The role of gender in bargaining: evidence from selling seed to smallholders in Uganda

Bjorn Van Campenhout*, Leocardia Nabwire†

March 4, 2025

Abstract

Haggling over prices is a common feature of economic transactions in many societies. This study examines whether the gender of the seller influences buyers' negotiation strategies and outcomes in bilateral price bargaining. Using a bargaining experiment in eastern Uganda, we analyze interactions between smallholder maize farmers and either a male or female seller. Our findings reveal that buyers negotiating with female sellers are less likely to accept the initial offer and respond with lower counter-bids compared to those bargaining with male sellers. Negotiations also last, on average, one round longer when the seller is a woman, and final transaction prices are nearly 9 percent lower. These results are particularly relevant for rural economies, where restrictive gender norms limit women's financial autonomy. Given that small agribusinesses often provide one of the few viable income-generating opportunities for women, gender biases in market interactions can have substantial implications for economic empowerment and household welfare.

Keywords: gender bias, bargaining, maize seed, Uganda

1 Introduction

In many contexts, price bargaining is the norm rather than the exception. The strategies used and the final transaction price depend on various factors, including perceptions of purchasing power, power dynamics, and assumed preferences. If these factors systematically disadvantage female informal vendors, gender bias may shape both negotiation strategies and outcomes.

In this study, we conduct a bargaining experiment to examine whether a seller's gender influences buyers' negotiation behavior and outcomes. In particular, we offer the opportunity to a representative group of smallholder maize farmers to buy a bag of hybrid maize seed. A trained enumerator, guided by a

*Innovation Policy and Scaling Unit, IFPRI, Belgium - corresponding author: b.vancampenhout@cgiar.org

†Innovation Policy and Scaling Unit, IFPRI, Uganda

script implemented on a tablet computer, acts as a seller. After briefly explaining the virtues of hybrid maize seed to the buyer, the seller asks if the buyer wants to buy the seed at an initial offer price. If the buyer rejects the offer, he or she is encouraged to call out a first counter-bid. The algorithm on the tablet then determines if the seller agrees on the counter-bid (depending on whether the difference between the two bids is small enough) or to enter into a second round of negotiations and name a second offer price (which is lower than the previous offer price but higher than the farmer's previous counter-bid). This process continues until either the farmer accepts an offer price, or the seller is instructed to accept a bid because the difference between last bid price and new offer price is lower than a particular threshold.

Even though the primary focus of this study is the gender of the seller, we provide exogenous variation along two dimensions. First, we assign farmers to either a male or female seller in a way that is as good as random. This allows us to estimate the causal impact of the seller's gender on the bargaining process and outcomes. Second, we randomly assign the initial offer price that the seller (male or female) asks of the farmer, allowing us to estimate the causal impact of level of the initial offer price on the bargaining process and outcomes. The addition of the level of the initial offer prices as a secondary experimental factor in our experiment allows us to compare the economic importance two effects. Furthermore, it enables us to explore potential heterogeneity in the gender effect conditional on initial offer price levels.

We investigate the effect of the seller's gender (and the initial offer price) on various strategies used by the buyer, as well as on outcomes of the process. These include: (1) the likelihood that the buyer immediately accepts at the initial offer price (and hence no bargaining takes place); (2) the first counter-bid following the initial offer price; (3) the likelihood that this first counter-bid is the minimum admissible counter-bid; (4) the likelihood that the buyer sticks with the initial counter-bid throughout the bargaining process (that is, the buyer plays a non-concessional strategy); (5) the number of negotiation rounds before any party accepts; (6) the likelihood that the buyer accepts at any point (as opposed to ending negotiations because of convergence); and (7) the transaction price.

The results indicate that buyers are significantly less likely to accept the initial offer when the seller is a woman. Negotiations with female sellers result in lower initial counter-bids from buyers and a higher likelihood of starting at the lowest possible bid. These negotiations also tend to last longer, reflecting greater buyer resistance, and ultimately lead to transaction prices that are approximately UGX 630 lower than those with male sellers. Overall, our findings suggest that gender-based disparities emerge early in the negotiation process, shaping counter-bids and influencing the trajectory of bargaining interactions, highlighting the substantial impact of seller gender on market outcomes.

This article contributes to the existing literature in at least two ways. First, most research on bargaining uses a WEIRD population (Western, Educated, Industrialized, Rich, and Democratic), yet bargaining is much more prevalent in non-WEIRD societies, and may also differ in these settings (Henrich, Heine,

and Norenzayan, 2010; Andersen et al., 2018). By implementing a bargaining experiment in the context of smallholder farmers bargaining over seed, we contribute to an emerging literature that studies how economic transactions transpire in more realistic settings (Fitzpatrick, 2017; Bhattacharya and Dugar, 2023). Second, the majority of studies that look at discrimination in the market place are mainly concerned about seller-side discrimination, where sellers offer different prices depending on minority membership (Castillo et al., 2013; Ayres and Siegelman, 1995; Fitzpatrick, 2017). We focus on buyer-side discrimination, where buyers bid different prices depending on seller's minority group membership.

We build on a large number of studies—based on observational data and more rigorous field experiments alike—that find overwhelming evidence of differences in the outcomes of market transactions when minorities (including women) are involved as a transacting party (as compared to cases where all transaction parties come from the majority, see Riach and Rich (2002)). This unsettling regularity has led to a search for the sources of this apparent discrimination, generating an equally large body of research.

Research on the causes of discrimination is particularly prominent in labour economics, where so-called situation or audit tests have been used to estimate the effect of race on the likelihood of being invited for a job interview (eg: Bertrand and Mullainathan, 2004). Another well-explored topic is the gender wage gap, where women generally earn less than men. Potential explanations include differences in initial wage offers and variations in wage negotiation strategies (Card, Cardoso, and Kline, 2015; Leibbrandt and List, 2015). However, recent research also suggests interesting dynamics, where an initial gendered disadvantage turns into an advantage over time (Bohren, Imas, and Rosenberg, 2019).

Our study aligns with research examining how the gender of one party (the seller) influences the bargaining behavior of the other party (the buyer) and incorporates key aspects of bilateral negotiation. List (2004) studies bilateral negotiation in the US sports card market and observes that 1) sellers from minority groups (in terms of gender, race, and age) receive initial and final bids that are lower than those received by majorities, and that 2) buyers from minority groups receive initial and final offers that are higher than those received by majority groups. He further finds that the former type of discrimination (that is, buyer-side discrimination) is more pronounced than the latter (seller-side discrimination). Note that in our experiment, we only test for buyer-side discrimination.

One of the first studies to use identical scripted bargaining strategies to study the impact of gender (and race) is Ayres and Siegelman (1995). In their study, seller-side discrimination in the market for new cars is investigated. Ayres and Siegelman (1995) carefully selected mock buyers to resemble each other as closely as possible and trained them to bargain uniformly through a prespecified bargaining script. From over 300 negotiations at new car dealerships in the US, they conclude that dealers quoted significantly lower prices to white males than to black or female test buyers.

Castillo et al. (2013) report on a sequential bargaining experiment in the market for taxi rides in Lima. Here, the focus is also on seller-side discrimination, as they are interested in the impact of the customer's gender on bargaining strategies and outcomes of the taxi driver (which are all men). They use a fixed-offer bargaining script that both male and female potential passengers follow when interacting with taxi drivers. Interestingly, they find that men are offered and pay higher prices than women.

Fitzpatrick (2017) tests whether women pay more or less than men in the Ugandan market for antimalarial drugs in yet another seller-side discrimination audit study. To do so, she started from a census of outlets selling antimalarial drugs in 5 parishes and sent mystery shoppers to purchase an antimalarial drug according to randomly assigned scripts. She finds evidence that, for the same product, women are offered higher prices than men. However, women are more successful at bargaining, and as a result the transaction price does not differ between male and female buyers.

The only study that investigates buyer-side discrimination is Delecourt and Ng (2021), who observe that women-owned micro-businesses are generally less profitable than male-owned businesses. To separate the effect of differences in business characteristics from the gender effect, they conduct a field experiment among Indian vegetable sellers where men report earning roughly 50 percent more daily revenue than women. In their experiment, they keep every business aspect (e.g., location, opening hours, stock, etc.) the same except for the gender of the seller. After controlling for supply side factors in this way, they find that earnings between male and female vendors do not differ and conclude that there is no buyer-side discrimination.

Our study holds significant academic value, but it also offers critical insights from a broader policy perspective. In environments shaped by strong gender norms and customs, the roles and responsibilities within households are often divided along gender lines. For example, men might focus on economic activities like maize production, while women manage reproductive tasks such as fetching water and firewood. In subsistence farming communities, women typically enter the food supply chain at downstream stages, engaging in light processing or retail activities. Research indicates that informal vendors are frequently self-employed or women-owned, making these forms of informal self-employment a vital source of income independent of male household members (Giroux et al., 2021).

However, despite women's participation in these roles, they often face biased perceptions. For example, a study with agro-input dealers in Uganda revealed that agro-input shops managed by women were viewed less favorably across various attributes compared to those run by men. This included perceptions that women-operated shops sold lower-quality seeds, even though the opposite was true (De, Miehe, and Van Campenhout, 2024). The present study shows that these biased perceptions translate in tangible, real-world consequences.

The remainder of this article is organized as follows. In the next section, we provide an in-depth description of the bargaining experiment. This is followed by a section on the empirical strategy and a description of the study population.

Section 3 provides the results of the analysis, and a final section provides a discussion, lists study limitations, and concludes.

2 Bargaining Experiment

Studies of gender-based discrimination often employ audit studies, a research method designed to isolate discrimination by controlling for all factors except the characteristic being tested (in this case, gender). In these studies, the same individual interacts with different counterparts while varying only a key trait—such as the gender of the person they engage with. This approach allows researchers to measure within-subject differences in how people respond to individuals of different genders under otherwise identical circumstances.

While audit studies are well-suited for detecting seller-side discrimination, where identical products or services are offered to individuals of different genders, they may be less effective for identifying buyer-side discrimination. This is because buyers typically make one-time purchases, meaning that requiring the same buyer to interact with both male and female sellers could influence their behavior, thereby affecting the external validity of the study. In real-world settings, buyers do not usually face repeated, identical purchasing decisions, and forcing such interactions within a study may create artificial decision-making patterns that do not reflect typical market behavior. As a result, a between-subjects design, in which different buyers are randomly assigned to interact with either male or female sellers, is likely a more appropriate approach. This ensures that observed differences in purchasing behavior reflect genuine gender-based discrimination rather than experimental artifacts introduced by repeated exposure to different seller types.

In our experiment, farmers are offered the opportunity to buy a bag of seed from a seller through a bargaining process. Compared to a one-shot, take-it-or-leave it approach (such as the Becker–DeGroot–Marschak method that is often used to measure willingness to pay, as in Burchardi et al. (2021)), a bargaining experiment is more realistic in settings where haggling over prices is the norm. An initial offer price is randomly drawn from a set of four prices (UGX12,000, 11,000, 10,000, and 9,000), with higher probability on the extremes (probabilities are 0.3, 0.2, 0.2, and 0.3 respectively).[1] This price is then presented to the farmer as the price of the bag of seed. The seller explains what kind of seed it is and what the advantages are, and the farmer is asked if they want to buy the seed for this price. If the farmer says no, then they are encouraged to name their counter-bid price. The minimal bid price was UGX3,000, but this lower limit was not communicated to the farmer in advance. Only when the farmer's initial counter-bid was lower than 3,000 was it communicated that this was the lowest acceptable price, and the farmer could either revise the first counter-bid

[1] The price at which seed was sold in shops was 12,000. As farmers thus receive a discount on the price of seed (unless they draw the highest price and immediately accept), we did not offer any additional incentives to participate to farmers.

to 3,000 or above, or abandon the game.[2][3]

Sellers then follow a concession script where they split the difference between the offer price and the farmer's bid (List, 2004). The tablet computer guiding the seller uses an algorithm to determine a counter-offer that the enumerator asks in a second round of negotiation. This new offer price is determined as the farmer's bid price plus 80 percent of the difference between the (initial) offer price and the farmer's bid price, and this is rounded to the nearest multiple of 500. This updated (lower) offer price is then compared to the last bid price of the farmer. If the difference is smaller than 500, the seller is instructed to accept the bid price. If the difference between the updated (lower) offer price and the bid price is larger than 500, then the updated offer price is presented to the farmer, and the farmer gets a second opportunity to accept or reject. If the farmer does not accept, the farmer is encouraged to make a second bid that should be equal to or higher than the first bid the farmer made. Based on this second bid, a third offer price is determined as the farmer's second bid price plus 80 percent of the difference between the second offer price and the farmer's second bid price.

Bargaining continues in this way until the farmer accepts an offer price, or the price difference between the bid and offer price is smaller than 500 Ugandan shilling, in which case the computer instructs the enumerator to sell at the last bid price. If the highest initial offer price of UGX12,000 was drawn and a farmer sticks to the lowest possible bid price (UGX3,000), the program accepts this bid after 10 negotiation rounds. Farmers were not informed about the algorithm. That is, they did not know that the seller would eventually accept even if they stuck to the lowest price. We do not expect that farmers would be able to learn about the offer price formation algorithm from a single bargaining experiment, and we also made sure that farmers could not communicate with each other by making sure the experiments were run in parallel in villages. All parameters in the experiment were informed by extensive testing in the field.

The experiment was timed to coincide with the start of the harvest season to ensure high demand for the seed. We had a team of 26 enumerators, of which 10 were female and 16 were male. While a 50-50 split would have resulted in highest statistical power for the comparison we are interested in, the fact that we have more men than women does not affect the estimate of the treatment effect which is simply the difference in average outcomes in the group of farmers

[2] As UGX3,000 is less than a dollar and participating farmers were told to bring some money to the experiment (see next section), virtually all farmers stayed in the game.

[3] To reduce potential bias from tester behaviour, the seller was instructed to follow a standard script: "Take one bag of seed and show it to the farmer. Read out the following: 'Hello, as part of the research project we introduced earlier [during consent], we are giving you the opportunity to buy a bag of maize seed of an improved variety to try out in your fields. The seed is a popular hybrid variety called Bazooka. Bazooka is high yielding, tolerant to drought, tolerant to pests and diseases for example resistant to kayongo. The seed has been obtained from a certified agro-input dealer and we can guarantee you that it is fresh and has not been tampered with in any way. Would you be interested in buying this? You can use cash or mobile money to pay. We offer you the seed at [insert randomly selected initial offer price]. Do you want to buy the seed at this price?'"

who were confronted by a male seller and the group that was confronted by the female seller.

3 Empirical Strategy

The primary focus is on estimating differences in bargaining outcomes and strategies between farmers who were confronted by male sellers and those who faced female sellers. To do so, we construct an indicator variable of the gender of the seller (T_i^g) which takes the value of one if the seller was a woman and zero if it was a man. However, recall that we also have a second experimental factor—the initial offer price—that is crossed into the design. We thus also construct an indicator variable (T_i^p) which takes the value of 1 if the initial price was 12,000 or 11,000, and zero if it was 9,000 or 10,000.

The effect of the seller's gender is estimated using Equation 1, which is a standard fully saturated regression model that is often used to analyze cross-randomized designs. In this equation, y_i represents the outcome of interest (for instance, the initial counter-bid price, or an indicator that describes the use of a particular strategy such as sticking to the initial bid throughout the entire negotiation process) of farmer i. The parameter of interest in this equation is β_g, the estimate of the effect of the seller being a woman. Other parameters include ε_i, a buyer specific residual, α, a constant to be estimated, β_p, the estimate of the impact of a high starting price, and β_{gp}, a potential interaction effect. Finally, because we found some indications of gender matching in the negotiation pairing (see section 6) and some imbalance with respect to buyer age in Table 1 in the next section, we control for the gender of the buyer and age of the buyer in the regressions as well (x_i).

$$y_i = \alpha + \beta_g T_i^g + \beta_p T_i^p + \beta_{gp} T_i^g T_i^p + \gamma x_i + \varepsilon_i \tag{1}$$

The above fully saturated model is the most agnostic specification to estimate parameters in crossed designs. However, such models with binary treatments essentially split the sample into four treatment cells, significantly reducing statistical power as only half of the sample is used for any comparison. However, by re-specifying the model, we can boost power by pooling treatments (comparing buyers that face female sellers to buyers that face male sellers, regardless of the level of the initial offer price). This is usually done by simply dropping the interaction term in Equation 1 and focus on the main treatment effects. However, this leads to specification bias if the true interaction effect is not zero, something that is hard to test in small samples (Muralidharan, Romero, and WÃŒthrich, 2023).

Fortunately, there is a way to recover an unbiased estimate of the pooled regression coefficient if we treat the orthogonal factor as a co-variate and control for it by entering it in deviations from its mean (and interact it with the main experimental factor to avoid specification bias). Therefore, in Equation 2 where the effect of the seller's gender $\left(\beta_g^{pooled}\right)$ is the effect of interest, the treatment indicator for a initial offer price is entered in deviation from its mean $\left(T_i^p - \overline{T^p}\right)$.

$$y_i = \alpha + \beta_g^{pooled} T_i^g + \beta_p \left(T_i^p - \overline{T^p}\right) + \beta_{gp} T_i^g \left(T_i^p - \overline{T^p}\right) + \gamma x_i + \varepsilon_i \qquad (2)$$

It is important to note that β_g^{pooled} in Equation 2 has a slightly different interpretation than β_g in Equation 1. While β_g is an estimate of the effect of the gender of the seller when the initial price is low, β_g^{pooled} is a weighted average of the effect of gender of the seller when initial price is low and the effect of gender of the seller when the initial price is high. In factorial experiments where the orthogonal factor has a control level, β_g is likely to be the preferred estimand, as this provides the pure treatment effect (in the absence of any other treatment). However, in our case, it may be reasonable to remain agnostic about the initial offer price, and so the effect of the gender of the seller averaged over both high and low initial prices may be the appropriate estimand.

The initial offer price was included as an experimental factor as a benchmark to which the effect of the seller's gender can be compared to judge economic significance. However, we also added the randomized starting price to compensate for the fact that we did not do ex-ante power calculations for the gender comparison. Adding a treatment that is known to work on an experiment is a strategy sometimes employed in clinical trials to demonstrate that a particular implementation of a design with a given sample size is powered to detect a treatment effect that is at least as as large. In our case, we argue that being able to replicate an established finding (that the initial offer price affects the entire bargaining process that follows—see for instance Chertkoff and Conley (1967); Ochs and Roth (1989); Kahneman (1992)—means that we are powered to detect effects that are at least as large.

Finally, as we will be evaluating multiple bargaining strategies and outcomes, we will have to account for multiple hypothesis testings. To do so, we control the False Discovery Rate (FDR) using sharpened two-stage q-values proposed by Benjamini, Krieger, and Yekutieli (2006)—see also Anderson (2008).

4 Data and Sample

The total sample consists of a representative sample of 760 households, drawn from 4 districts in southeastern Uganda (Mayuge, Kamuli, Iganga, and Bugiri). These districts were chosen because maize is an important crop for both food and cash for smallholder farmers living there. In these 4 districts, 76 villages were randomly selected from a list of all villages, with the likelihood of a village being selected proportional to the number of households that live in the village. Within each village, 10 households were randomly selected.

Enumerators visited these sampled households and asked to speak with the person within the household who generally makes the most decisions related to growing maize and input use, such as what type of maize seed to use. An appointment was then made with these individuals for a follow-up visit. The farmers were told to "bring some small money to this follow-up meeting as there may be an opportunity to buy something". The follow-up meeting took place

at the farmer's homestead, and we did not lose any farmers between the initial visit—where the primary purpose was to set a date for the interview—and the actual experiment. There were only a few days at most between this invitation and the follow-up interview, which included the bargaining experiment. During the follow-up meeting, individuals participated in the bargaining experiment, after which a short survey was administered. Since the minimum acceptable price was set very low and farmers were prepared to pay something, everyone who took part in the experiment ultimately purchased seed.

Table 1 summarizes some characteristics of study participants and their households. We find that 85 percent of interviewed individuals were men. The average age of the person that participated in the bargaining experiment was about 48 years. The sampled households consisted of about 8 people. Farmers cultivate maize on plots that are on average about 1.1 acres each. Yields on an average plot were about 442 kilograms per acre in the previous agricultural season (*Nsambya* of 2022).

A significant share of farmers have experience with improved seed varieties. We find that about 40 percent of farmers in our sample used seed of an open pollinated or hybrid variety in the previous season on any of their plots. However, farmers have less experience with the type of seed that we offer in the bargaining experiment (a type popularly known as *Bazooka*). Only about 9.5 percent of farmers indicate that they used this type of seed on any of their plots in the previous season.

Table 1 also doubles as a balance table based on the fully interacted model of Equation 1, with rows 1 and 3 showing difference between treatment condition (respectively the seller being a woman and a high initial offer price) and control (respectively the seller being a man and a low initial offer price; corresponding standard errors in brackets below). The fifth column also shows the interaction effect. Overall, with the exception of the gender of the respondent and maybe age, we find good overall balance. To account for imbalance with respect to the gender of the respondent and age, we control for this in Equations 1 and 2.

5 Results

Figure 1 provides a first graphical impression of the difference in the bargaining process emanating from the gender of the seller. The figure shows that the bargaining process is more likely to converge at a low price when the seller is a woman than when the seller is a man. When the seller is a woman, there is a clear peak in the density around UGX5,000. When the seller is a man, there is also some bunching around 5,000, but the likelihood that the eventual transaction price is around 5,000 does not differ all that much from the likelihood that the negotiation ends up at around 10,000.

The bottom panel shows that the disadvantage of the female seller immediately manifests itself at the start of the negotiation process when the buyer names their first counter-bid after the seller named the initial (randomly assigned) offer price. When the seller is man, a first counter bid of 5,000 is most

Table 1: Descriptives and Balance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Seller is Female	-0.137***	0.607	-0.174	-0.085	-29.474	0.075	0.009
	(0.045)	(1.487)	(0.418)	(0.095)	(47.565)	(0.054)	(0.031)
Offer Price is High	-0.069*	2.547**	-0.129	-0.035	14.392	-0.015	-0.025
	(0.037)	(1.237)	(0.345)	(0.078)	(39.230)	(0.044)	(0.026)
Offer Price is High x Seller is Female	0.095	-2.312	0.169	0.090	-17.245	-0.047	0.013
	(0.062)	(2.070)	(0.583)	(0.132)	(66.162)	(0.075)	(0.043)
Control Mean	0.849	47.697	8.262	1.140	442.525	0.405	0.095
	(0.359)	(13.387)	(4.136)	(0.942)	(384.328)	(0.492)	(0.294)
F-test	4.031***	1.503	0.081	0.270	0.487	0.968	0.500
Number of Observations	759	744	759	758	752	759	759

Note: ***,**, and denote significance at the 1, 5, and 10% levels based on sharpened q-values (Benjamini, Krieger, and Yekutieli, 2006). Outcomes are in columns as follows: (1) Respondent is male, (2) Age,(3) Household Size, (4) Plot Size, (5) Yield (kg/acre), (6) Used Improved Seed, (7) Used Bazooka Seed. Control mean is for male seller and low initial offer price.

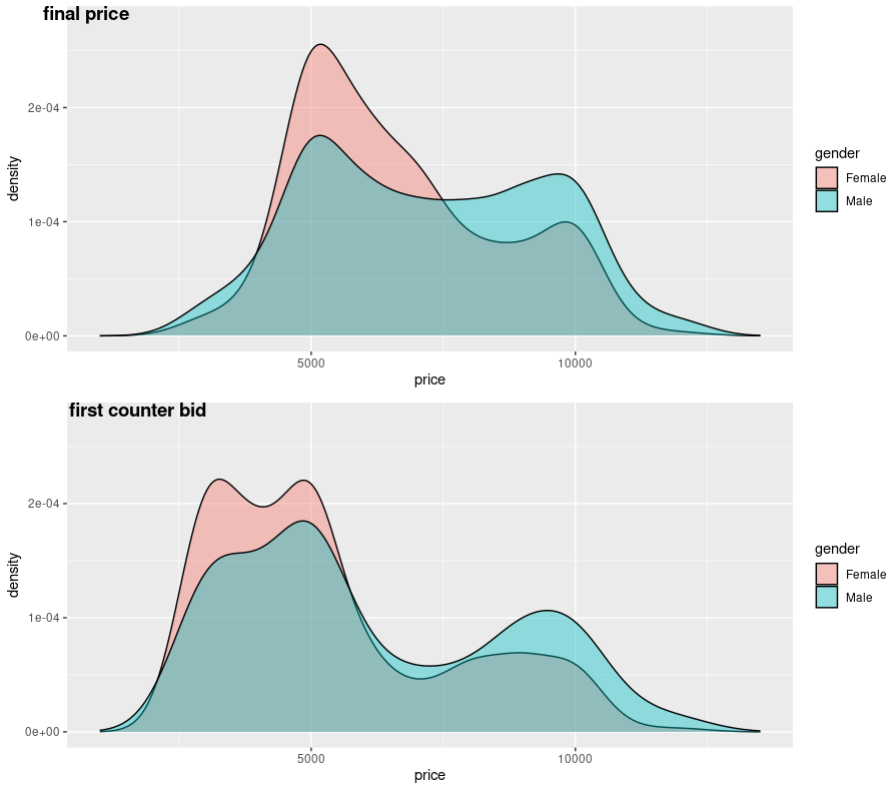

Figure 1: Prices

likely. When the seller is a woman, farmers are equally likely to quote the absolute minimum as 5,000. As with the first offer price, the first counter-bid price is likely to be an important anchoring point for the rest of the negotiation, and the gendered effect is likely to affect a range of other outcomes in the bargaining process (Galinsky and Mussweiler, 2001).

We now turn to a more formal analysis of the entire bargaining process by estimating the regression models presented in Section 3. We consider the following outcomes and strategies to judge impact of the gender of the seller: (1) the likelihood that the buyer accepts the initial offer of the seller (and thus no negotiation ensues); (2) the counter-bid price that the buyer calls after the initial offer by the seller; (3) the likelihood that the initial counter bid is the lowest admissible bid (UGX3,000); (4) the likelihood that the buyer sticks to their initial bid; (5) the number of negotiation rounds before the buyer accepts or the seller is instructed to accept by the algorithm; and (6) the final transaction price.

Results of the analysis are in Table 2, which shows different outcomes and strategies as colums. Control group averages (for the subset of buyers that nego-

tiated with a male seller and started from a low initial offer prices of UGX9,000 or 10,000) are in the bottom panel of Table 2. The first four rows in Table 2 reports the impact the the seller being a women. The first two rows report the coefficient from the fully saturated model, that is β_g in equation 1 (and corresponding standard error). The third and fourth report the coefficients from the fully saturated model, or β_g^{pooled} in equation 2 (and corresponding standard error). The table also reports the main effect from the orthogonal treatment and the interaction effect. We also report the coefficients for the control variables (gender of the buyer and age of the buyer).

As a first outcome of interest, we see that about 30 percent of buyers immediately buy the seed pack at the initial offer price. Interestingly, we see that the likelihood that farmers immediately accept decreases significantly when the seller is a woman, reducing to only 12 percent. As expected, the likelihood of accepting immediately also reduced if the initial offer price is high. Finally, even though there is a small positive interaction effect, the chance that the buyer immediately accepts the initial offer when the seller is a women and the initial offer price is high is virtually zero. Averaging over initial offer prices, the pooled effect amount to an almost 12 percentage point reduction in the likelihood that the initial offer is immediately accepted.

Having already touched upon the importance of the initial counter-bid in the negotiation process, we revisit the first counter-bid of the buyer here (see starting price in Figure 2). The average counter-bid by farmers in response to this initial offer was just over UGX6,000. We find a significant reduction in the first bid price when the seller is a woman, regardless of whether we look at the estimate of the interacted model or the pooled model, as the interaction effect is not significant. The effect is also economically significant, amounting to only 87 percent of the initial bid price that male sellers are confronted with. This suggests systematic gender-based differences in bargaining behavior, where buyers push harder for lower prices when negotiating with women. For this outcome, there is no significant impact from the initial price level. Apparently, buyers do not anchor their first counter-offer on the starting price.

We also find that about 17 percent of buyers started negotiating from UGX3,000, the lowest possible counter-bid. In line with the previous finding, we see that the share of buyers going for the lowest possible counter-bid is significantly higher if the seller is a woman. However, this is only the case for the pooled regression model, that increases statistical power by combining the positive but insignificant gender effect of the low initial price group with the positive but insignificant gender effect of the high initial price group.

Another interesting negotiation strategy some buyers seem to use is to name an initial counter-bid and stick to this price. A surprisingly large share of farmers (40 percent) use this strategy. We find that a significantly lower share of farmers use this strategy when the woman is a seller. Apparently, the fact that female sellers tend to start with lower initial offers provides buyers with more room for upward movement in price. This lower anchor could make buyers more willing to adjust their bids upward over time, as they may see the negotiation as having more flexibility. The effect is virtually equal to the effect of a high

Table 2: Effect of High Price and Gender of Seller on Bargaining

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Seller is Female (β_g)	-0.178***	-827***	0.045	-0.208***	1.030***	-0.108*	-631**
	(0.037)	(274)	(0.044)	(0.046)	(0.318)	(0.059)	(232)
Seller is Female (β_g^{pooled})	-0.117***	-853***	0.061**	-0.125***	0.959***	-0.102***	-643***
	(0.026)	(191)	(0.031)	(0.032)	(0.221)	(0.039)	(161)
Offer Price is High (β_p)	-0.242***	-74	0.000	-0.237***	2.069***	-0.041	328*
	(0.031)	(228)	(0.037)	(0.039)	(0.264)	(0.049)	(193)
Seller is Female x Offer Price is High (β_{gp})	0.121**	-51	0.032	0.164**	-0.141	0.010	-25
	(0.052)	(381)	(0.061)	(0.064)	(0.441)	(0.078)	(322)
Buyer is Male (γ_1)	-0.041	-159	-0.026	-0.037	0.143	-0.033	-129
	(0.030)	(223)	(0.036)	(0.038)	(0.258)	(0.047)	(188)
Buyer Age (γ_2)	0.002*	12*	-0.001	0.001	-0.013*	-0.001	11*
	(0.001)	(7)	(0.001)	(0.001)	(0.008)	(0.001)	(6)
Control Mean	0.298	6139	0.175	0.397	4.774	0.395	7034
	(0.458)	(2529)	(0.380)	(0.490)	(3.096)	(0.490)	(2024)
F-test	18.862***	4.849***	1.312	11.340***	22.965***	1.629	4.910***
Number of Observations	744	744	744	744	744	633	743

Note: ***,**, and denote significance at the 1, 5, and 10% levels based on sharpened q-values (Benjamini, Krieger, and Yekutieli, 2006). Outcomes are in columns as follows: (1) Initial Accept: is the share of buyers that immediately accept to buy the seed pack at the initial offer price; (2) Starting Bid Price: is the initial counter bid in UGX by the buyer following the initial (randomized) offer price of the seller; (3) Bottom Price: is the share of buyers that respond to the initial (randomized) offer price of the seller with the lowest admissible bid price (UGX3000); (4) Sticky Strategy: is the share of buyers that stick to their initial counter-bid throughout the bargaining process; (5) Rounds: refers to the number of negotiation rounds; (6) Buyer Accepts: is the share of buyers that accept (as opposed to situations where negotiation ends because the last bid and offer price is smaller than the threshold and the seller accepts); and (7) Transaction price: is the price in UGX at which the transaction was concluded. Control means are for male sellers starting from a low initial offer price.

initial offer price, where the higher range between the initial offer price and the lowest possible counter bid also seems to provide buyers with more room for upward movement in price.

The average negotiation took almost 5 rounds before the buyer agreed or the difference between the last bid and the last offer was smaller than the threshold at which the seller was instructed to agree. We find that negotiation increases to about 7 rounds if the seller started with a high initial offer price. The significant and positive effect is not surprising given that sellers follow a concessional script where the steps are a direct function of the initial offer price. More interestingly, when the seller is a woman, this adds an additional round to the negotiation process.

The fact that female sellers face an additional round of bargaining seems to suggest that farmers who negotiate with a woman are less likely to agree with an offer price. We thus look at the share of negotiations that were concluded with the buyer agreeing (as opposed to instances where the negotiations ended because the difference between offer price and bid price was less than UGX500). While in about 40 percent of cases the buyer eventually accepts, this percentage is almost 12 percentage points lower when the seller is a woman.

Finally, we look at what is arguably the most important outcome. The average transaction price was about UGX7,000, which was about 70 percent of the maximum initial offer price, and 2.3 times the minimum bid price. If the seller is a woman, we see that the transaction price is about UGX630 to UGX640 lower than when the seller is a man. An initially high offer price increases the final price by UGX328.

Together, these results show a clear and substantial effect emanating from the seller's gender. The effect originates early in the bargaining process, with a lower first counter-bid and a higher share of buyers that start off at the lowest possible bid price when the seller is a woman. This lower bound appears to serve as an anchor for subsequent strategies—with buyers less likely to accept and hence more negotiation rounds—eventually leading to a significantly lower price at which the transaction takes place.

6 Discussion, Limitations, and Conclusion

In this paper, we examined the potential consequences of gender-related discrimination on market transactions. Specifically, we tested whether the gender of seed sellers had an impact on seed buyers' negotiation strategies and eventual outcomes in bilateral price negotiations. This was done through a bargaining experiment in eastern Uganda, where a representative sample of smallholder maize farmers were given the opportunity to bargain over a bag of maize seed of an improved variety from either a male or female seller.

We find evidence of systematic gender disparities in bargaining strategies used by buyers. In particular, we find that buyers negotiate more aggressively with female sellers, making lower initial counter-bids, extending negotiations by an additional round, and ultimately agreeing less often. This translates into a

transaction price that was almost 10 percent lower when the seller is a women.

Our results are in line with List (2004) who finds that buyer-side discrimination appears to be more pronounced than seller-side discrimination. Delecourt and Ng (2021), in contrast, find no evidence of buyer-side discrimination in a context closer to ours. However, an important difference in our study is that in their context—the Indian market—transactions tend to be fast-paced, short and without chit-chat, and bargaining is uncommon. Exley, Niederle, and Vesterlund (2020) make the argument that since discrimination is already present from the initial counter-bid, it is unlikely that differences in outcomes are due to differences in negotiation. Our study indicates that differences in final outcomes have their origin in both the initial counter-bid and the ensuing negotiations.

As is typically the case, our experiment merely demonstrates the presence of discrimination, but it does not provide insight into its nature. In the literature, a distinction is generally made between discrimination that involves some kind of animus on the one hand and statistical discrimination on the other. While in the former case there is some kind of general distaste for minorities or a "social custom" of discrimination (Riach and Rich, 2002), in the latter case the apparent discrimination is simply the result of market actors using average group characteristics as a proxy of reservation value. There are some studies that look into the behavioral mechanisms behind (statistical) gender discrimination, often in the context of ultimatum games. We distill three interconnected mechanisms: perceived negotiation strength, implicit biases and social norms, and strategic responses.

First, buyers may perceive female sellers as weaker negotiators, leading them to push for lower prices and resist concessions. Evidence from ultimatum game experiments suggests that both male and female participants demand more from female proposers and offer less to female responders, reinforcing the notion that women are seen as less assertive in bargaining settings (Solnick, 2001). Additionally, gender differences in bargaining persistence have been documented, with female sellers being less likely to walk away from negotiations, further reinforcing buyers' strategic advantage (García-Gallego, Georgantzís, and Jaramillo-Gutiérrez, 2012).

Second, implicit biases against female sellers may be rooted in broader societal norms that position men as dominant in economic transactions. The meta-analysis by Oosterbeek, Sloof, and Van De Kuilen (2004) highlights that bargaining behavior varies significantly across cultures, with responders adjusting their acceptance and rejection behavior based on contextual expectations. In societies where women have historically been underrepresented in commercial negotiations, buyers may (subconsciously) view them as less authoritative or credible, leading to more aggressive bargaining tactics.

Third, even in the absence of overt bias, buyers may engage in strategic behavior that disadvantages female sellers. Research on framing effects in ultimatum games suggests that men are more sensitive to how offers are presented, with different physiological and decision-making responses depending on whether they perceive an interaction as a "gain" or a "loss" ((Sarlo et al., 2013). If buyers interpret negotiations with female sellers as an opportunity to

"gain" more favorable terms—perhaps due to an expectation that women will concede more readily—they may push harder for lower prices. Furthermore, since female sellers tend to start with lower initial offers, buyers may perceive greater flexibility in the negotiation, making them less likely to commit to their initial bids.

Our study has several limitations. One limitation of the study is potential bias from tester behavior. For instance, it could be that male sellers bargain harder than female sellers. Confounding by tester behavior is a known problem in audit studies that involve actual people in the transactions, and a reason why correspondence studies (where personal contact is avoided, such as in the Bertrand and Mullainathan (2004) study, where CVs of imaginary job candidates with white and non-white sounding names are sent to potential employers to screen on discrimination) are preferred. We tried to mitigate this problem by instructing our enumerators to strictly stick to a script on the tablet computer. However, we cannot completely rule out the fact that male sellers behaved differently during the field experiment than their female counterparts.

A second limitation lies in the fact that, for logistical consideration, we did not randomize the seller's gender ex-ante. Sellers were sent to farmers based on who was available (hence the larger group where the seller was a man). While supervisors were instructed not to assign enumerators to farmers in a systematic fashion, we do find that women sellers had a significantly higher probability of being paired with women buyers than male sellers. To account for this, we include the gender of the buyer as a control variable in the regression model. We further looked at balance on a range of characteristics (such as age, education level, etc.) between farmers that were paired to male and female sellers and generally found no significant differences. That said, we cannot completely rule out that sellers and buyers were matched on some other (unobservable) characteristics.

Third, our study population may not be representative for real-life situations. For instance, List (2004) works with subjects that endogenously select into the market and likely have previous experience in the transactions he is studying. In our case, it may be that participants have never bought seed in the past and did not intend to do so in the near future. Furthermore, it is not common for seed sellers to approach potential buyers at their homes; normally farmers would go to agro-input shops to buy seed. Our study should therefore be regarded as somewhere in-between an experimental study in a lab environment where certain behavioral patterns and roles are endogenously imposed on study subjects and studies that observe actual individual behaviour in an existing market.

Fourth, our study does not look at heterogeneity in bias. One obvious source of heterogeneity in this context would be the gender of the buyer, as gender homophily effects have been found in a wide range of interactions (McPherson, Smith-Lovin, and Cook, 2001). If we consider the gender of the buyer, we see that the reduction in both initial and transaction prices due to the seller being a woman is largest for female buyers. This suggests that female buyers appear to be even more biased than men. However, the difference is insignificant, and the parameter estimate is likely to suffer from small sample size.

In sum, our study contributes to the growing literature on gender-based price discrimination by providing a crucial counterpart to existing audit studies, which predominantly show that women pay higher prices as buyers. We demonstrate that women also receive lower prices as sellers, revealing a "double penalty" in market interactions. This two-sided disadvantage underscores the structural barriers women face in economic transactions, reinforcing income disparities and limiting their financial autonomy.

Acknowledgments

We would like to thank Charles Marc Wanume, Richard Ariong, and Wilberforce Walukano for their support in the field. The research received funding from the CGIAR Seed Equal Research Initiative, the CGIAR Market Intelligence Research Initiative, and the CGIAR Gender Impact Platform, which are funded by contributors to the CGIAR Fund (https://www.cgiar.org/funders/).

References

Andersen, S., S. Ertac, U. Gneezy, J. A. List, and S. Maximiano. 2018. "On the cultural basis of gender differences in negotiation." *Experimental Economics* 21: 757–778.

Anderson, M. L. 2008. "Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects." *Journal of the American statistical Association* 103 (484): 1481–1495.

Ayres, I. and P. Siegelman. 1995. "Race and Gender Discrimination in Bargaining for a New Car." *The American Economic Review* 85 (3): 304–321.

Benjamini, Y., A. M. Krieger, and D. Yekutieli. 2006. "Adaptive linear step-up procedures that control the false discovery rate." *Biometrika* 93 (3): 491–507.

Bertrand, M. and S. Mullainathan. 2004. "Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination." *American Economic Review* 94 (4): 991–1013.

Bhattacharya, H. and S. Dugar. 2023. "Undervaluation versus unaffordability as negotiation tactics: Evidence from a field experiment." *Journal of Economic Psychology* 96: 102609.

Bohren, J. A., A. Imas, and M. Rosenberg. 2019. "The dynamics of discrimination: Theory and evidence." *American economic review* 109 (10): 3395–3436.

Burchardi, K. B., J. de Quidt, S. Gulesci, B. Lerva, and S. Tripodi. 2021. "Testing willingness to pay elicitation mechanisms in the field: Evidence from Uganda." *Journal of Development Economics* 152: 102701.

Card, D., A. R. Cardoso, and P. Kline. 2015. " Bargaining, Sorting, and the Gender Wage Gap: Quantifying the Impact of Firms on the Relative Pay of Women *." *The Quarterly Journal of Economics* 131 (2): 633–686.

Castillo, M., R. Petrie, M. Torero, and L. Vesterlund. 2013. "Gender differences in bargaining outcomes: A field experiment on discrimination." *Journal of Public Economics* 99: 35–48.

Chertkoff, J. M. and M. Conley. 1967. "Opening offer and frequency of concession as bargaining strategies." *Journal of Personality and Social Psychology* 7 (2p1): 181.

De, A., C. Miehe, and B. Van Campenhout. 2024. "Gender bias in customer perceptions: The case of agro-input dealers in Uganda." *Agricultural Systems* 217: 103954.

Delecourt, S. and O. Ng. 2021. "Does gender matter for small business performance? Experimental evidence from India." *Experimental Evidence from India (April 21, 2021)* .

Exley, C. L., M. Niederle, and L. Vesterlund. 2020. "Knowing when to ask: The cost of leaning in." *Journal of Political Economy* 128 (3): 816–854.

Fitzpatrick, A. 2017. "Shopping While Female: Who Pays Higher Prices and Why?" *American Economic Review* 107 (5): 146–149.

Galinsky, A. D. and T. Mussweiler. 2001. "First offers as anchors: The role of perspective-taking and negotiator focus." *Journal of personality and social psychology* 81 (4): 657.

García-Gallego, A., N. Georgantzís, and A. Jaramillo-Gutiérrez. 2012. "Gender differences in ultimatum games: Despite rather than due to risk attitudes." *Journal of Economic Behavior & Organization* 83 (1): 42–49.

Giroux, S., J. Blekking, K. Waldman, D. Resnick, and D. Fobi. 2021. "Informal vendors and food systems planning in an emerging African city." *Food Policy* 103: 101997. Urban food policies for a sustainable and just future.

Henrich, J., S. J. Heine, and A. Norenzayan. 2010. "The weirdest people in the world?" *Behavioral and brain sciences* 33 (2-3): 61–83.

Kahneman, D. 1992. "Reference points, anchors, norms, and mixed feelings." *Organizational behavior and human decision processes* 51 (2): 296–312.

Leibbrandt, A. and J. A. List. 2015. "Do women avoid salary negotiations? Evidence from a large-scale natural field experiment." *Management Science* 61 (9): 2016–2024.

List, J. A. 2004. "The Nature and Extent of Discrimination in the Marketplace: Evidence from the Field." *The Quarterly Journal of Economics* 119 (1): 49–89.

McPherson, M., L. Smith-Lovin, and J. M. Cook. 2001. "Birds of a Feather: Homophily in Social Networks." *Annual Review of Sociology* 27: 415–444.

Muralidharan, K., M. Romero, and K. WÃŒthrich. 2023. "Factorial Designs, Model Selection, and (Incorrect) Inference in Randomized Experiments." *The Review of Economics and Statistics* 1–44.

Ochs, J. and A. E. Roth. 1989. "An experimental study of sequential bargaining." *The American Economic Review* 355–384.

Oosterbeek, H., R. Sloof, and G. Van De Kuilen. 2004. "Cultural differences in ultimatum game experiments: Evidence from a meta-analysis." *Experimental economics* 7: 171–188.

Riach, P. A. and J. Rich. 2002. "Field Experiments of Discrimination in the Market Place." *The Economic Journal* 112 (483): F480–F518.

Sarlo, M., L. Lotto, D. Palomba, S. Scozzari, and R. Rumiati. 2013. "Framing the ultimatum game: gender differences and autonomic responses." *International Journal of Psychology* 48 (3): 263–271.

Solnick, S. J. 2001. "Gender differences in the ultimatum game." *Economic Inquiry* 39 (2): 189–200.

Appendix - Experimental Script

The enumerator starts with the following introduction:

> "Hi, as part of the research, we are offering you the opportunity to buy a bag of maize seed to try in your fields. The seed is a popular hybrid variety called 'Bazooka.' This is a high-yielding, drought-tolerant variety that is also resistant to pests and diseases, such as kayongo. The seed is obtained from a certified agro-input dealer, and we guarantee it is fresh and untampered with."
>
> "We offer you the seed at a price of [initial randomized offer price]. Would you be interested in buying this? You must pay the full amount after the transaction. Mobile money is also an option for payment."

The buyer can now indicate that they buy the seed at the [initial randomized offer price], in which case the bargaining experiment is concluded. If the farmer says they do not want to buy at that price, the enumerator proceeds:

> "How much are you willing to pay for it?"

The counter bid is entered into the ODK app. If the first counter bid is less than 3,000, the enumerator answers that the absolute minimum is 3,000 and the buyer is asked if they want to revise their first counter bid to 3,000 or stop altogether. If the difference between the initial offer price and the counter bid below 500, the transaction is concludes at the last bid price. If not, the enumerator continues:

> (*)"Hmmm, that is too low. What about [next price point]?"

The buyer can now indicate that they buy the seed at the [next price point], in which case the bargaining experiment is concluded. If the farmer says they do not want to buy at that price, the enumerator proceeds:

> "How much are you willing to pay for it?"

The counter bid, which should be at least as high as the previous counter bid, is entered into the ODK app. If the difference between the [second price point] and the counter bid below 500, the transaction is concludes at the last bid price. If not, the enumerator continues from (*).