highest level of female empowerment is usually thought to be the case in which a woman makes decisions alone. This is followed by a woman making decisions with her spouse (second best) and a woman not involved in decision-making (worst). But it is not obvious that this ranking is sensible (Peterman, Schwab, Roy, Hidrobo, & Gilligan, 2015; Seymour & Peterman, 2018). Husbands and wives may prefer to make decisions jointly. Some women who make decisions independently do so only because their husband is unable or unwilling to be involved; in these cases, the women shoulder heavy responsibility for the family. In a study of female-headed households among pastoralists on the Kenya/Ethiopia border, many respondents said that one of the disadvantages of being a single head of household is that they had no one with whom to share decision-making (McPeak, Little, & Doss, 2012). Thus, simply looking at the identity of the decision-maker may not provide the information that we expect.

A third concern is that many analyses that use women's role in decision-making only consider responses from women. Evidence suggests that men and women may provide different responses to questions about women's roles and that spousal agreement is important for improved outcomes (Ambler, Doss, Kieran, & Passarelli, 2017; Donald et al., 2017). In this paper, we do not explicitly compare the responses of husbands and wives (or the responses of wives living in polygynous households), but we include the responses of both husbands and wives in our analysis.

Finally, households make myriad decisions and the patterns of decision-making may vary across domains. This is particularly challenging for our understanding of rural agricultural households which make multiple and layered production and consumption decisions. Despite a long-standing literature on non-separability of household's production and consumption decisions in poor rural areas,[4] the economics literature on household decision-making has typically considered decision-making within one sphere and often only considered one or a few related outcomes. Analyses focusing on whether households obtain cooperative outcomes have typically analyzed consumption (Bobonis, 2009; Bourgignon, Browning, Chiappori, & Lechene, 1993; Browning, Bourguignon, Chiappori, & Lechene, 1994; Thomas & Chen, 1994) or production (Akresh, 2005; Chiappori, Fortin, & Lacroix, 2002) decisions, but generally have not assessed both domains for the same households. To the best of our knowledge, only one study assesses the Pareto efficiency of both consumption and production, finding that, while farming households in Burkina Faso, Senegal, and Ghana may not achieve productive efficiency, they cannot reject the hypothesis that these households achieve an efficient allocation of resources towards consumption (Rangel & Thomas, 2005). Most of these papers also do not allow for heterogeneity in efficiency across households, although the few studies that consider this find that cooperative or efficient outcomes vary across households (Angelucci & Garlick, 2016; Hoel, 2015; Hoel, Hidrobo, Bernard, & Ashour, 2019)

In this paper, we contribute to the literature by going beyond simply identifying who makes the decisions or identifying the patterns of cooperation or noncooperation across a sample of households. Instead, we seek to understand the reasons why particular individuals are involved in making decisions and relate this to outcomes. By considering both a production and consumption decision, we are able to demonstrate that the patterns vary across domains.

3. Who decides: a household typology

Drawing on the extensive literature on household decision-making, we identify five types of households based on five potential ways of understanding 'why' one makes the decisions within the household. These five categories are not necessarily exclusive, but each has a different key element.

The first household type is one in which one person (or the couple together) makes all decisions. We refer to this as the "unitary" model. In the unitary model, the household is assumed to act as one either because of common preferences or because it has a dominant decisionmaker who may use violence or the threat of violence (Alderman, Chiappori, Haddad, Hoddinott, & Kanbur, 1995). We describe a unitary household as one in which the husband makes all decisions, the wife makes all the decisions, or the couple acts as if they are one, without speculating on the means through which they act as one.

We characterize the second household type as the "contributions" model, one where decision-making is based on individual contributions, whether in terms of resources (such as land or cows), income, or labor. For example, the wife may decide how to spend money from milk sales when she sells milk from her own cows. Sen asserts that each household member's contribution to output can legitimize "a correspondingly bigger share of the fruits of cooperation" (Sen, 1987, p. 136). Similarly, drawing from the psychology literature, Engle (1988) describes a contributions rule in which an individual's contribution to the household determines their proportion of household resources. Farmer and Teifenthaler (1995) also apply a variety of concepts of fairness, including the contribution rule, to the problem of how resources are distributed within households.

A third household type can be characterized as the "separate spheres" model where individuals each have separate domains in which they make the decisions (Carter & Katz, 1997; Lundberg & Pollak, 1993). Separate spheres reflects the noncooperative equilibrium that, although not Pareto efficient, may result due to transaction costs. Specialization in certain domains reduces the need for complex coordination.

A fourth type of household decision-making is one in which the person who decides is determined by community norms, rather than the individual preferences or bargaining power of the individuals in the household. We refer to this as the "norms" model. Duflo and Udry (2004) find evidence that households in Côte d'Ivoire exhibit expenditure patterns that match descriptions of the norms of household provision in that setting but contradict the collective household model.

Finally, in the last type of household, decision-making authority is based on information or knowledge. The decision-maker is described as the one who is most informed about that particular domain. We refer to this as the "most informed" model. Many development programs seek to provide information to individuals to improve welfare outcomes, claiming that imperfect information leads to inefficiencies. This reflects an implicit assumption that once information is given to a particular individual, he or she will be able to act upon it. This paper contributes to the literature by highlighting this tacit assumption.

These categories may overlap. The husband, for instance, may make decisions about managing the cattle because he owns them, livestock production is his domain, and he is the most knowledgeable about raising cattle. Moreover, community norms may influence other household types. For example, if norms dictate that young boys care for cattle while young girls conduct household

---

[4] E.g. (Janvry & Sadoulet, 2006) for a review.

chores, this may eventually result in the *separate spheres* or *most informed* models due to acquired competencies. To address concerns regarding potential overlap between typologies, we first ask respondents which types of couples they resemble and then ask which couple they most resemble. We also present correlations across types that respondents resemble in Appendix A. For both production and consumption, the highest positive correlations are between the *contribution* and *community norms* types, followed by the correlation between *separate spheres* and *community norms*. The largest negative correlation is between the *unitary* and *separate spheres* types. Given the imperfect correlations, we analyze each of the five types separately in our analysis. Our claim in this paper is simply that understanding the source of decision-making authority reported by the respondent, that is, 'why' one is entitled to make certain decisions, may be relevant for understanding the outcomes of household decision-making.

4. Context, data, and measures

4.1. Context and data

We study household decision processes among Fulani dairy farmers in Northern Senegal, who have a long nomadic pastoralist history. Given the semi-arid climate of the Sahel, the Fulani and their herds move daily and seasonally in search of water and pasture. Households can affect the amount of milk produced, particularly through enhanced access to animal feed and concentrates, water, veterinary care, and limited migration. Households decide how to allocate inputs across cows and whether to sell milk or keep it for home consumption. If milk is sold, they decide how to use the revenue from milk sales.

For the Fulani, gender roles in milk production and herd management are established at a young age: young boys are responsible for monitoring the herd, while girls are trained in domestic chores and milking cows (Parisse, 2012). These early roles lay the foundation for women's responsibility for milk production and men's responsibility for herd management and meat production. Decisions regarding livestock purchase, sales, feeding, vaccinations, and migration are typically more in men's domain, while milking and decisions about milk sales are more in women's domain. Traditionally, milk production and sales were merely a by-product of meat production and livestock sales, but in recent years, with the introduction of a dairy processing company, milk production has become a more important source of household revenue.

Data on household decision processes were collected as part of a larger randomized controlled evaluation to measure the impacts of a women's training program about milk production.[5] The study was conducted with dairy farmers who deliver milk to a local milk processing company in Northern Senegal, La Laiterie du Berger (LDB). Data used in this analysis come from a baseline survey conducted in November 2014 and an endline survey conducted in November 2015. The sample of farmers surveyed included all dairy farmers in the region who had delivered milk in the previous two years to the LDB. In total, 591 dairy farming households were surveyed at baseline and 583 were re-surveyed at endline. While specific to households engaged with the LDB, this sample nevertheless encompasses the majority of dairy farming households within a 50-kilometer radius from the plant.

Each survey round was composed of three parts: a household questionnaire, an individual questionnaire, and a child questionnaire. The household questionnaire contained detailed information on milk production and a cow-level roster with information on ownership, inputs, and outputs for each lactating cow near the concession.[6] The individual questionnaires were administered to male and female respondents who were married to each other.[7] They contain information on the relationship with LDB, milk production knowledge, risk preferences and trust, decision-making with respect to production and income generation, marriage history and social networks, and access to productive capital.[8] At endline only, the men's and women's questionnaires included a series of vignettes on milk production and consumption decisions explained in more detail below. Finally, the child questionnaire contains hemoglobin measurements for all children 12–71 months.

Our sample is the subset of households interviewed in the endline with at least one husband-wife pair. A total of 502 households completed the individual surveys and vignettes. Of these, 375 have responses from the husband and one wife, while 127 have responses from the husband and two wives.[9] As a result, 502 of the respondents are men and 629 are women, for a total of 1131 observations. Among the 375 couples with responses from the husband and only one wife, 91 are in polygynous unions.

4.2. Vignettes and their implementation

The vignettes were designed to elicit information on why certain individuals make decisions within specific domains. As noted above, in the endline survey, separate men's and women's questionnaires contained vignettes—or stories – about household decision-making.

Prior to conducting the vignettes, we asked a relatively standard set of questions about 'who' makes the decision concerning (a) the distribution of concentrate food among lactating cows and (b) how to spend income from the sale of milk. For ease of discussion, we refer to the former decision as the production decision and the latter as the consumption decision. Similar to other surveys, the response options included (1) the respondent without his or her spouse(s), (2) the respondent's spouse(s) without the respondent, (3) the respondent and his or her spouse(s) together, (4) the respondent and his or her spouse(s) separately, (5) another person or other people in the household, or (6) other(s) outside of the household. If the respondent reported (5) or (6), they were only asked a subset of the follow-up questions, which are not analyzed in this paper.

We tailored the vignettes to the response to these initial questions. For example, if the respondent reported that the wife decides without her husband how to spend money from milk sales, then the enumerator read a series of five vignettes in which the wife makes this decision. Each vignette provides a different reason for why the wife makes the decision. Similarly, if the respondent reported that the husband makes the decisions alone, the vignettes reflected this pattern. If the respondent stated that the husband and wife decide together how to spend money from milk sales, then the enumerator read a series of five vignettes each giving a different reason for why the couple makes the decision together.

These fives reasons, described below, remain constant regardless of who reportedly made the decision.

Before administering the production vignettes, the enumerator explained, "I would like to tell you some stories about five couples in which [the husband/the wife/the husband and wife together/or the husband and wife separately] decide(s) how to allocate food among the lactating cows. After reading these stories, I will ask you some questions about how you view these couples. The five couples are married and, in each couple, the husband and wife/wives possess lactating cows. They each have concentrated food, permitting them to ensure that certain cows stay healthy and productive." For the consumption vignettes, the enumerator changed the decision so that it was about how to spend money from the sale of milk.

The enumerators read all five stories and provided a visual aid (see Appendix B) to help the respondents distinguish among the couples. As an example, the production stories can be summarized as follows for the case where the husband makes the decisions:[10]

- Vignette 1 (*Unitary*): The first story describes how Abdul decides how to allocate concentrate food among lactating cows because he makes all of the decisions for the family.
- Vignette 2 (*Contribution*): The second story states that Mody decides how to allocate the concentrate food among the lactating cows because the concentrate food comes from his own milk sales.
- Vignette 3 (*Separate Spheres*): The third story explains that Mousa decides how to allocate the concentrate food among the lactating cows because he makes all of the decisions about that particular activity while his wife makes other types of decisions for the family.
- Vignette 4 (*Norms*): The fourth story depicts how Sileye decides to allocate the concentrate food among lactating cows because it is the norm in their community for him to make these decisions.
- Vignette 5 (*Most informed*): The fifth story portrays how Bocar decides how to allocate the food among lactating cows because he has the most information regarding this activity.

If the respondent had said that someone other than the husband alone made the decision, the vignette was changed to reflect the identity of the decision-maker(s).

Once the respondent was familiar with all five stories, the respondent was asked whether he or she and his or her spouse (s) were similar to or different from each of the five couples, with response options of (1) completely similar, (2) somewhat similar, (3) somewhat different, and (4) completely different. The enumerator then asked which couple they resembled most, with only one possible answer. In our analysis, we analyze the response to this follow-up question regarding which couple they most resemble to identify the decision type.

Next, the enumerator asked if the decision-maker makes good choices for the respondent's household as a whole and for the respondent him/herself. Response options included (1) Yes, the best choices, (2) Yes, good choices, (3) No, not very good choices, and (4) No, bad choices. We use the responses for the household as one set of outcome measures.[11] The same approach was used regarding consumption decisions, with each couple described as deciding how to spend money from milk sales.

4.3. Outcome measures

We assess the usefulness of the vignettes in predicting production and consumption-related outcomes, comparing responses to the production decision vignettes to production-related outcomes and consumption decision vignettes to consumption-related outcomes. For each, we consider both objective and subjective measures of outcomes. Objective measures of well-being include the standardized average milk output per cow (production) and the standardized average hemoglobin level for children 12–71 months (consumption).[12] Hemoglobin concentration is used to detect anemia of children, which is 80 percent in our sample population. Iron-deficiency anemia is responsive to improved diets, food fortification, and supplementation (Le Port, Bernard, Hidrobo, Birba, Rawat, & Ruel, 2017). Subjective measures are based on respondents' own assessment of whether the identified decision-maker makes good choices for the respondent's household. For both production and consumption, the majority of men and women respondents report that the decision-maker makes the best choices for the household (approximately 85 percent). Very few (2 percent) respondents report that the decision-maker did not make good choices for their household.[13] Summary statistics for the outcome measures are presented in Appendix Table D.1.

5. How reliable are vignette-based measures?

To be analytically useful, a measurement tool must display an acceptable level of reliability. Reliability is understood as the instrument's capacity to produce a consistent measure independent of variations in the implementation of the survey.[14] We first assess *observer reliability*, according to which one expects that enumerators' characteristics do not affect respondents' answers to the survey instrument. While we did not randomly allocate enumerators across surveyed households, we also did not allocate them based on expected household types as measured by the vignettes. We therefore use this independent allocation of enumerators to assess whether their characteristics, and in particular their gender, is correlated with respondents' answers to vignette questions.

Second, we investigate *respondent reliability* by assessing whether respondent characteristics systematically affect the answers given. We do so by making use of spouses' independent answers to the same vignette questions regarding their own households and evaluate whether, in the same household, age and sex affect the response. Because vignettes are in part meant to capture gender-based participation in decision-making, we expect to find some differences across male and female answers. Thus, as a benchmark, we run similar tests on the widely used questions regarding 'who' makes the decision to gauge the vignettes' respondents' reliability.

Lastly, we test for issues of *anchoring effects*, according to which the order of questions may affect responses. Specifically, we introduced two random variations in the ordering of the questionnaire:

---

[10] An excerpt from the survey instrument can be found in Appendix B.

[11] We focus on whether the decision was best for the household as opposed to the respondent because the sample has more women than men, which would impose structural bias on this outcome if women make decisions that promote their own interests.

[12] Hemoglobin levels are first converted to sex and age adjusted z-scores, before taking the average level for the household (in cases where there is more than one child 12–71 months). Average milk output per cow and average hemoglobin level per child are standardized by dividing the difference between each observed value and the mean by the standard deviation, resulting in a mean of zero and a standard deviation of one.

[13] Due to the small number of responses in the categories "No, not very good choices" and "No, bad choices," we later combine these responses into one "No" category.

[14] Most investigations into the reliability of an instrument also include so-called test-retest measures, in which a respondent is asked a question and then asked the same question again after some amount of time (for instance, two weeks). Reliability is then assessed as the extent to which the same responses are given both times (see Bernard & Taffesse (2014) or Laajaj & Macours (2017) for recent examples). For logistical reasons, we were not able to perform test-retest measures in our study.

for half of the respondents, consumption-related questions were asked before production questions and vice versa; for half of the questionnaires, respondents were first asked about the type of household that they admire before answering which household they most resemble. We test whether these ordering variations caused systematic differences in the way respondents answered the vignette-based questions.

We test for observer reliability, respondent reliability, and anchoring effects by estimating OLS regressions of each household typology on each factor separately (enumerator characteristics, respondent characteristics, and ordering). For respondent reliability tests, for which sex and age varies across respondents within the same household, we add household fixed effects to the estimations. Results are presented in Table 1, where each cell is the result of an independent estimation. Specifically, results in the first two rows are obtained from the following model:

$$Y_{ih}^d = \alpha + \beta W_{ih}^d + \theta_h + \varepsilon_{ih}$$

where Y_{ih}^d is a binary measure of whether respondent i from household h for consumption or production decision d is of the type referenced in the column heading. W_{ih}^d is the individual characteristic referred to in the row headings, and θ_h is a vector of household-level fixed effects. We do not control for any other household or individual characteristics in these regressions.

The model used for the last three rows is similar apart from the removal of household-level fixed effects θ_h (since the independent variables of interest do not vary within household). With enumerator and questionnaire ordering varying between and not within household, we nevertheless account for non-independent errors

across individuals of the same household by clustering the standard errors at the household-level.

We find little evidence of respondent reliability issues: gender and age only affect the likelihood that the decision-maker is chosen because they are the *most informed* in production decisions. Regarding observer reliability, our results suggest that male enumerators are more likely to obtain responses to vignette questions associated with *community norms* and less likely to obtain responses to questions associated with *most informed*, for production decisions. For consumption decisions, our results suggest that male enumerators are more likely to obtain responses to questions associated with the *unitary* model and less likely to obtain responses associated with *most informed*. We also find evidence of anchoring effects. When asked about production vignettes (vignettes A) before consumption ones, respondents are less likely to say that their household is most like the *community norms* model in production, while they are less like the *unitary* model in consumption. Similarly, when first asked about themselves before a couple they admire, respondents are less likely to report the *most informed* model in production, and less likely to report the *contribution* model in consumption. While none of the reported coefficients are large in magnitude, they do call for specific attention to questionnaire design.

These reliability issues are not specific to vignettes, however. In Table 2 we report the same set of estimates, this time using the "who decides" questions instead of the vignettes. We also find evidence of significant reliability issues. In particular, we find signs of respondent bias that appear more pronounced than in the vignette-based questions. For the production decision, a domain dominated by men, men claim more sole decision-making of hus-

Table 1
Reliability test vignettes.

	Production					Consumption				
	Unitary	Contribution	Separate spheres	Norms	Most informed	Unitary	Contribution	Separate spheres	Norms	Most informed
Respondent is male	−0.009	−0.026	−0.023	0.007	0.051	0.014	−0.026	0.035	−0.013	−0.010
	(0.029)	(0.016)	(0.020)	(0.019)	(0.019)*	(0.027)	(0.019)	(0.024)	(0.019)	(0.024)
Constant	0.427	0.090	0.148	0.104	0.231	0.304	0.122	0.217	0.121	0.235
	(0.019)**	(0.011)**	(0.013)**	(0.013)**	(0.016)**	(0.018)**	(0.013)**	(0.016)**	(0.013)**	(0.016)**
N	1070	1070	1070	1070	1070	1065	1065	1065	1065	1065
Age of respondent	−0.002	−0.001	−0.002	−0.000	0.005	0.001	−0.002	0.001	−0.000	0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)**	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.492	0.121	0.221	0.116	0.050	0.267	0.189	0.205	0.138	0.201
	(0.077)**	(0.044)**	(0.054)**	(0.051)*	(0.067)	(0.074)**	(0.052)**	(0.066)**	(0.052)**	(0.066)**
N	1069	1069	1069	1069	1069	1064	1064	1064	1064	1064
Enumerator is male	0.069	−0.008	−0.027	0.072	−0.106	0.120	0.004	−0.055	0.002	−0.071
	(0.036)	(0.018)	(0.025)	(0.018)**	(0.033)**	(0.031)**	(0.022)	(0.031)	(0.022)	(0.031)*
Constant	0.377	0.084	0.156	0.059	0.324	0.231	0.108	0.269	0.114	0.278
	(0.029)**	(0.015)**	(0.021)**	(0.012)**	(0.029)**	(0.023)**	(0.017)**	(0.026)**	(0.019)**	(0.027)**
N	1069	1069	1069	1069	1069	1065	1065	1065	1065	1065
Production Vignettes first	0.064	0.027	0.013	−0.062	−0.042	−0.064	−0.010	0.033	−0.011	0.052
	(0.033)	(0.017)	(0.023)	(0.020)**	(0.029)	(0.030)*	(0.021)	(0.028)	(0.021)	(0.028)
Constant	0.391	0.065	0.132	0.138	0.274	0.341	0.116	0.217	0.121	0.206
	(0.023)**	(0.011)**	(0.015)**	(0.016)**	(0.021)**	(0.022)**	(0.016)**	(0.019)**	(0.016)**	(0.018)**
N	1070	1070	1070	1070	1070	1065	1065	1065	1065	1065
Question 7 first	0.030	0.017	0.004	0.010	−0.061	0.053	−0.047	0.038	−0.015	−0.030
	(0.033)	(0.017)	(0.023)	(0.020)	(0.029)*	(0.030)	(0.021)*	(0.028)	(0.021)	(0.028)
Constant	0.407	0.070	0.136	0.102	0.284	0.283	0.135	0.213	0.123	0.246
	(0.023)**	(0.011)**	(0.016)**	(0.013)**	(0.022)**	(0.021)**	(0.017)**	(0.019)**	(0.016)**	(0.022)**
N	1070	1070	1070	1070	1070	1065	1065	1065	1065	1065

Standard errors in parenthesis clustered at the household level. *$p < 0.1$ **$p < 0.05$; ***$p < 0.01$. All dependent variables are binary measures of the household type that the respondent most resemble

Table 2
Reliability test on who decides questions.

	Production			Consumption		
	Husband without wife	Wife without husband	Husband and wife together	Husband without wife	Wife without husband	Husband and wife together
Respondent is male	0.077	−0.086	0.025	−0.011	0.052	−0.023
	(0.025)**	(0.018)**	(0.020)	(0.022)	(0.024)*	(0.022)
Constant	0.532	0.193	0.218	0.239	0.487	0.208
	(0.016)**	(0.012)**	(0.013)**	(0.014)**	(0.016)**	(0.014)**
N	1112	1112	1112	1112	1112	1112
Age of respondent	0.002	−0.003	0.002	−0.002	0.003	−0.001
	(0.002)	(0.001)**	(0.001)	(0.001)	(0.002)*	(0.001)
Constant	0.463	0.297	0.161	0.309	0.359	0.231
	(0.068)**	(0.051)**	(0.056)**	(0.059)**	(0.067)**	(0.060)**
N	1111	1111	1111	1111	1111	1111
Enumerator is male	−0.082	−0.025	0.124	0.028	−0.074	0.060
	(0.037)*	(0.028)	(0.029)**	(0.031)	(0.038)*	(0.027)*
Constant	0.620	0.172	0.148	0.216	0.559	0.158
	(0.030)**	(0.023)**	(0.021)**	(0.024)**	(0.031)**	(0.021)**
N	1111	1111	1111	1111	1111	1111
Production Vignettes first	−0.009	−0.035	0.043	−0.079	0.051	0.050
	(0.036)	(0.026)	(0.031)	(0.030)**	(0.036)	(0.027)
Constant	0.571	0.172	0.208	0.273	0.485	0.173
	(0.025)**	(0.019)**	(0.021)**	(0.022)**	(0.026)**	(0.018)**
N	1112	1112	1112	1112	1112	1112

Standard errors in parenthesis clustered at the household level. $*p < 0.1$ $**p < 0.05$; $***p < 0.01$. All dependent variables are binary measures of who decides.
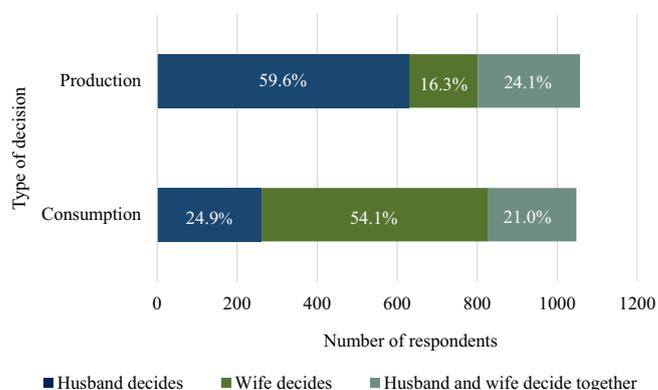
bands and less sole decision-making of wives than women claim. In contrast, for the consumption decision, which is dominated by women, women claim more sole decision-making power than men report. Age is also significantly correlated with the wife saying she decides without her husband for both production and consumption. Similarly, we find evidence of observer bias, with male enumerators being less likely to obtain answers for husbands deciding without wives for production and wives deciding without husbands for consumption decisions, and more likely to obtain answers where husbands and wives make decisions together. Finally, we find some evidence of anchoring effects with the order of production versus consumption decisions influencing who decides in consumption but not production.[15] In particular, when the production vignettes were administered first, fewer respondents report that husbands make consumption decisions without wives.

Overall, vignette-based assessments of 'why' certain individuals make a particular decision display reliability issues. These issues call for careful interpretation of answers, controlling for respondent characteristics (and in particular gender) in regression frameworks, as well as extended enumerator training to reduce potential observer biases. These reliability issues are, however, comparable to those of 'who decides' questions, which are currently employed in many surveys.

6. Are outcomes correlated with household type?

In this section we evaluate whether vignette-based measures of household types—which measure why a certain individual or couple makes decisions—explain variation in household outcomes, above and beyond what is explained by who decides. In Section 6.1, we present descriptive information regarding who makes production and consumption decisions and then display the household types, disaggregated by who decides. Since many studies focus on who makes decisions, Section 6.2 first present a benchmark
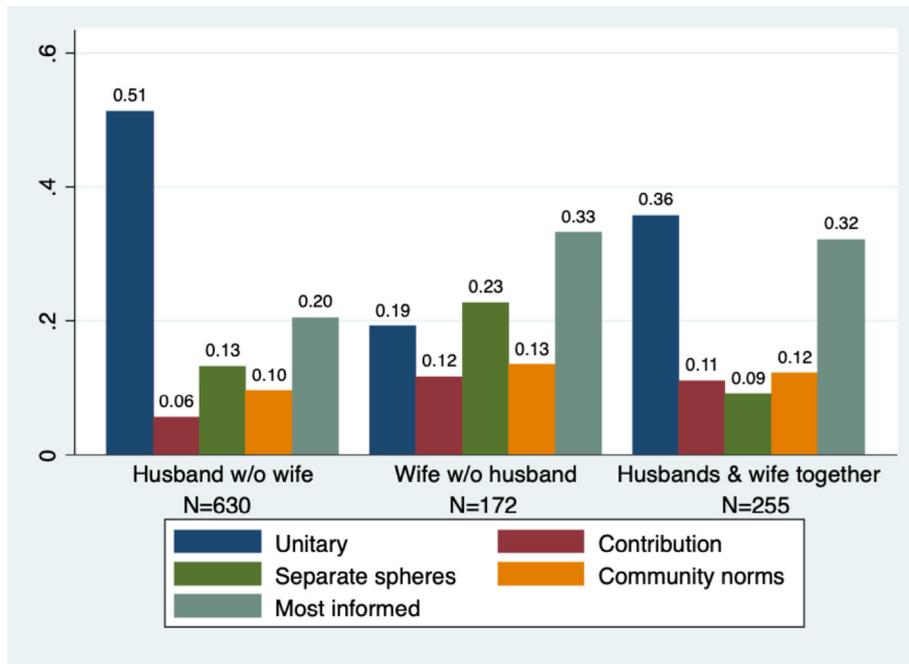

Fig. 1. Who decides? The production decision refers to who allocates food inputs among lactating cows and the consumption decision refers to who decides how to spend money obtained from milk sales.

model of the relationship between who decides and several household outcomes. To investigate the degree of complementarity between who decides and why, we add controls for household types and, finally, we interact who decides with household types.

6.1. Correspondence between 'who' decides and household types

In Fig. 1 we present the sample distributions of answers to questions on 'who' decides for production and consumption decisions. It reveals that, while husbands in northern Senegal most frequently decide how to allocate food among lactating cows, the majority of wives decide how to spend income from milk sales. This reflects the traditional gender roles among the Fulani, as described by Parisse (2012), in which men are responsible for herd management while women manage milk marketing.

In Figs 2a and 2b we combine the answers regarding who decides with the type of couple that respondents most resemble (see also Appendix Figures D.1.a through D.1.d for analysis disaggregated by respondent sex). For all subsequent analysis we only

---

[15] We do not look at anchoring effects with respect to the ordering of which couple they admire because this question always occurred after the response to who makes the decision.

Fig. 2a. Production: Type of household by who decides. This figure presents the distribution of household types for respondents based on their reporting of whether husbands decide without wives how to allocate food among lactating cows, that wives make this decision without husbands, or that couples make this decision together.
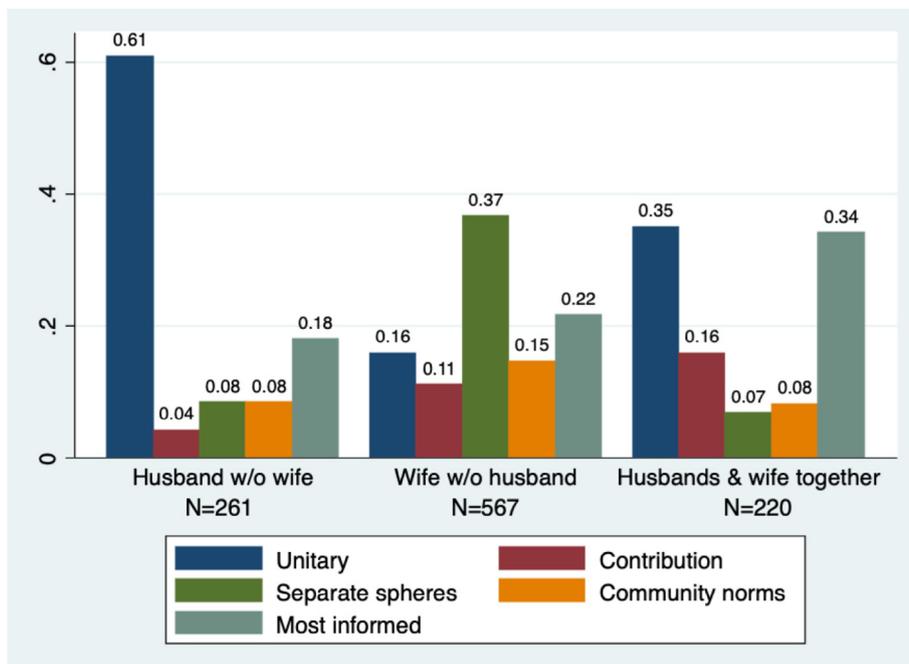
Fig. 2b. Consumption: Type of household by who decides. This figure presents the distribution of household types for respondents based on their reporting of whether husbands decide without wives how to spend money from milk sales, wives make this decision without husbands, or that couples make this decision together.

include observations where the identity of the decision-maker is either 1) husband without wife; 2) wife without husband; or 3) wife and husband together. The other categories have too few observations (see Appendix tables D.2 and D.3).

For both decisions we find a strong correspondence between the husband being the main decision-maker and the household being categorized as the *unitary* type. Over 50% (60%) of the respondents who said that the husband made the decisions regarding production (consumption) reported that in their household one person made most of the decisions. However, a significant share (around 20% for both decisions) considered their household to be the *most informed* type, while around 10 percent considered it to be the

separate spheres type. There is more diversity in answers when the wife is reported as the main decision-maker. In this case, respondents are more likely to report that they resemble the *most informed* type for production, and the *separate spheres* type for consumption. These only represent one third of the answers, however, with the remaining responses distributed across the other types. When both husbands and wives jointly make the decision for production and consumption, respondents mostly assign the *unitary* or the *most informed* type to their household, in fairly equal proportions.

Overall, despite a significant correspondence between husbands being in charge of the decisions and the *unitary* type of households, we find important heterogeneity of household types within each decision-maker category. In other words, respondents find different reasons to explain the fact that a given individual within their household is the decision-maker.

6.2. To what extent do vignettes help explain outcomes?

We assess how the different household types correlate with outcome variables using the subjective and objective outcomes for both production and consumption decisions. As a benchmark, we start from the analysis of the correlations between who decides and the outcomes of interest, as is usually reported in empirical analyses of decision-making:

$$Y_{ih}^d = \alpha + \boldsymbol{D}_{ih}^{d'}\boldsymbol{\beta} + \boldsymbol{X}_{ih}^{d'}\boldsymbol{\gamma} + \varepsilon_{ih} \tag{1}$$

where Y_{ih}^d is the production or consumption outcome d for individual i from household h. $\boldsymbol{D}_{ih}^d$ is a vector of dummy variables indicating whether it is the wife without her husband or the husband and wife together who decide for decision domain d. The omitted category is the husband without his wife, such that coefficients in the $\boldsymbol{\beta}$ vector measure the difference in means of each category compared to the husband deciding alone. $\boldsymbol{X}_{ih}^d$ is a vector of control variables that includes individual characteristics (age, sex, polygyny status, and literacy status) and household characteristics (milk route, the number of lactating cows, household size, and number of children 0–5 years[16]). See Appendix table C.1 for summary statistics on the control variables. Standard errors are clustered at the household level. We run Ordinary Least Squares/Linear Probability models for all outcomes.[17]

We then add household type to the estimation equation to analyze its association with the production or consumption outcomes, holding who decides constant:

$$Y_{ih}^d = \alpha + \boldsymbol{D}_{ih}^{d'}\boldsymbol{\beta} + \boldsymbol{T}_{ih}^{d'}\boldsymbol{\delta} + \boldsymbol{X}_{ih}^{d'}\boldsymbol{\gamma} + \varepsilon_{ih} \tag{2}$$

where $\boldsymbol{T}_{ih}^d$ is a vector of dummy variables indicating the *contribution*, *separate spheres*, *norms*, or *most informed* type, for decision domain d. The omitted decision-maker category is the husband deciding without his wife and the omitted household category is the *unitary* type, such that coefficients in the $\boldsymbol{\delta}$ vector measure the difference in means of each category compared to the *unitary* category.

Lastly, since we are interested in both who decides and why, we estimate the impacts of the interaction between who decides and the household type on subjective and objective outcomes:

$$Y_{ih}^d = \alpha + \boldsymbol{D}_{ih}^{d'}\boldsymbol{T}_{ih}^d\boldsymbol{\eta} + \boldsymbol{X}_{ih}^{d'}\boldsymbol{\gamma} + \varepsilon_{ih} \tag{3}$$

The interaction across who decides and types creates 15 individual indicators. The omitted category is the husband deciding without his wife because he makes all decisions (*unitary* type), such that coefficients in the $\boldsymbol{\eta}$ vector estimate the difference in means of each interacted category compared to this omitted category.

6.2.1. Results

Table 3 presents the results of estimating Eq. (1). For production, there are no significant associations between who decides and the outcomes of interest. For consumption, the husband and wife deciding together is associated with significantly lower child hemoglobin levels relative to the omitted category in which the husband decides alone. Thus, when simply considering who decides and ignoring the rationale for why that person decides, one might conclude that joint decision-making is worse for child nutrition than the husband deciding alone how to spend milk money (see Appendix Tables D.4 and D.5 for regressions disaggregated by respondent sex).

Adding household typology (Eq. (2)) does not qualitatively change most of the findings on the relationship between who decides and production and consumption outcomes, but the negative correlation between the wife deciding without the husband and milk production becomes statistically significant (Table 4). Compared to the *unitary* type (the omitted household category), the *contribution* and *separate spheres* types are associated with a lower probability that the decision maker made the best production decision while the *norms* type is correlated with lower milk production. The only typology that performs significantly better than the *unitary* type for any of the production outcomes is the *most informed* category. When the *most informed* individual or couple makes the production decision, it is associated with significantly higher milk output than when one person or the couple decides because they are the *unitary* type. Conversely, for consumption outcomes, none of the types are significantly associated with the subjective measure while the *contribution*, *norms*, and *most informed* categories are significantly associated with better hemoglobin levels compared to the *unitary* category (see Appendix Tables D.6 and D.7 for regressions disaggregated by respondent sex).

Finally, in Table 5 we regress the indicators created from interacting *who* decides with *why* that individual or couple decides on the outcomes of interest.[18] This preferred specification clarifies that the negative association between wives deciding and milk output that we observed in Table 4 is driven by wives deciding alone because they make all decisions or due to norms. Similarly, the negative correlation between joint decision-making and child hemoglobin levels that we also observed in Table 4 is only significant when the couple decides together because they are the *unitary* type, relative to a man deciding because he is the *unitary* type.

Many of the interactions between who decides and why are negatively associated with production outcomes, compared to the husband making the production decision because he is the *unitary* type (the omitted category). The main exception to these negative correlations occurs when the husband makes the production decision because he is *most informed*, which is associated with significantly higher milk production relative to the husband deciding because he makes all decisions (*unitary* type). When the wife or couple make decisions because they are the *most informed*, the out-

---

[16] Consumption outcomes also include an indicator for whether or not there was more than 1 child measured for hemoglobin.

[17] Our findings do not change when we use a probit specification for the binary outcomes regarding whether the decision-maker made the best production or consumption decisions for the household. Results are available upon request.

[18] For clarity of exposition, we create 15 interaction terms: one for each interaction between who decides (husband without wife, wife without husband, or husband and wife together) and why (unitary, contribution, separate spheres, norms, and most informed). We then exclude the category husband decides without wife because he is the unitary type so that all coefficients can be interpreted with respect to this omitted variable. In Appendix Table D.8. we present a reparameterized version of this table that includes the two categorical main effects and their interaction.

Table 3
Who decides.

	Production		Consumption	
	Best production decision for household	Standardized weekly milk output (L) per cow	Best consumption decision for household	Standardized hemoglobin per child 12–71 months
Wife without husband	−0.05	−0.11	0.01	0.06
	(0.03)	(0.09)	(0.03)	(0.10)
Husband and wife together	−0.01	−0.05	0.02	−0.22
	(0.03)	(0.09)	(0.03)	(0.11)**
Adjusted R-squared	0.00	0.04	−0.01	0.01
N	1042	1043	1033	788

Omitted category is husband decides without wife. The vector of control variables includes individual characteristics (age, sex, polygyny status, and literacy status) and household characteristics (milk route, the number of lactating cows, household size, and number of children 0–5 years). For consumption outcomes, we also control for whether hemoglobin levels were collected for more than one child per household. We run Ordinary Least Squares/Linear Probability models for all outcomes. Standard errors in parenthesis are clustered at the household level. $^*p < 0.1$ $^{**}p < 0.05$; $^{***}p < 0.01$

Table 4
Who decides and type.

	Production		Consumption	
	Best production decision for household	Standardized weekly milk output (L) per cow	Best consumption decision for household	Standardized hemoglobin per child 12–71 months
Wife without husband	−0.03	−0.15	−0.00	−0.03
	(0.04)	(0.09)*	(0.03)	(0.11)
Husband and wife together	−0.00	−0.08	0.03	−0.28
	(0.03)	(0.09)	(0.04)	(0.11)**
Contribution	−0.12	0.18	−0.07	0.24
	(0.05)**	(0.16)	(0.05)	(0.12)**
Separate spheres	−0.10	0.10	0.05	0.14
	(0.04)***	(0.10)	(0.03)	(0.13)
Norms	−0.06	−0.19	−0.04	0.28
	(0.04)	(0.07)***	(0.05)	(0.13)**
Most informed	−0.01	0.19	0.02	0.19
	(0.03)	(0.06)***	(0.03)	(0.11)*
Adjusted R-squared	0.01	0.05	−0.00	0.01
N	1042	1043	1033	788

Omitted category is husband decides without wife and omitted type is unitary. The vector of control variables includes individual characteristics (age, sex, polygyny status, and literacy status) and household characteristics (milk route, the number of lactating cows, household size, and number of children 0–5 years). For consumption outcomes, we also control for whether hemoglobin levels were collected for more than one child per household. We run Ordinary Least Squares/Linear Probability models for all outcomes. Standard errors in parenthesis are clustered at the household level. $^*p < 0.1$ $^{**}p < 0.05$; $^{***}p < 0.01$

comes are not observably different than the outcomes achieved by the male *unitary* type.

Using Wald tests, we assess whether the *unitary* and *most informed* types differ within each category of who decides. We reject the null hypothesis of equality between coefficients for wives who decide alone because they are the *unitary* type as opposed to the *most informed* for milk production and hemoglobin levels. In other words, objective household outcomes are better when wives make decisions alone because they are *most informed*. As we observed previously, when husbands make decisions alone because they are *most informed* rather than the *unitary* type, it is also associated with higher milk production. Conversely, we fail to reject equality between these two typologies when the husband and wife decide together for all outcomes.

We then test for joint significance by type. We reject the null hypothesis of no joint significance for the *unitary* type for both production outcomes as well as for hemoglobin levels, suggesting that the husband *unitary* type achieves better outcomes than the wife and couple *unitary* types. For the *contribution* and *separate spheres* types, we reject the null hypothesis for satisfaction with the pro-

duction decision, while for the *norms* type we reject the null hypothesis for milk production and for satisfaction with the consumption decision. This suggests that the *contribution*, *separate spheres*, and *norms* typologies are associated with worse outcomes than the male *unitary* type deciding. For the *most informed* type, on the other hand, we fail to reject the null hypothesis across all outcomes, implying that it is statistically indistinguishable from the male *unitary* type.

Although the adjusted R-squared values are small, they do increase across the three specifications (the only exception is the adjusted R-squared in the second specification for hemoglobin is larger than in the third specification). This finding supports our claim that understanding both who makes decisions and why explains differences in household outcomes better than simply knowing who decides.

7. Discussion and conclusion

Developing policies and programs that reduce gender inequalities and the inefficiencies propagated by such inequalities requires

Table 5
Who decides interacted with type.

	Production		Consumption	
	Best production decision for household	Standardized weekly milk output (L) per cow	Best consumption decision for household	Standardized hemoglobin per child 12–71 months
Husband without wife, Contribution	−0.08	0.30	0.06	0.04
	(0.07)	(0.34)	(0.09)	(0.18)
Husband without wife, Separate spheres	−0.09	−0.02	0.06	0.09
	(0.05)*	(0.15)	(0.07)	(0.28)
Husband without wife, Norms	−0.09	−0.28	−0.12	0.31
	(0.05)	(0.09)***	(0.10)	(0.34)
Husband without wife, Most informed	−0.04	0.16	−0.07	−0.12
	(0.04)	(0.09)*	(0.07)	(0.18)
Wife without husband, Unitary	−0.15	−0.53	−0.05	−0.16
	(0.08)**	(0.09)***	(0.05)	(0.17)
Wife without husband, Contribution	−0.14	0.07	−0.10	0.14
	(0.10)	(0.15)	(0.06)*	(0.18)
Wife without husband, Separate spheres	−0.06	0.04	0.04	0.05
	(0.06)	(0.13)	(0.04)	(0.14)
Wife without husband, Norms	−0.03	−0.26	−0.07	0.19
	(0.07)	(0.13)*	(0.06)	(0.13)
Wife without husband, Most informed	−0.05	0.06	0.03	0.16
	(0.06)	(0.14)	(0.04)	(0.14)
Husband and wife together, Unitary	0.02	−0.06	0.02	−0.42
	(0.03)	(0.11)	(0.05)	(0.16)***
Husband and wife together, Contribution	−0.18	−0.14	−0.07	−0.03
	(0.08)**	(0.12)	(0.07)	(0.20)
Husband and wife together, Separate spheres	−0.28	0.11	−0.13	−0.22
	(0.11)**	(0.21)	(0.12)	(0.42)
Husband and wife together, Norms	−0.06	−0.25	0.10	−0.16
	(0.07)	(0.15)	(0.06)	(0.33)
Husband and wife together, Most informed	0.01	0.07	0.05	−0.08
	(0.04)	(0.11)	(0.05)	(0.18)
Constant	0.93	−0.14	0.81	−0.14
	(0.06)***	(0.23)	(0.07)***	(0.27)
Adjusted R-squared	0.02	0.06	0.00	0.00
N	1042	1043	1033	788
P-value: Wife without husband, unitary = Wife without husband, most informed	0.29	0.00	0.12	0.07
P-value: Husband and wife, unitary = Husband and wife, most informed	0.91	0.26	0.61	0.10
P-value: Joint Unitary type = 0	0.08	0.00	0.50	0.03
P-value: Joint Contribution type = 0	0.05	0.52	0.26	0.86
P-value: Joint Separate Spheres type = 0	0.02	0.95	0.38	0.93
P-value: Joint Norms type = 0	0.34	0.02	0.07	0.36
P-value: Joint Most Informed type = 0	0.51	0.35	0.41	0.50

Omitted category is husband decides without wife because he is the unitary type. The vector of control variables includes individual characteristics (age, sex, polygyny status, and literacy status) and household characteristics (milk route, the number of lactating cows, household size, and number of children 0–5 years). For consumption outcomes, we also control for whether hemoglobin levels were collected for more than one child per household. We run Ordinary Least Squares/Linear Probability models for all outcomes. Standard errors in parenthesis are clustered at the household level. *p < 0.1; **p < 0.05; ***p < 0.01

a more thorough understanding of decision-making processes within households. Empirical studies of the household often rely on who makes decisions as proxies for bargaining power within households. We argue that this is insufficient. We question the assumption that making more decisions implies that one has more bargaining power. Understanding both *who* makes production and consumption decisions within the household as well as *why* that person (or the couple) is the decision-maker can provide more insights into intrahousehold dynamics than simply considering who makes the decision.

By analyzing a series of vignettes, we shed light on the black box of household decision-making processes across production and consumption domains. Outcomes that appear to be related to the gender of the decision-maker are actually driven by decision-making typologies within the household. In particular, focusing on who decides suggests that joint decision-making on how to spend money from milk sales is correlated with worse child nutrition. Interacting who decides with why reveals that this result

is driven by couples deciding as the *unitary* type. Similarly, focusing on who decides for production decisions suggests that a wife deciding without her husband leads to worse milk output. However, this is driven by wives deciding without their husbands either because they are the *unitary* type or following *norms*. Thus, researchers and policymakers should be cautious in interpreting differences in outcomes based on the identity of the decision-maker.

The decision-making typologies that we identify in this paper help explain heterogeneous outcomes across households. If a household follows the *unitary* typology, they may be better off with a male decision-maker than with a female or the couple making decisions. However, households in which husbands (wives) make production decisions because they are *most informed* produce more milk than households in which husbands (wives) make production decisions because they are the *unitary* type. Similarly, children from households where wives make consumption decisions because they are *most informed* have better hemoglobin levels than children from households where wives make the

decisions because they are the *unitary* type. Reducing barriers that inhibit the most knowledgeable household members from making decisions in any domain may improve household outcomes. In addition, closing information gaps between husbands and wives may increase women's ability to contribute to decisions—if they so choose—while ensuring that households are at least as well off as they were with a male making all decisions. These insights provide guidance on how agricultural extension and nutrition programs and policies may work to improve agricultural production, child health, as well as individual satisfaction with decision-making processes.

We demonstrate that there is a link between the rationale for decision-making and household outcomes across multiple domains using five different typologies. However, we do not know whether it is possible to change a household's typology, or whether it would have the desired effects on household outcomes. We provide here a measurement tool that may help other researchers and practitioners monitor the effects of their programs and their effects on household decision-making.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.worlddev.2019.104671.

References

Akresh, R. (2005). *Understanding Pareto inefficient intrahousehold allocations* Discussion Paper 1858. IZA.

Alderman, H., Chiappori, P.-A., Haddad, L., Hoddinott, J., & Kanbur, R. (1995). Unitary versus collective models of the household: Is it time to shift the burden of proof? *World Bank Research Observer, 10*(1), 1–19.

Ambler, K., Doss, C., Kieran, C., & Passarelli, S. (2017). He says, she says: Spousal disagreement in survey measures of bargaining power. *Economic Development and Cultural Change.* https://doi.org/10.1086/703082.

Angelucci, M., & Garlick, R. (2016). Heterogeneity in the efficiency of intrahousehold resource allocation: Empirical evidence and implications for investment in children. Mimeo.

Barter, C., & Renold, E. (1999). The use of vignettes in qualitative research. Social Research Update University of Surrey, Summer, 1–25.

Beaman, L., Chattopadhyay, R., Duflo, E., Pande, R., & Topalova, P. (2009). Powerful women: Does exposure reduce bias? *The Quarterly Journal of Economics, 124*(4), 1497–1540. https://doi.org/10.1162/qjec.2009.124.4.1497.

Benini, A. (2018). Subjective measures in humanitarian analysis. Geneva: Assessment Capacities Project – ACAPS.

Bobonis, G. (2009). Is the allocation of resources within the household efficient? New evidence from a randomized experiment. *Journal of Political Economy, 117*(3), 453–503.

Bourguignon, F., Browning, M., Chiappori, P.-A., & Lechene, V. (1993). Intra household allocation of consumption: A model and some evidence from French data. *Annales d'Economie et de Statistique, 29*, 137–156.

Browning, M., Bourguignon, F., Chiappori, P.-A., & Lechene, V. (1994). Income and outcomes: A structural model of intrahousehold allocation. *Journal of Political Economy, 102*(6), 1067–1092.

Browning, M., & Chiappori, P.-A. (1998). Efficient intra-household allocations: A general characterization and empirical tests. *Econometrica, 66*(6), 1241–1278.

Carter, M., & Katz, E. (1997). Separate spheres and the conjugal contract. In L. Haddad, J. Hoddinott, & H. Alderman (Eds.), *Intrahousehold resource allocation in developing countries: Models, methods and policies* (pp. 95–111). Baltimore, MD: Johns Hopkins University Press.

Chiappori, P.-A., Fortin, B., & Lacroix, G. (2002). Marriage market, divorce legislation and household labor supply. *Journal of Political Economy, 110*(1), 37–72.

Dercon, S., & Krishnan, P. (2000). In sickness and in health: Risk sharing within households in rural Ethiopia. *Journal of Political Economy, 108*(4), 688–727.

Djebbari, H. (2005). *The impact on nutrition of the intrahousehold distribution of power* Discussion Paper 1701. IZA.

Donald, A., Koolwal, G., Annan, J., Falb, K., & Goldstein, M. (2017). Measuring women's agency. Policy Research Working Paper No. 8148.

Doss, C. (2013). Intrahousehold bargaining and resource allocation in developing countries. *World Bank Research Observer, 28*(1), 52–78. https://doi.org/10.1093/wbro/lkt001.

Doss, C. R. (1996). Testing among models of intrahousehold resource allocation. *World Development, 24*(10), 1597–1609. https://doi.org/10.1016/0305-750X(96)00063-0.

Duflo, E., & Udry, C. (2004). *Intrahousehold resource allocation in Cote d'Ivoire: Social norms, separate accounts and consumption choices (No. w10498).* National Bureau of Economic Research.

Engle, P. L. (1988). Intra-household allocation of resources: Perspectives from psychology. In B. L. Rogers & N. P. Schlossman (Eds.), *Intra-household resource allocation.* Tokyo: United Nations University Press.

Farmer, A., & Teifenthaler, J. (1995). Fairness concepts and the intrahousehold allocation of resources. *Journal of Development Economics, 47*, 179–189. https://doi.org/10.1016/0304-3878(95)00099-F.

Hoel, J. B. (2015). Heterogeneous households: A within-subject test of asymmetric information between spouses in Kenya. *Journal of Economic Behavior and Organization, 118.* https://doi.org/10.1016/j.jebo.2015.02.016.

Hoel, J. B., Hidrobo, M., Bernard, T., & Ashour, M. (2019). Productive inefficiency and cooperation between spouses: Evidence from dairy farming in Senegal. Mimeo.

Janvry, A. De, & Sadoulet, E. (2006). Progress in the modeling of rural households' behavior under market failures. In A. de Janvry & R. Kanbur (Eds.), *Poverty, inequality and development: Essays in honor of Erik Thorbecke.* https://doi.org/10.1007/0-387-29748-0.

King, G., Murray, C. J. L., Salomon, J. A., & Tandon, A. (2004). Enhancing the validity and cross-cultural comparability of measurement in survey research. *American Political Science Review, 98*(1), 191–2007. https://doi.org/10.1017/S000305540400108X.

Le Port, A., Bernard, T., Hidrobo, M., Birba, O., Rawat, R., & Ruel, M. T. (2017). Delivery of iron-fortified yoghurt, through a dairy value chain program, increases hemoglobin concentration among children 24 to 59 months old in northern Senegal: A cluster-randomized control trial. *PLoS One, 12*(2). https://doi.org/10.1371/journal.pone.0172198.

Lundberg, S., & Pollak, R. A. (1993). Separate spheres bargaining and the marriage market. *Journal of Political Economy, 101*(6), 988–1010.

Manser, M., & Brown, M. (1980). Marriage and household decision-making: A bargaining analysis. *International Economic Review, 21*(1), 31–44.

McElroy, M. B., & Horney, M. J. (1981). Nash-bargained household decisions: Toward a generalization of the theory of demand. *International Economic Review, 22*(2), 333–349.

McPeak, J. G., & Doss, C. R. (2006). Are household production decisions cooperative? Evidence on pastoral migration and milk sales from northern, Kenya. *American Journal of Agricultural Economics, 88*(3). https://doi.org/10.1111/j.1467-8276.2006.00877.

McPeak, J., Little, P., & Doss, C. (2012). *Risk and social change in an African rural economy.* London: Routledge.

Munro, A. (2018). Intra-household experiments: A survey. *Journal of Economic Surveys, 32*(1), 134–175.

Parisse, M. (2012). Developing local dairy production: The Laiterie du Berger, Senegal. *Field Actions Science Reports: The Journal of Field Actions, 6.*

Peterman, A., Schwab, B., Roy, S., Hidrobo, M., & Gilligan, D. (2015). *Measuring women's decisionmaking: Indicator choice and survey design experiments from cash and food transfer evaluations in Ecuador, Uganda, and Yemen* IFPRI Discussion Paper 1453. Washington, D.C.: International Food Policy Research Institute (IFPRI).

Rangel, M., & Thomas, D. (2005). *Out of West Africa: Evidence on the efficient allocation of resources within farm households.* University of Chicago.

Ravallion, M., Himelein, K., & Beegle, K. (2016). Can subjective questions on economic welfare be trusted? *Economic Development and Cultural Change, 64*(4), 697–726.

Sen, A. (1987). Gender and cooperative conflicts. In I. Tinker (Ed.), *Persistent inequalities: Women and world development.* Oxford: Oxford University Press.

Seymour, G., & Peterman, A. (2018). Context and measurement: An analysis of the relationship between intrahousehold decision making and autonomy. *World Development, 111*, 97–112. https://doi.org/10.1016/j.worlddev.2018.06.027.

Strauss, J., Mwabu, G., & Beegle, K. (2000). Intrahousehold sllocations: A review of theories and empirical evidence. *Journal of African Economics, 9*(supplement 1), 83–143.

Thomas, D. & Chen, C.-L. (1994). Income shares and shares of income: Empirical tests of models of household resource allocations. RAND Labor and Population Program Working Paper Series, 94-08, Santa Monica, California.

Udry, C. (1996). Gender, agricultural production, and the theory of the household. *Journal of Political Economy, 104*(5), 1010–1046. https://doi.org/10.1086/262050.