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FACULTY OF ECONOMICS AND BUSINESS

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Gendered Perceptions in Maize Supply Chains

Evidence from Ugandan maize farmers, agro-input dealers, assembly traders, and processors

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R0776884

Thesis submitted to obtain the degree of

MASTER OF ADVANCED STUDIES IN ECONOMICS

Promoter: Prof. Dr. Johan Swinnen

Academic year 2020-2021

Abstract

Faced with imperfect information, economic actors use judgment and perceptions in decision making. Inaccurate perceptions or false beliefs may result in inefficient value chains and systematic bias in perceptions may affect inclusiveness. In this paper, I study perceptions in Ugandan maize supply chains. A random sample of maize farmers were asked to rate other value chain actors—agro-input dealers, assembly traders and maize millers—on a set of important attributes such as service quality, price competitiveness, ease of access, and overall reputation. These other value chain actors are tracked and asked to assess themselves on the same attributes. We find that input dealers, traders and millers assess themselves more favourably than farmers do. We also zoom in on heterogeneity in perceptions related to gender and find that women rate higher than men. The sex of the actor being rated does not affect the rating.

Acknowledgements

I would first like to thank Professor Jo Swinnen and Doctor Bjorn Van Campenhout. I am very appreciative of Jo for providing me the opportunity to work on this topic and get involved in the research project. I am grateful to Bjorn for giving me immense guidance and helpful advice throughout, and keeping track of every step in the preparation of the thesis. I am also thankful for all the surveyors involved in the data collection. I would like to express my gratitude for the researchers at International Food Policy Research Institute (IFPRI), who were engaged in the design of the study, implementation of the surveys and collection of the data. I am grateful to all my colleagues at LICOS Centre for Institutions and Economic Performance, Faculty of Economics and Business (KU Leuven) for their advice and inputs.

Finally, I would take the opportunity to thank my parents for always being there for me and my friends for encouraging me.

Anusha De,

Leuven, Belgium,

10/05/2021.

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1 General Introduction

Neoclassical economic theory assumes rational agents to be interacting in a context of full information. However, in the real world, both consumers and producers face substantial information frictions. Sometimes agents lack skills to correctly assess information about the counterpart. In other cases, one actor may strategically decide to hide valuable information. As a result, economic agents often rely predominantly on perceptions to inform transaction decisions. Similarly in commodity supply chains, information frictions may exist, especially in informal value chains where quality is hard to track and agreements difficult to enforce. As a result, value chain actors also base part of their decisions on perceptions and beliefs about actors up- and downstream.

Although perceptions provide information to the other actors about the attributes of an individual seller or buyer in the supply chain, these can have significant consequences for the entire supply chain, especially if perceptions do not align with reality. False beliefs and incorrect preference may lead to inefficient supply chains and hamper value chain innovations. More importantly, systematically biased perceptions may hamper inclusiveness of value chains. For instance, if traders of a certain clan or tribe are traditionally regarded as good traders, other actors may hold inflated perceptions. This may result in barriers to entry for other traders.

Despite the importance of beliefs and perceptions for transactions within food supply chains, there are few studies that track perceptions throughout the chain. This is at least partly because perceptions are not always objectively measurable. However, we cannot ignore the importance of perceptions as a crossing node for operational psychological preferences and real economic mechanisms in the markets. These arguments necessitate the study of perceptions in the agricultural supply chains in detail.

I study the case of maize value chains in Uganda where ratings are used as a proxy measure for perceptions and beliefs. I use data from 1,500 maize farmers, 78 input (seed) dealers, 341 assembly traders, and 174 millers from Eastern Uganda to document (in)consistency in farmer's, input (seed) dealer's, trader's, and miller's perceived attribute ratings of these actors. To investigate systemic bias along gender lines, I further test if the sex of the rater or the ratee has any impact on the ratings (perceptions). A representative sample of farmers were asked to rate up to three dealer(s), trader(s) and miller(s). Then these dealers, traders and millers were traced and asked to assess themselves in a similar way. I use input dealer, trader, and miller attributes, such as perceived ease of access to the dealer, trader, or miller, perceived quality of the seed sold by the dealer or the quality of service provided by the trader or the miller, and reputation of the dealer, trader, or miller, to assess how such perceived input-dealer, trader, or miller attributes align between value chain actors, and how (non-)alignment is mediated by sex of the farmer (rater) or the ratee (dealer, trader, or miller).

Ratings can be used as a tool to understand what factors determine widespread perceptions about certain actors in the food value chains. The literature shows that ratings can be used as an instrument for identifying performance levels of various actors in markets and industries, for information transparency (Karminsky and Polozov, 2016) and for decision management. Various rating based decision management studies come from the financial sector, like credit ratings explaining investment decisions (Bolton et al., 2012) and financial risk (Karminsky and Peresetsky, 2009), the link between corporate credit ratings and the financial crisis (deHaan, 2017) and bond ratings' informational value (Kliger and Sarig, 2000). In marketing research, ratings are the tool to identify demand (Dhar and Weinberg, 2016), sales and consumer preferences (Sun, 2012) and helps the product manufacturer to improve quality and align the product features with consumer tastes (Cheung et al., 2003; Barton, 2006). Social and psychological studies use ratings to analyse social behavior (Renk and Phares, 2004; Schofield et al., 2007), teaching and learning patterns (Feldman, 2007), child development (Bukowski et al., 2012), parenting aspects (Kuppens et al., 2009) and languages (Rudell, 1993; Cole et al., 2019). Similarly, ratings can be used to study various agricultural aspects, providing an understanding of the perceptions of the different value chain actors. Recently, the study of perceptions has also been applied to food supply chains where perceptions have been found to correlate to innovations in supply chains and indicate loopholes in the performance of involved actors (Ola and Menapace, 2020; Odongo et al., 2016).

Broadly, studying the rater's ratings and ratee's self-assessments can give insights about the deeper mechanisms of performance perceptions in the value chains. Higher ratings may motivate actors to sustain performance while lower ratings may lead actors to improve performance or at least induce increased effort. Although there are various other factors like competition, access to facilities, knowledge of the business, etc. which can influence the performance levels directly, the fact that ratings can also drive these factors directly or indirectly cannot be ignored. Ratings can be assumed as a method of assessment which does not couple with direct repercussions but do successfully indicate indirect repercussions which impact the rated subjects (in the present or in the future).

Systematic differences in ratings related to gender have been studied extensively and the literature shows a wide range of studies in different fields on gender-based rating patterns

(Mitchell and Martin, 2018; Furnham, 2005; Patiar and Mia, 2008). In the agricultural sector, studies based on sex of the various actors of the food value chains are becoming more prominent, particularly in the developing economies (Maertens and Swinnen, 2012; Barrientos, 2019; Kruijssen et al., 2018; Mnimbo et al., 2017). For instance, in Africa, attempts of closing the productivity gap between male and female farmers is a new step towards achieving food security with gender dimensions in the food value chains across Uganda increasingly gaining importance in the recent years (Akite et al., 2018; Bamanyaki and Muchunguzi, 2020; Nchanji et al., 2020). Larson et al. (2016) showed that improved access to markets and extension services for both male and female smallholder maize farmers can help reduce the gender productivity gap in Uganda. These motivate the aim to understand the alignment of perceptions based on the sex of the farmer, agro-input dealer, trader, and miller in the case of maize value chains in Uganda.

Traditionally, women have not been playing a significant role in the input dealing, processing, and trading activities for maize in Uganda. Thus, analysing how the sex of each actor impacts the ratings from farmers and the self-ratings is crucial in the Ugandan maize value chain. Systemic gender bias in perceptions can demotivate the entry of women in the food supply chains, creating better opportunities for men to flourish in these industries. Issues like discrimination against women, barriers to market access for women, mistrust, lower credit availabilities, etc. are some of the consequences of such gender bias in perceptions. Thus, perceptions obtained from this study can aid in the explanation of why women do not participate as much as the men in these kinds of businesses which fuel the maize value chain and the production of maize in Uganda.

The first objective of this study is to establish how the perceived attribute ratings and self-ratings of dealers, traders, and millers differ from each other. All the actors are studied together highlighting the ratings being received and the self-assessments. The four attributes, as rated on a scale of 1-5 by farmers and by the dealers, traders and millers themselves, are: (i) quality of service provided by a dealer, trader or miller relative to the other dealers, traders or millers; (ii) price competitiveness assessed of one actor relative to the other actors; (iii) location (ease of access by road or phone) of the input dealer (trader or miller) relative to other dealers (traders or millers); (iv) reputation of a given dealer (trader or miller) relative to other dealers (traders or millers). The second objective aims at understanding rating patterns based on the sex of the farmer (rater). The third objective aims to understand the self-rating patterns based on the gender of the ratee (dealer, trader, or miller). The fourth objective is to identify whether farmers score based on the sex of the input and service providers. The final objective is to study the interaction between the sex of the rater (farmer) and the ratee (essentially gender related homophily as discussed by McPherson et al. (2001)). Average ratings and multivariate regression models are used for the analysis.

This study contributes to the literature that examines the role of agro-input dealers, traders and millers in facilitating or limiting the development of smallholder agriculture. Ratings for the different actors of the supply chain, which this study employs to examine farmer's perceived value of input dealers, traders or millers, is widely an used system in marketing as a mechanism to increase customer trust in and purchase of services/products (Jayashankar et al., 2018; Chiu et al., 2014). Such a rating system, if applied to agricultural input marketing, is likely to encourage input dealers to desist from counterfeiting, adulteration or deceptive marketing of inputs in order to maintain a good reputation and higher rating (Kim and Park, 2013; Bente et al., 2012; Bar-Isaac and Tadelis, 2008). If applied to assembly trading, it will ensure broader access to maize markets and good prices for the farmers' harvests. Similarly, ratings for maize processing can improve the end products obtained from maize and can sustain the value chain, ensuring less wastage and good quality of food.

Seller ratings and reputation are increasingly becoming important assets in marketing, particularly when the quality of the good or service transacted is hard to measure and the buyer and seller cannot perfectly contract on the outcome of the transaction, or where there are no legal institutions to alleviate buyer uncertainty (Bar-Isaac and Tadelis, 2008). This significantly ties into the literature on product standards and traceability. Ratings can be aggregated through crowdsourcing in information clearinghouses, an evidence of which was given by Hasanain et al. (2019), where a randomized control trial was used to study the impact of clearinghouse ratings in the context of veterinarian success in Punjab, Pakistan. Through these types of ratings, the supply chain actors may be mindful of building and maintaining a good reputation through the information that the farmers have about these actors, including previous transactions and the reports of other farmers.

The findings of this study indicate enhanced (positive) self-perceptions compared to the perceived attributes of the farmers. Interestingly, the prominence of gender is evident in the farmers' perceptions where women are observed to have more positive perceptions about the input and service providers. However, I find no evidence of significant gender bias for the input and service providers in the ratings obtained. In the sections that follow, I expound on the study context and hypotheses; explain the data used and econometric models I will estimate; present the results; and finally provide a conclusion and recommendations.

2 Study Context

This section discusses the context and background of the study. The case for this investigation is the maize value chain in Uganda. Maize is a staple crop in Uganda, prioritized by the government for food security and household income. By land area, maize is the most cultivated crop in Uganda, covering 30% of the total cropped land, followed by beans, covering 15% of cropped land. Maize and beans are often intercropped. Government's interventions in the maize sub-sector over the past decade have targeted increasing on-farm productivity and production, yet productivity remains very low. On-farm maize data from 2018 agricultural year reports (Uganda Annual Agricultural Survey) yield figures of 596 kg per acre (or 1.49mt/ha); a figure that falls almost midway the yield range of 270 and 995 kg per acre, as reported by Gourlay et al. (2019). While there is some ambiguity in the on-farm yield figures, partly due to errors in farmer-reported production (Gourlay et al., 2019) and differences in the climatic conditions between different agricultural years (Van Campenhout et al., 2020), they are still considerably lower than the research station yield figures which range between 730 kg per acre and 1,820 kg per acre (Fermont and Benson, 2011).

Improved maize seed (hybrid and open pollinated varieties) is among the top agricultural inputs promoted by the government, development partners and private sector to increase maize yields in Uganda. But, just like the other improved agricultural inputs, the proportion of households using improved maize seed in Uganda is still low, estimated to range between 27% and 37%, compared to between 30% and 50% in Tanzania and Malawi (Van Campenhout et al., 2020). When measured using the percentage of land under improved maize seed, the use rates in Uganda slightly increase to 54% (Sheahan and Barrett, 2017).

Limited use of improved maize seed is just one among the many factors constraining maize yields in Uganda. In addition, insubstantial access to markets for harvested maize for farmers living in remote areas, slow advancement in milling technologies, price discrimination at all levels of the supply chain, issues of trust amongst the supply chain actors, lower selling prices of the harvest, quality of services provided by the various supply chain actors and business ethics in the sector during selling, trading, or milling influence maize yields at large. For instance, several factors at household, market and policy levels constrain the use of improved maize seed and generally improved agricultural inputs by Ugandan farmers. Like any other industry, the maize supply chains need to maximize yield gains, ensure cost-effective sale, storage and production, adhere to improved technologies and increase the usage of improved inputs to increase the profits for all the actors in the sector.

Not only input usage is important in the context of maize supply chains, trading and processing of maize are equally essential to meet consumption needs across Sub-Saharan Africa. For instance, Ekpa et al. (2019) discusses the importance of promoting processing techniques reducing the loss of nutrients, improving nutritional, and baking properties and increasing shelf life. Traders and processors should be aware of the high potential in localized maize foods, ensuring effective ways to preserve the nutritional components of the maize crops and fair prices for the maize farmers. A better understanding of these aspects can be obtained from the perceptions of these value chain actors about their performance attributes.

2.1 Supply Chain Actors

The roles of input dealers, maize traders and maize processors in the maize supply chain are intricate. Their performance can have major impacts on the entire value chain leading to food security issues. There is ample evidence of the essential role of improved agricultural inputs, especially improved seed, inorganic fertilizers and agro-chemicals, in enhancing agricultural productivity, poverty reduction, and generally economic transformation (McArthur and McCord, 2017; Zeng et al., 2015; Evenson and Gollin, 2003). Yet, despite decades of policy and institutional reforms to promote their use in developing countries (Erenstein and Kassie, 2018; Swinnen et al., 2010; Jayne et al., 2013), adoption levels of such improved inputs remain extremely low, especially in sub-Saharan Africa (Sheahan and Barrett, 2017; Benin, 2016).

Common explanations advanced in the literature are that: farmers are risk averse, or are not aware of existing technologies, or lack knowledge about their proper use, or are financially constrained, or lack information about profitability (Porteous, 2020; Mbowa and Mwesigye, 2016; Fisher and Kandiwa, 2014; Minten et al., 2013). Literature also hints on the limited availability of improved input technologies in developing countries (Asfaw et al., 2012; Maredia et al., 2000). However, as improved inputs become more available in developing countries (due to increased research and breeding, privatization/liberalization of the inputs market, and input subsidy programs) (Sheahan and Barrett, 2017; Fisher and Kandiwa, 2014; Minten et al., 2013; Jayne et al., 2013; Jayne and Rashid, 2013), poor quality inputs, especially of purchased inputs (Ashour et al., 2019; Bold et al., 2017), is emerging as an additional explanation for the limited adoption. Poor quality inputs pose a major disincentive to the adoption of improved inputs as use of low-quality inputs result in low average returns to farmers (Bold et al., 2015).

Research and policy have focused on two main explanations for low quality inputs: (i) sellers deliberately counterfeiting or adulterating inputs; and (ii) poor storage processes along the supply chain (Omotilewa et al., 2018; Barriga and Fiala, 2018). Although some studies find inaccuracy in farmer's perceptions that purchased inputs are of poor quality (Ashour et al., 2019; Michelson et al., 2018), the (mis)perceptions have been found to be fairly right and correlated with actual quality in the local markets (Ashour et al., 2019; Urrea-Hernandez et al., 2016).

Several qualitative and experimental studies (Ashour et al., 2019; de Boef et al., 2019; Barriga and Fiala, 2018; Bold et al., 2017) provide insights into the actual (poor) quality of agricultural inputs in selected African countries, including Uganda. Drop in the quality of seeds after leaving the breeders (Barriga and Fiala, 2018), low levels of authentic seeds in locally retailed hybrid seeds (Bold et al., 2017), counterfeiting/adulteration of inputs (Ashour et al., 2019; de Boef et al., 2019) and high levels of deceptive marketing (Ashour et al., 2019) are some common phenomena. Henceforth, input dealers dealing in these agricultural inputs are an important node for the sustenance of the maize value chains. Although their role has already been studied with respect to the agricultural innovation processes (Etyang et al., 2014; Odame and Muange, 2011; Chinsinga, 2011; Feder et al., 2011; Adhiguru et al., 2009), it is essential to realise the perceptions of their performance in the maize supply chain.

Trading of maize is an essential part of the maize value chain. Assembly traders help in the marketing of maize and thus, are a bridge between the farmers and the markets (or the millers in particular). Local assembly traders reach the remote locations to collect maize harvests mostly directly from the farmers at the farm gate, the small rural storage facilities, or the markets. These traders take the responsibility of transportation in general so that the harvested maize can reach the essential marketing destinations, starting from small retailers, millers or processors, bigger regional markets to export centers.

The assembly traders even play a major role in the storage of the harvest. This can impact the quality of maize in the supply chain as there can be incidences of contamination and mould (Kaaya and Kyamuhangire, 2006). While studying market access in Southern and Eastern Africa, Mather et al. (2013) commented that access to assembly traders have increased over time and this has given greater opportunities to the remote areas in terms of access to maize markets. This claim is supported by Sitko and Jayne (2014) with the mention of trading being highly competitive in Eastern and Southern Africa in terms of the marketing margins and the number of traders operating. Studying the perceptions of and about these important actors can aid in the understanding of the marketing linkages, maintenance of quality during trading activities (storage and transportation) and sustenance of trading relationships in these rural markets.

Another necessary actor of the maize supply chain is the millers or processors who produce the final product from the harvested maize. For instance, the profit-efficiency of the maize mills has been studied by Abu and Kirsten (2009) in South Africa where the researchers indicated the unexplored potential of the mills due to the deregulation of the maize markets in the country.

Interestingly, the type of maize being milled can be influenced by consumer preferences. An example of this can be obtained from Omueti et al. (2006) where the authors mention that soft endosperm varieties of maize are preferred in Western Africa because they are easier to process and thus, finer final products can be achieved from such varieties. Thus, maize millers or processors can act as a connection between the supply and the demand chains because consumer preferences can be rooted into the supply chains through the decisions of the maize millers in the types of maize, they buy to process for selling purposes. At the same time, large scale processors can influence government actions for the sustenance of food value chains (Omueti et al., 2006), indicating the extent to which maize millers hold a prime role in the maize value chain mechanisms. These arguments help in explaining why studying the perceptions of milling performances are important to get better insights about the supply chain.

2.2 Perceived Attributes of Supply Chain Actors

Due to limited knowledge and information asymmetries, it is often hard for farmers to assess the quality of products and services offered by input dealers. Products sold by agro-input dealers such as improved seed varieties, inorganic fertilizer, and pesticides or herbicides are considered "experience goods". The quality of these goods is hard to assess ex-ante, and the information advantage of the input dealer may lead to a lemons market (Bold et al., 2017). Based on limited knowledge, own experience, and the dealer's reputation (information that other buyers have about the seller), a farmer may form his or her own perceptions about quality of inputs and services provided by the input dealer.

In addition to the quality attribute, farmers may use perceptions and beliefs related to a range of other attributes of the input dealer. For instance, price considerations and the relative competitiveness of the dealer will be important when a farmer decides to transact with a particular input dealer. Primarily, ease of access to an input dealer determines transaction costs and subsequently farmer's access to and use of improved inputs (Alene et al., 2008). Secondly, ease of access to input dealers may increase interaction between farmers and the input dealers, thereby increasing farmers' learning about improved seed. The theoretical framework motivating a possible link between input dealer attributes and use of improved seed can be located in the literature on customer perceived value and consumption behavior (Jayashankar et al., 2018; Chiu et al., 2014). This literature suggests that (continued) usage of a given product or service is accompanied by not just a customer's perceived value (price or quality) of that product/service, but also the perceived value (e.g. trust/reputation, accessibility) of the provider of the product. Thus, the perceptions formed based on price competitiveness, quality of seeds, ease of access and reputation can determine the use of improved inputs to some extent.

Next, I turn to the perceived attributes of traders. In remote locations, if the traders are easily accessible, that would mean that the farmers have greater exposure to selling opportunities, might reduce wastage of harvest, ensure constant income for the farmer and increase availability of maize harvests at the buying points. Thus, ease of access is likely to be more important than for instance, quality when assessing traders. Traders having better reputation will influence the perceived reputation attributes, i.e., if a farmer hears something good about a trader from another farmer, he or she will perceive that trader to be well-reputed. Reputation of the trader may also be motivated by trustworthiness and higher number of business interactions. Traders in greater demand are likely to be well-reputed.

The perceived quality of service can be driven by many aspects like behavior of the trader, flexibility of the trader, risks taken by the trader for the transportation of the harvest, etc. The price paid by traders while buying the harvest is an essential part of the interaction between the trader and the farmer. It is very important to know how accurately the farmers perceive the prices being paid by the traders and how accurately the traders perceive the prices they are paying themselves. This is an observable attribute of the trader, so most farmers should agree on their perceptions. However, these perceptions can have some underlying factors like length of the relationship between the trader and farmer. For instance, if a trader has been buying maize from a farmer for a long period of time, the farmer might agree at a lower price because he or she will be ensured that the harvest will always be sold on time without any hassle. Therefore, these perceived attributes about the traders can give better insights about access to maize marketing channels.

Millers or processors are scored by the farmers based on similar factors or attributes. The location of the mill is necessary to understand how easy it is for the traders or farmers to take the harvest to the processing points since in Uganda, both farmers and traders can take the harvests to the mills. For farmers living in remote areas, it may be hard to transport their harvest for milling or processing. Thus, location of the mills can influence perceptions of the farmers about the millers. In addition, perceptions are formed based on the quality of service and the quality of end product provided by these mills. Better milling technologies, cleanliness of the mills, transparency at the mills and flexibility provided by the mill staff can result in good perceived performance levels. Similarly, friendly behavior and shorter waiting times at the mills can ensure good perceived reputation of the processors.

Perceived prices cannot directly indicate the actual price charged at the mills because perceptions are not objectively measured or directly observed. High prices may not always be perceived as bad as they can be coupled with the quality of processing and the quality of the end product ensured by the mill. This may point towards the provision of price competitiveness among the processors. Finer end products can improve the perceived quality of end product along with the perceived reputation of the mill or the processor. Thus, the quality of processed maize available for the consumers can be partially explained by the perceived attributes of the maize millers.

3 Study Hypotheses

This section describes the hypotheses that are analysed which are as follows:

1. Self-ratings are higher than ratings given by raters (farmers) to ratees.
2. Ratings from women are more favourable than ratings from men.
3. Self-ratings from women are less favourable than self-ratings from men.
4. Ratings for men are higher than ratings for women.
5. The impact of both rater (farmer) and ratee being a woman is significant on the ratings.

Hypothesis 1 determines how the agro-input dealers, processors and traders rate themselves (self-assessments) compared to the ratings from the farmers. Self-ratings have been criticized largely and checked for validity by many researchers in different fields of research (Heneman, 1974; Lowman and Williams, 1987; Horwood and Anglim, 2021). This study does not claim that the self-ratings determine the actual performance levels of the agro-input dealers, processors, and traders in the Ugandan maize value chain. This is because self-ratings can be a victim of self-bias (Sui and Humphreys, 2017), self-deception (Von Hippel and Trivers, 2011), self-enhancement (Sedikides and Gregg, 2008; Alicke and Sedikides, 2009) and impression management (Wayne and Liden, 1995). However, the self-ratings indicate the perceived level of performance by the service and input providers which is the main motivation towards the inclusion of this hypothesis in the study.

Perceptions in this regard can explain a lot about the sector and could also explain slower technological change and advancements. If these service and input providers perceive themselves to be performing better than they actually are, then there will be lesser efforts to improve their professional stance in the industry. If the farmers rate the input dealers, traders, and millers lower than their self-ratings, it shows that the agro-input dealers, processors and traders are not meeting the expectations of the farmers without even realising their perceived low performance levels. This non-realisation is emanated through their more favourable self-ratings. Cheng et al. (2017) discusses that more favourable self-assessments can be a result of leniency in assessing self-performance. Such a leniency creates a gap between the perceived performance levels from the farmers and the perceived self-performance levels of the input and service providers.

Then, I turn to the variations in ratings based on gender (hypothesis 2). There is evidence from various areas of research that women generally rate more favourably than men. Furnham (2005) discussed ratings from men and women on business intelligence where women rated boss's overall, emotional and organizational IQ more favourably than the male subordinates. Interestingly, Rappoport et al. (1993) showed that women tended to assess healthy meals more favourably based on factors like health, pleasure and convenience compared to men. Winquist et al. (1998) argues that women have a tendency to score higher because perceptions of women are more positive than perceptions of men.

In this study, it is expected that female farmers will more favourably rate the input dealers, processors and traders on average compared to the male farmers, i.e., perceptions of female farmers will be more positive about the service and input providers. This can indicate various interesting and unknown attributes of the maize value chain. There are possibilities that female farmers are given better services and inputs by the input dealers, maize processors and traders, leading to more favourable ratings from the women. This can be culturally linked for a prominent gender bias in the provision of services and sale of goods. Another reason for this can be minimal stringency and greater leniency from women while rating the service and input providers they are involved with in their income-generating activities. However, the literature does not mention statistically significant presence of leniency for ratings provided by female raters (Thornton III et al., 2019). Validating this in the research of food value chains can be an interesting contribution to the existing studies.

Hypothesis 3 essentially compares the self-ratings (assessments) given by female and male agro-input dealers, processors, and traders. Women generally tend to underrate themselves, i.e., women perceive their potentials to be limited. Patiar and Mia (2008) saw a similar pattern for female Department Managers in the hotel industry. Male Department Managers always inflated their self-assessments while the women refrained from doing so. Gendered differences in self-perceptions do exist and this induces women and men to rate themselves differently, as argued by Beyer (1990); Wohlers and London (1989) and Rosenkrantz et al. (1968). Not only that, Braddy et al. (2020) found that women tend to experience harsher consequences than men when they overrate themselves. Such gendered ideas of self-assessment can partially explain why lesser number of female agro-input dealers, processors and traders get involved in the maize markets in Uganda. Since they underestimate their ability and do not think themselves to be performing well enough as the men, women could be less willing to be involved in these kind of business activities. Thus, the maize value chain remains dominated by the male service and input providers, pointing towards the need for important policy implications in this sector to encourage greater involvement of women.

Another important reason or consequence of less favourable self-perceptions can be the lack of confidence to strive in the business. In the developing economies, women generally have low confidence levels and face a lot of obstacles due to the standard cultural norms, societal expectations, gender discrimination and job-family conflicts (Izhar, 2006). Brown (1996) illustrated this phenomenon for Ugandan women describing how socialization effects, cultural validation of male dominance and gender stereotyping hinders the advancement of these women in educational management roles. As a result of social imposition of family roles, Ugandan women tend to have lower self-esteem and confidence in their potential to succeed outside domestic roles (Izhar, 2006; Brown, 1996).

The goal for hypothesis 4 is to study the differences in ratings received by male and female agro-input dealers, traders, and processors from maize farmers. One of the reasons behind lower ratings for women may be that women are generally perceived to be performing worse than men. For instance, Lyness and Heilman (2006) found that female managers received lower performance ratings compared to male managers. Particularly, women involved in line jobs (jobs involving physical strain like installation of transmission systems, etc.) received lower ratings compared to women involved in staff jobs. Basow and Silberg (1987) presented similar findings for female professors who were rated by both male and female students. Bias against female professors has been very prominent in the literature in the past decades (Feldman, 1993; Mengel et al., 2018; Miller and Chamberlin, 2000). This evident bias against women can be the root for lower ratings received by female input and service providers. A recent study by Wu (2020) found that there is a gender bias in how women are perceived in professional circumstances, i.e., perceptions about women mostly are less about their professional success and more about their physical or family factors. This can be a major driving factor for why women are always rated lower than men.

In the context of this study, bias against women can aid the explanation for the minimal involvement of women in agro-input dealing, trading, and processing of maize. When women are aware that they are perceived to be less capable for these business activities, they might not enter the sector in the first place to avoid criticisms and performance obstacles at a later stage. Social stringency and family practices might limit the women from performing better or being equally competitive as the men. Another compelling reason for the lower ratings received by women could be that their actual performance levels are worse than the men. Lower access to facilities, finance and business guidance can be the drivers of worse performance for the female dealers, traders, and processors alongside the underlying societal aspects. These arguments can be supported by the claims of Niethammer (2013), mentioning the significant gender differences in the access to finance for the development of businesses and the lower formal bank account penetration for women when compared to men in the developing nations.

A study done on the women entrepreneurs in the Kigali region of Rwanda by Nsengimana et al. (2017) reported many challenges for the success of their businesses like the lack of collateral, lack of information technology access, high interest rates for loans, lack of skill development opportunities, cultural imperatives and psychological factors induced by the families and the society. Similarly, Guma (2015) discusses the barriers faced by women entrepreneurs in Uganda. Some of the prominent issues faced by women are gender-related stereotypes (risk-taking behavior, higher levels of empathy and lower aggressiveness), under-capitalization (credit access limits, availability of collateral), balance across multiple responsibilities (childcare, family responsibilities, inter-role conflict), inadequate skills and business knowledge, disapproval from societal standards, lack of respect from the male-dominated business community, lack of support, time investment constraints, reputation and work credibility challenges. These can significantly impact the ratings received by the female input and service providers in the supply chain and can undermine their perceived performance in the sector.

Finally, the primary goal of hypothesis 5 is to study the interaction between the sex of the rater (farmer) and the ratee in order to investigate if there is some significant impact of both being of the same sex on the ratings. This is mainly motivated by the literature studying homophily in social networks. The homophily principle essentially focuses on network ties based on relationships and characteristics of the actors involved. McPherson et al. (2001) discussed the consequences of such preferences like limitations in the social world, biased information, attitudes influenced by the characteristics of the ties formed and interactions limited to these homogeneous networks, arguing that gender based homophily can strongly divide personal environments.

Gender based homophily in food value chains can mean bias towards certain actors. For instance, if a female farmer has higher preference for a female trader, she may always interact with traders of the same sex. Other traders of opposite sex might be providing better services which this female farmer will be deprived of. While rating if the farmers intentionally rate the input and service providers of the same sex more or less favourably, incorrect performance perceptions will be exposed within the value chain. This may impact the performance of these actors and make business worse for some of the actors who received lower scores because of gender based homophily in preferences.

4 Data

This section explains the characteristics of the sample, describes the data collection, gives information about the variables, and discusses the validity of the ratings for the analysis.

4.1 Sample

The data for this study come from a survey of 1,526 farming households, 78 agro-input dealer shops, 341 assembly traders and 174 millers operating in the maize growing districts of Iganga, Bugiri and Namutumba in Eastern Uganda. The data were collected in July 2019. The farmer household sample is drawn from 64 villages in the three districts. Using the 2012 sampling frame of Uganda National Bureau of Statistics (UBoS), the household sample per village was randomly allocated, proportionate to the village population[1]. The villages were selected through a process of stratified random sampling at sub-county level. In each of the three districts, the sub-counties from which the villages were sampled were purposely selected based on their distance (km) from the main district town, in the range of 10 kms, 20 kms and 30 kms from the main town. A map of the study area is given below (figure 1). The input dealer shops, assembly traders and millers interviewed are those that were referred to by farmers, either because they have ever purchased improved maize seed from them, sold harvest to traders or processed (sold) maize at the milling farms or these supply chain actors are within their vicinity.

A key question that may arise is the degree to which results for the three study districts can be generalized to Uganda as a whole. The representativeness of the study area is examined using maize production figures. The Eastern region, where the three districts fall, accounted for the highest share (47%) of the roughly 2.3 million tons of maize harvested in 2009 (Daly et al., 2016). The district of Iganga was the largest producer in the region and country, contributing 13.1%, followed by Mubende (7.4%) in Central Uganda and Soroti (5.9%) in Eastern Uganda. The remaining districts contributed less than 4%, including Bugiri (2.7%) which is part of this study.

[1] A random sample of farmers were interviewed in each village. The number of farmers to be sampled in a village was proportional to the size of the village. So, in larger villages, more farmers were interviewed.

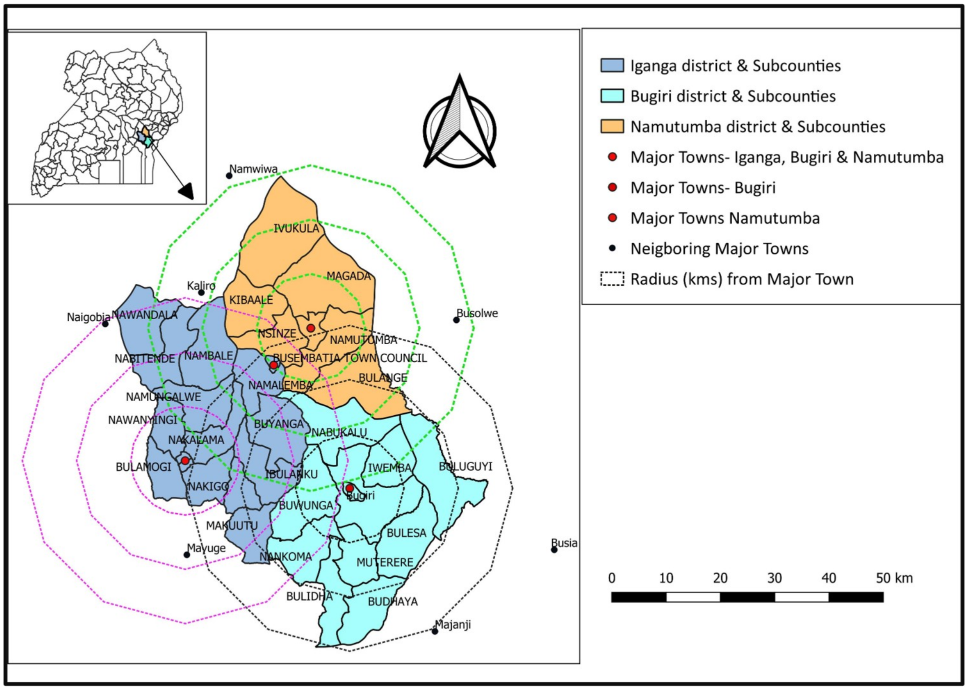

Figure 1: Map of the study area.

4.2 Variables

The summary statistics for the main variables used in this study are presented in tables 1 and 2. Each farmer rates a minimum of one input dealer, trader, or miller to a maximum of three input dealers, traders, or millers (ratees). Farmer perceptions about the ratees and ratee perceptions about themselves are understood from the ratings given on four dimensions of location, quality, price, and reputation. The averages of these dimension-based ratings are obtained to get the overall average ratings (for both farmer ratings and self-ratings).

Several methods have been proposed and used to measure respondents' perceptions, attitudes, or beliefs in social science research. Delavande et al. (2011) survey the literature on the measurement of subjective beliefs in developing countries and categorize possible methods into three groups: Likert style questions, elicitation of the 'most likely' outcome, and a full elicitation of the distribution of beliefs, most often conducted with visual aids. The ratings in this study reflect Likert style assessment where the scores range from 1 to 5, 5 being the best score and 1 being the worst score. This is the case for both farmer ratings and self-ratings from the agro-input dealers, traders, and millers[2].

Table 1 presents the variables related to the farmers in the dataset. The summary statistics

[2]The farmer ratings are assumed to be not exposed to the input and service providers before their self-ratings were collected.

for ratings based on all the dimensions and the overall ratings are presented. Some interesting trends are present in the ratings. For example, it is seen that about 6 percent of the farmers rated the ratees in the lowest category on the location dimension (score of 1) while about 38 percent gave the highest rating for ease of reaching the ratee (score of 5). Gender of the farmer is a dummy variable taking the value of 1 if the farmer is a woman and 0 otherwise.

Gender based rating patterns indicate that female farmers are more inclined to giving the highest score of 5 for location (41 percent) compared to male farmers (36 percent). Considering the dimensions, reputation and quality, larger shares of male farmers give a rating of 5 compared to the female farmers. Higher percentage of male farmers think that ease of access is poor (at least level 2 score) and price competitiveness is poor (at least level 2 score) while higher percentage of female farmers perceive poorer reputation of the ratees (at least level 2 score). Same percentage of male and female farmers perceive poor quality of services from traders, millers, or input dealers.

Education and marital status are dummies indicating whether the farmer has some level of education and whether the farmer is married. It is interesting to note that 49 percent of the farmers are women, most of them have some level of education (87 percent) and are married (86 percent). The average age of the farmers is 44.5. The average distance of farmers' homestead to tarmac road is 6.54 kms and to murram road is 0.51 km. Dummy variable for interaction between farmers and the input dealer, trader or processor is also included. 88 percent of the farmers have had some business interaction with the individual they are rating.

Table 2 shows summary statistics for the self-ratings from agro-input dealers, traders, and maize processors. The ratees (dealers, traders, and millers) seem to be very confident about their reputation as among all the dimensions, the highest percentage give a self-score of 5 for reputation (58 percent). They seem to be the least confident about their location as among all the dimensions, the highest percentage adhere to a score of at least 2 for location.

Gender, education, and marital status of these supply chain actors are dummy variables. Women consist of 29 percent of the input dealers, only 2 percent of the traders and only 7 percent of the millers. A very good share of these supply chain actors has some level of education and are married. Although the average age of the dealers, traders and millers is between 35 and 40 years, there is noticeable variation in the oldest actor observed. The oldest input dealer is 66 years old; the oldest trader is 80 years old while the oldest miller is 75 years old.

	Summary Statistics (Farmers)			
	Mean	Standard Deviation	Minimum	Maximum
Overall rating (all ratees)	3.6	0.77	1	5
Location rating (all ratees)	3.88	1.17	1	5
Quality rating (all ratees)	3.5	1.1	1	5
Price rating (all ratees)	3.04	1.08	1	5
Reputation rating (all ratees)	3.83	1.02	1	5
Overall rating (dealers)	3.59	0.74	1	5
Location rating (dealers)	3.65	1.27	1	5
Quality rating (dealers)	3.64	1.02	1	5
Price rating (dealers)	2.99	1.08	1	5
Reputation rating (dealers)	3.84	0.96	1	5
Overall rating (traders)	3.67	0.8	1	5
Location rating (traders)	4.09	1.02	1	5
Quality rating (traders)	3.54	1.01	1	5
Price rating (traders)	3.07	1.05	1	5
Reputation rating (traders)	3.84	1.04	1	5
Overall rating (millers)	3.54	0.75	1	5
Location rating (millers)	3.8	1.21	1	5
Quality rating (millers)	3.41	1.19	1	5
Price rating (millers)	3.02	1.11	1	5
Reputation rating (millers)	3.82	1.03	1	5
Gender	0.49	0.5	0	1
Age	44.5	13.54	16	97
Education	0.87	0.34	0	1
Marital Status	0.86	0.34	0	1
Distance of homestead to tarmac road	6.54	7.7	0	90
Distance of homestead to murram road	0.51	1.17	0	15
Interaction between farmers and all ratees	0.88	0.33	0	1
Interaction between farmers and dealers	0.8	0.4	0	1
Interaction between farmers and traders	0.84	0.37	0	1
Interaction between farmers and millers	0.95	0.22	0	1

Table 1: Summary Statistics of the variables related to the farmers.

	Summary Statistics (Ratees)			
	Agro-Input Dealers			
	Mean	Standard Deviation	Minimum	Maximum
Overall self-ratings	4.13	0.43	2.8	5
Location self-ratings	4.22	0.88	2	5
Quality self-ratings	4.58	0.61	3	5
Price self-ratings	4.05	0.82	2	5
Reputation self-ratings	4.4	0.86	1	5
Gender	0.29	0.46	0	1
Age	35.95	12.35	19	66
Education	0.99	0.11	0	1
Marital Status	0.76	0.43	0	1
	Assembly Traders			
Overall self-ratings	4.29	0.5	2.2	5
Location self-ratings	4.11	0.85	1	5
Quality self-ratings	4.33	0.77	1	5
Price self-ratings	3.91	0.83	1	5
Reputation self-ratings	4.45	0.77	2	5
Gender	0.02	0.14	0	1
Age	37.85	9.56	19	80
Education	0.96	0.18	0	1
Marital Status	0.96	0.2	0	1
	Millers			
Overall self-ratings	4.18	0.52	3	5
Location self-ratings	3.99	0.97	1	5
Quality self-ratings	4.16	0.84	2	5
Price self-ratings	3.84	0.95	1	5
Reputation self-ratings	4.5	0.69	2	5
Gender	0.07	0.25	0	1
Age	36.68	14.42	17	75
Education	0.95	0.21	0	1
Marital Status	0.81	0.39	0	1

Table 2: Summary Statistics of the variables related to the ratees (dealers, traders, and millers).

Looking at self-ratings based on the sex of the ratee, it is noticed that among all the different dimensions, the greatest percentage of female ratees rate themselves 5 for quality (68 percent) and the highest percentage of male ratees rate themselves 5 for reputation (59 percent). Giving self-scores of 5 is more common in women for location, price, and quality. However, male ratees think themselves to be more well reputed. Indeed, women think the quality of their services or products are way better as they never rate themselves below 3 and men think they are well reputed as only 1 percent of them rate themselves below 3.

The primary variables of interest in this study are ratings (perceived attributes) from farmers (raters), self-ratings (perceived self-attributes) from ratees, the sex of the farmer and the ratee. In order to identify the ratees as input dealers, traders or processors, unique identifiers were attached to them. Similarly, unique identifiers were also assigned to each farmer.

4.3 Validity of ratings

Testing whether the ratings are actually meaningful (instead of just noise) is important. This will give better insights about the validity of the perceptions. I look at intra-class correlation (ICC) coefficients determining the level of agreement between the ratings. In other words, ICC coefficients are a measure of inter or intra rater reliability. Inter or intra rater reliability in the ratings literature means levels of agreement between the ratings from different raters (Gwet, 2014). Inter rater reliability (agreement) looks at how close the ratings from different farmers are for an individual ratee while intra rater reliability (agreement) looks at how close the different ratings from an individual farmer are.

Intra-class correlation coefficient can range between 0 and 1. The lower it is, the poorer is the agreement and the higher it is, the better is the agreement level. In this context, inter and intra-rater reliability is studied for all the ratings given by the raters (farmers). Only farmers who rated more than 6 times are considered for this analysis (to reduce loss of observations during the analysis). The ICC coefficients indicating inter-rater reliability compare the ratings for each ratee from different farmers (raters). This helps to understand the level of agreement among the farmers on the different attributes of a particular ratee. The ICC coefficients indicating intra-rater reliability compare the various ratings given by each individual farmer. This shows how similar or different the farmer rates the various ratees.

Table 3 presents the ICC coefficients. Firstly, it can be inferred that raters (farmers) agree decently on overall ratings given to ratees. The ICC coefficient being 0.54, it can be deduced that the ratings captured in the survey are not entirely random or untrue. However, the

	Intraclass correlation coefficients	
	Inter-Rater Reliability	*Intra-Rater Reliability*
Overall	0.54	0.64
Location	0.47	0.62
Quality	0.15	0.31
Price	0.43	0.43
Reputation	0.24	0.68

Note - The sample consists of all the raters and ratees (agro-input dealers, traders, and processors). The averaged overall ratings, ratings based on location, quality, price, and reputation are taken into account. ICC for Inter-Rater Reliability : Inter-rater reliability indicates the level of agreement between the ratings given by different individual farmer (rater) for the same ratee. The ratee being rated is constant during the comparison of the ratings. The sample consists of only the farmers who have rated more than 6 times. ICC for Intra-Rater Reliability : Intra-rater reliability focuses on the agreement between the different ratings given by each individual rater for different ratees. The farmer who has rated more than 6 times is constant during the comparison of the ratings.

Table 3: ICC coefficients for inter-rater reliability and intra-rater reliability.

level of agreement among the raters (farmers) drops majorly for quality (0.15) and reputation (0.24). For location- and price-based ratings, the agreement levels are higher (0.47, 0.43). This is expected as location and prices are observable factors and hence, ratings for these factors should be more similar compared to non-observable attributes like quality and reputation.

Secondly, analysing the overall averaged rating pattern, it can be derived that every farmer rate in a similar way every dealer, trader or miller. This is because the ICC coefficient is 0.64 (table 3), indicating a very decent level of agreement. Similarly high levels of agreements are noticed for location (0.62) and reputation (0.68) based ratings.

5 Econometric Analysis

This section deals with the methodologies and estimation models used for the analysis. In order to understand the rating patterns, mean ratings from farmers and mean self-ratings are described in detail in the next section. Ratings from farmers and self-ratings are compared based on the sex of the farmers and the ratees, and differences in how women rate other women and how men rate other men are presented in section 6.

Next, I turn to the regression models to test the hypotheses laid out in section 3. In order to understand gender-based impacts on the ratings from the farmers, the following multivariate regression specification is used where the standard errors are clustered at the ratee level:

$$\begin{aligned} Y_{ija} = \beta_0 + \beta_1 * Gender(F)_{ija} + \beta_2 * Gender(R)_{ja} + \beta_3 * X_{ija} + \\ \beta_4 * Z_{ja} + \beta_5 * \Gamma_a + e_{ija} \end{aligned} \tag{1}$$

Here, Y_{ija} is the primary outcome variable, the ratings from the farmers or the differences in ratings between the farmer ratings and the self-ratings. The ratings are categorized into overall average, location, quality, price, and reputation. In equation 1, i is each individual farmer, j is each individual ratee and a can be an agro-input dealer or assembly trader or processor (ratee groups). The main independent variables are gender of the farmer ($Gender(F)_{ija}$, a dummy variable which takes the value of 1 if the farmer is a woman and 0 otherwise) which can vary for each individual farmer i, each individual ratee j and each ratee group a and the gender of the ratee ($Gender(R)_{ja}$, a dummy variable taking the value of 1 for female ratee and 0 otherwise), varying for each individual ratee j and each ratee group a. X_{ija} includes all the control variables varying for individual farmer, ratee and ratee group. Those are age of the farmer, dummy for interaction between the farmer and the ratee, dummy variable indicating if the farmer has some level of education, distance of farmer's homestead to tarmac and murram roads and marital status of farmer (dummy for married farmers). Z_{ja} consists of the control variables varying for individual ratee and ratee group like age, education (dummy for educated ratees) and dummy variable for marital status of the ratee. The dummies for input dealer (takes the value of 1 if a dealer and 0 otherwise) and trader (takes the value of 1 if a trader and 0 otherwise) are contained in Γ_a where the ratee being a miller is the reference category. The error term in the model is e_{ija}. The dataset used in the regression analyses is pooled, i.e., ratings for dealers, traders and processors are contained in the same dataset.

Following this, for the analysis of how ratings vary if farmer (rater) and ratee are of the same sex, an interaction term between the sex of the farmer (rater) and the ratee (both dummy variables) is added to the equation presented above. This is presented in the specification below with cluster robust standard errors (equation 2):

$$
\begin{aligned}
Y_{ija} = \beta_0 + \beta_1 * Gender(F)_{ija} + \beta_2 * Gender(R)_{ja} + \beta_3 * X_{ija} + \beta_4 * Z_{ja} + \\
\beta_5 * \Gamma_a + \beta_6 * Gender(F)_{ija} * Gender(R)_{ja} + e_{ija}
\end{aligned}
\tag{2}
$$

The coefficients of interest in these models are β_1, β_2 (equations 1 and 2) and β_6 (equation 2), showing the gender impacts on the ratings from farmers and the differences in farmer ratings and self-ratings.

The final regression model aims to study the relationship between the sex of the ratee and the self-ratings through multiple regression analysis:

$$
Y_{ja} = \beta_0 + \beta_1 * Gender(R)_{ja} + \beta_2 * Z_{ja} + \beta_4 * \Gamma_a + e_{ja} \tag{3}
$$

Here, the primary outcome variable of self-ratings is Y_{ja}, j is each individual ratee and a can be input dealer or assembly trader or processor (ratee groups). β_1 indicates the relationship between the sex of the ratee and the self-rating from the ratee. Some of the variables discussed above are included in this equation. The main independent variable is gender of the ratee ($Gender(R)_{ja}$). Z_{ja} and Γ_a consists of the control variables and the dummies for input dealer and trader. The error term in this model is e_{ja}.

An essential discussion is the motivation behind the inclusion of the control variables discussed in the models above. Men are likely to be better educated than women. Better levels of education and knowledge will probably mean that farmers have a better understanding of what to expect from service and input providers, and so, may rate more or less favourably (the ratings or scores given will be better informed). One does have to control for this impact pathway as otherwise, the gender and education effects will be conflated. In other words, correlation between the farmer's gender and the rating from the farmer may be confounded by education. Women are likely to be younger than men because of recent entry into farming activities and, older women devote more time to family responsibilities. Thus, age may directly affect ratings. For instance, older individuals may have more experience and so, may rate more or less critically. Therefore, age effects need to be purged from the model by controlling for it. Like age, mobility may directly affect ratings. In particular, men are more mobile and so more likely to have interacted with input dealers. If these interactions lead to systematically different ratings, it is necessary to control for it.

Distance to murram and tarmac roads are proxies of remoteness. In remote areas, input and service providers face many challenges such as larger transaction costs and poor access to services such as power. For instance, in semi-urban areas, mills often run on 3-phase electricity, while in remote areas, combustion engines are used to power the mills. The latter produce inferior quality maize products. These differences will be reflected in the ratings because farmers in remote areas tend to reach out to the input and service providers operating in those same areas. Thus, by controlling for distance of farmer's homestead to murram and tarmac roads, these differences are accounted for.

Men in farming activities tend to be married. On the other hand, it can be expected that women in farming are mostly not married as married women get involved more in household activities. Being married could mean that these farmers have been longer in maize production and thus, have more experience with service and input providers. This might make their ratings more or less favourable which makes it important to control for marital status of the farmer.

The arguments can be similar in the case of ratees. Since men are likely to be more educated than women, the education and knowledge might define what kind of service and inputs they provide to their customers (better or worse knowledge of improved services or inputs). This would lead to more or less favourable ratings from farmers and self-ratings, justifying the need to control for education of ratees. Men are likely to be older because of longer active periods in service providing and input dealing. Older individuals might have better experience in the business. This can impact the ratings. Farmers may rate older ratees with more experience more favourably while self-ratings are likely to be higher from older individuals because of their greater awareness about their performance in the sector. Hence, I control for age of the ratee (input dealer, trader, or miller).

Controlling for marital status of ratees is necessary as married service and input providers mostly tend to be men. This would mean they would have better knowledge and experience (more time spent in business as the chances of being married increases with age) which might lead to more favourable ratings from farmers. At the same time, women who are not married might be rating themselves lower because of minimal experience, knowledge, connections, and support in their businesses. Therefore, purging marital status effects of the ratees from the model is essential.

6 Results

This section focuses on the results obtained from the analysis of average ratings from farmers and average self-ratings given by ratees to themselves. Furthermore, the regression results are presented and discussed below.

6.1 Average ratings

Average scores are obtained for the ratings given by the farmers (raters) to the ratees (agro-input dealers, processors, and traders) and for the self-ratings by the ratees themselves. The primary goal of this section is to check whether the mean ratings obtained from the dataset (presented in table 4) reiterate the hypotheses of the study[3].

[3]The results for traders and millers may suffer from small sample share of women.

	Average Ratings (Mean)											
	Overall Average (All Dimensions)											
	All Ratees			Agro-Input Dealers			Assembly Traders			Millers		
	Men	*Women*	*All*	*Men*	*Women*	*All*	*Men*	*Women*	*All*	*Men*	*Women*	*All*
Male farmers	3.58	3.61	3.58	3.59	3.57	3.58	3.64	3.92	3.65	3.51	3.59	3.52
Female farmers	3.62	3.63	3.62	3.6	3.64	3.61	3.68	4.09	3.69	3.58	3.44	3.57
All farmers	3.59	3.61	3.6	3.59	3.59	3.59	3.66	4	3.66	3.54	3.53	3.54
Self-ratings	4.23	4.16	4.22	4.06	4.02	4.05	4.28	4.53	4.28	4.23	4.29	4.24
	Location											
Male farmers	3.85	3.54	3.83	3.61	3.33	3.53	4.05	4.41	4.06	3.76	3.74	3.76
Female farmers	3.98	3.82	3.97	3.93	3.77	3.89	4.13	4.4	4.13	3.87	3.67	3.86
All farmers	3.91	3.64	3.88	3.72	3.46	3.65	4.08	4.41	4.09	3.81	3.71	3.8
Self-ratings	4.11	4.07	4.11	4.08	4.01	4.06	4.1	4.97	4.12	4.12	3.91	4.11
	Quality											
Male farmers	3.49	3.7	3.51	3.71	3.65	3.69	3.53	3.82	3.54	3.37	3.77	3.39
Female farmers	3.47	3.65	3.49	3.48	3.64	3.52	3.54	3.93	3.55	3.41	3.56	3.42
All farmers	3.48	3.68	3.5	3.63	3.65	3.64	3.53	3.88	3.54	3.39	3.69	3.41
Self-ratings	4.24	4.68	4.28	4.48	4.62	4.52	4.3	4.88	4.31	4.12	4.71	4.16
	Price											
Male farmers	3.01	2.95	3	2.96	2.92	2.95	3.05	3.24	3.05	2.99	2.93	2.98
Female farmers	3.1	3	3.09	3.08	3.09	3.08	3.09	3.47	3.1	3.1	2.69	3.08
All farmers	3.04	2.97	3.04	3	2.97	2.99	3.07	3.34	3.07	3.04	2.83	3.02
Self-ratings	3.9	4.06	3.92	3.82	4.05	3.88	3.93	3.94	3.93	3.91	4.14	3.92
	Reputation											
Male farmers	3.82	3.93	3.83	3.82	3.96	3.86	3.81	4.06	3.82	3.83	3.84	3.83
Female farmers	3.83	3.93	3.84	3.78	3.89	3.81	3.85	4.4	3.87	3.82	3.79	3.82
All farmers	3.82	3.93	3.83	3.81	3.94	3.84	3.83	4.22	3.84	3.83	3.82	3.82
Self-ratings	4.48	4.34	4.47	4.53	4.4	4.49	4.38	4	4.37	4.55	4.33	4.54

Table 4: Average ratings (all dimensions) from farmers and average self-ratings (all dimensions) from dealers, traders, and processors, grouped by gender.

Table 4 shows that the mean overall self-rating given by the ratees (4.22) is higher than the mean rating from the farmers (3.6). This phenomenon is consistent across all the different rating dimensions. Looking at individual groups of input dealers, traders, and millers in table 4, the same inference can be made that self-ratings are always higher. These findings support hypothesis 1.

In order to validate hypothesis 2 from the trends in the dataset, I will first look at the entire group of ratees. The mean overall rating from female farmers is 3.62 which is higher than the mean overall rating given by male farmers (3.58). Similar pattern is noticed for location-, price- and reputation-based ratings. However, for quality-based rating, male farmers give a higher rating. Interestingly, these patterns vary across the groups of input dealers, traders, and millers. For overall average ratings, location- and price-based ratings, female farmers always give better scores to dealers, traders and processors. Male farmers give better scores for quality to dealers while lower scores for quality to traders and millers when compared to their female counterparts. More favourable scores for reputation of dealers and millers come from men while for traders, come from women. Thus, hypothesis 2 is generally true with an exception for quality- and reputation-based ratings from the farmers.

Next, I focus on the comparison of self-ratings from women and men. For overall average self-rating, women (4.16) rate lower compared to men (4.23). This is consistent for location and reputation based self-ratings. However, for quality and price, men self-assess themselves worse than how women self-assess themselves. These findings are similar for each rating dimension in the case of input dealers. Self-ratings from male assembly traders are always lower than female assembly traders except when they are rating for reputation. The results obtained from the mean self-ratings of the entire ratee group reflect in the results for the miller group in particular. However, the only exception is the overall average self-rating where male millers assess themselves worse than the female millers. Thus, supporting hypothesis 3, it can be stated that although women tend to generally self-assess less favourably; for quality and price, women tend to self-assess more favourably when compared to men.

Following this, the focus is on the sex of the ratees and the ratings from the farmers. Men receive less favourable ratings for overall average, quality, and reputation. For location and price, women receive better scores than men. These findings are consistent for the group of agro-input dealers across the rating dimensions. However, both male and female input dealers receive the same overall average rating. Interestingly, all male assembly traders receive lower scores across all the rating dimensions than the female assembly traders. Thus, female assembly traders are perceived to be performing better. In the case of millers, women always receive less favourable ratings, with an exception for quality. Thus, hypothesis 4 does not entirely align with these findings from table 4. Women mostly are rated lower for location and price whereas men are rated worse overall and for quality and reputation mostly.

Next, I examine how men rate other men and women rate other women. The average ratings show that women give more favourable ratings to other women compared to men's ratings for other men, only in the case of overall average, quality, and reputation. All female traders are always rated higher by female farmers in every dimension of rating. Male millers are generally rated higher by male farmers with an exception for quality. Women rate female agro-input dealers higher for all aspects except for quality. These findings portray the underlying idea of hypothesis 5.

It is interesting to note that generally, women are always rated higher for quality (consistent for dealers, traders, and processors), indicating provision of better quality from women. Similarly, men are consistently rated higher for location with an exception for traders. This may indicate that women (dealers and millers) are located in poorer locations. Some of the reasons behind that could be mobility constraints, lack of capital to set up businesses in better locations and less knowledge of good locations for business.

Farmer ratings indicate that price competitiveness of male input dealers and millers are perceived to be better, women in input dealing and trading and men in processing of maize are perceived to be well-reputed. The rating attribute that is always scored the lowest is price competitiveness and that is always scored the highest is ease of access for traders and reputation for agro-input dealers and millers. Input dealers get the lowest score for ease of access and price competitiveness and millers get the lowest rating for overall average, quality, and reputation. Thus, agro-input dealers are overall not easy to reach while assembly traders are. In terms of the quality of service provided, input dealers are perceived to be the best in comparison to traders and millers.

6.2 Regressions

Tables 5, 6 and 7 present results from the regressions implemented for this study. Table 5 shows multivariate regressions with clustered standard errors (at the ratee level), discussing the impact of the sex of the farmer (rater) and the ratee on the ratings given by the farmers to the ratees. From model 1, it is noticeable that the impact of the sex of the farmer on the average overall rating given by the farmer is significant. If the farmer is a woman, the average score given by the farmer is 0.06 higher. Thus, female farmers give more favourable ratings when compared to male farmers, consistent with the results from table 4. The relation between the gender of the ratee (dealer, trader, or miller) and the overall average ratings given by the farmer is insignificant.

If the farmer had some business interaction with the input dealer, trader, or processor the farmer is rating, the rating given by the farmer is approximately 0.4 point higher (significant). The education level of the farmer significantly influences the way the farmer rates the ratee. If the farmer has some level of education, the farmer (rater) rates the ratee 0.09 point higher. The negative relation between the average overall rating given by the farmer and the distance of the farmer's homestead from the nearest murram road is also significant. This means greater distance from the murram road would imply a lower score given by the farmer (rater). There is a negative relationship between the ratee's marital status, and the ratings received by the ratee. If the ratee is married, the ratee receives a significantly lower score. Ratings for dealers are higher on average by approximately 0.09 point (significant) and ratings for traders are significantly higher on average by 0.19 point (consistent with table 4 results). The total number of observations is 3589.

The interaction between the sex of the farmer and the sex of the ratee is insignificant throughout all the models in table 5. In other words, no significant gender based homophily effect is found (disproving hypothesis 5). The positive relationship between sex of the farmer and the farmer's ratings is significantly consistent for location-based and price-based ratings (models 3, 4, 7 and 8). This is consistent with the results from table 4. However, the magnitude of more favourable ratings from female farmers is most noticeable for location-based ratings, being highly significant too. Interestingly, for quality- and reputation-based ratings, if the ratee is a woman, the farmer's rating increases significantly. However, the ratings decline for location-based ratings if the ratee is a woman (similar findings in table 4). Thus, it can be inferred that female farmers give more favourable scores overall (proving hypothesis 2), particularly for location and price and female ratees receive better scores from farmers only for quality and reputation (disproving hypothesis 4).

	Dependent variable: Ratings from Farmers (Raters)									
	Overall		Location		Quality		Price		Reputation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	3.0954***	3.095***	3.5511***	3.554***	2.6314***	2.6314***	2.9595***	2.9584***	3.3677***	3.3673***
	(0.1649)	(0.1648)	(0.2925)	(0.292)	(0.2817)	(0.2816)	(0.2014)	(0.2013)	(0.1876)	(0.1876)
Gender(F)	0.062**	0.0635**	0.1499***	0.1381***	0.0087	0.0087	0.09**	0.0944**	0.0074	0.0091
	(0.0293)	(0.0306)	(0.0485)	(0.0505)	(0.0429)	(0.0446)	(0.0408)	(0.0426)	(0.0373)	(0.0388)
Gender(R)	0.0418	0.0487	−0.1205	−0.1753*	0.1733**	0.1734**	−0.0549	−0.0341	0.1232*	0.1308
	(0.0721)	(0.0725)	(0.1306)	(0.1414)	(0.1073)	(0.1081)	(0.0886)	(0.0853)	(0.0778)	(0.0934)
Age of farmer	0.0011	0.0949**	0.0021	0.1298**	0.0003	0.1132*	0.0011	0.1334**	0	0.0076
	(0.0012)	(0.0437)	(0.0018)	(0.0686)	(0.0016)	(0.0608)	(0.0016)	(0.0614)	(0.0014)	(0.0519)
Interaction	0.3985***	0.3985***	0.251***	0.2509***	0.4942***	0.4942***	0.2348***	0.2349***	0.4333***	0.4333***
	(0.0468)	(0.0468)	(0.0648)	(0.0648)	(0.0589)	(0.0589)	(0.0552)	(0.0552)	(0.0557)	(0.0557)
Education(F)	0.0947**	0.0011	0.131**	0.0021	0.1132*	0.0003	0.133**	0.0011	0.0074	0
	(0.0437)	(0.0012)	(0.0684)	(0.0018)	(0.0608)	(0.0016)	(0.0613)	(0.0016)	(0.0519)	(0.0014)
Tarmac	−0.0023	−0.0023	−0.0015	−0.0015	−0.0067***	−0.0067***	−0.0046**	−0.0046**	0.0014	0.0015
	(0.0022)	(0.0022)	(0.0039)	(0.0039)	(0.0032)	(0.0032)	(0.0026)	(0.0026)	(0.0026)	(0.0026)
Murram	−0.0191*	−0.0191*	−0.0286*	−0.0288*	−0.0084	−0.0084	−0.0141	−0.014	0.0018	0.0019
	(0.0094)	(0.0094)	(0.0171)	(0.0171)	(0.0141)	(0.0141)	(0.0129)	(0.0129)	(0.0125)	(0.0125)
Farmer marital status	−0.063	−0.0631	−0.0675	−0.0666	−0.0344	−0.0344	−0.0913	−0.0917	−0.0834	−0.0835
	(0.0445)	(0.0445)	(0.0732)	(0.0733)	(0.061)	(0.061)	(0.0662)	(0.0663)	(0.0547)	(0.0547)
Age of ratee	0.0018	0.0018	0.0009	0.0009	0.0044***	0.0044***	0.0007	0.0007	0.0026*	0.0026*
	(0.0017)	(0.0017)	(0.0026)	(0.0026)	(0.0032)	(0.0032)	(0.0022)	(0.0023)	(0.0021)	(0.0021)
Ratee marital status	−0.1142***	−0.114***	−0.1244*	−0.1255*	−0.1591***	−0.1591***	−0.1283**	−0.1279**	−0.081	−0.0809
	(0.0565)	(0.0565)	(0.107)	(0.1066)	(0.1045)	(0.1046)	(0.0708)	(0.0708)	(0.0641)	(0.0643)
Education(R)	0.0138	0.0135	−0.0968	−0.0952	0.2425**	0.2425**	−0.1613	−0.162	0.0663	0.0661
	(0.1145)	(0.1147)	(0.1778)	(0.1761)	(0.22)	(0.2201)	(0.1032)	(0.1028)	(0.1368)	(0.1368)
Dealer dummy	0.0888**	0.0887**	−0.0919	−0.0908	0.2256***	0.2256***	0.0066	0.0061	0.0403	0.0401
	(0.0452)	(0.0451)	(0.1068)	(0.1067)	(0.0838)	(0.0838)	(0.0646)	(0.0646)	(0.0531)	(0.053)
Trader dummy	0.1908***	0.1908***	0.3321***	0.3322***	0.2195***	0.2195***	0.0966**	0.0965**	0.0734*	0.0734*
	(0.0414)	(0.0414)	(0.0653)	(0.0653)	(0.0755)	(0.0755)	(0.0529)	(0.0529)	(0.0505)	(0.0505)
Gender(F):Gender(R)		−0.0187		0.1482		−0.0005		−0.0563		−0.0207
		(0.086)		(0.167)		(0.1248)		(0.1221)		(0.1207)
R^2	0.0408	0.0408	0.0341	0.0344	0.0374	0.0374	0.0136	0.0137	0.0212	0.0212
Adj. R^2	0.0373	0.0371	0.0306	0.0306	0.0339	0.0336	0.01	0.0098	0.0177	0.0174
Number of obs.	3589	3589	3589	3589	3589	3589	3589	3589	3589	3589

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Note: Standard errors are clustered at the ratee level (agro-input dealers, traders, and millers). The dependent variable is the rating given by the farmers and the main independent variables are farmer's and ratee's gender. The dimensions based on which the ratings are given are overall average (models 1, 2), location (models 3, 4), quality (models 5, 6), price (models 7, 8) and reputation (models 9, 10). Models 2, 4, 6, 8 and 10 include an interaction between the farmer's and ratee's gender while the other models do not. F refers to farmers and R refers to ratees.

Table 5: Regression results for the impact of farmer's (rater's) and ratee's gender on the ratings given by the farmers to the ratees.

Following this, table 6 shows the results from multiple regression analysis looking at the impact of sex of the ratee on self-assessments (self-ratings). The relationship is significant only for quality-, price- and reputaion-based self-ratings. If the ratee is a woman, she significantly self-assesses herself higher than the male ratees for quality and price. However, for reputation, she rates herself lower (significant). These results are consistent with the findings from table 4. Looking at model 1, it can be noted that older and educated ratees self-assess themselves higher significantly and married ratees self-assess themselves lower significantly. Consistent with table 4 results, it can be observed that traders significantly give higher self-ratings while dealers give significantly lower self-ratings. Henceforth, it can be inferred that for quality and price, women self-assess themselves higher while for reputation, lower. Here, hypothesis 3 is only consistent with the finding about reputation based self-ratings.

Finally, table 7 studies the relationship between farmer's and ratee's gender and the differences between the farmer ratings and ratee self-ratings. Here, again the standard errors are clustered at the ratee level. The differences increase significantly for the overall average ratings, location- and price-based ratings if the farmer is a woman (also for reputation (model 10), when the interaction term is added). This means female farmers give significantly more different ratings compared to the self-assessments by the ratees themselves. The impact of the sex of the ratee on the differences is interesting as the differences in ratings decline significantly for quality and price if the ratee is a woman while the differences increase in the case of reputation-based ratings.

The interaction between sex of the farmer and the ratee (gender based homophily) is insignificant. If the farmer had some business interaction with the ratee or if the farmer has some level of education, the differences rise significantly. If the farmer is married, the differences in ratings decline. In the case of dealers and traders being rated, the differences increase significantly. Therefore, it can be stated that women give more different ratings than self-assessments, particularly in the case of location and price. The gender of the ratee only matters significantly when differences in ratings based on quality, price and reputation are considered. From these inferences, it can be derived that indeed self-assessments can be different from the actual ratings received from the farmers (aligns with the idea of hypothesis 1) and gender influences these differences. Investigating the intercepts in table 7, it can be noted that the coefficients are significantly negative for overall average rating differences, quality-, price- and reputation-based rating differences. This indicates that self-ratings are always higher than the farmers' ratings (in the case of quality, price, and reputation), a strong evidence supporting hypothesis 1.

	Dependent variable: Self-ratings by dealers, traders, and millers				
	Overall	Location	Quality	Price	Reputation
	(1)	(2)	(3)	(4)	(5)
Intercept	4.0737***	3.896***	3.9657***	3.438***	4.7091***
	(0.053)	(0.1035)	(0.086)	(0.0958)	(0.0798)
Gender(R)	0.0353	−0.0289	0.391***	0.2388***	−0.197***
	(0.0301)	(0.0588)	(0.0489)	(0.0544)	(0.0454)
Age of ratee	0.0021***	0.0064***	−0.0013	0.0084***	0.001
	(0.0007)	(0.0014)	(0.0012)	(0.0013)	(0.0011)
Ratee marital status	−0.0575**	−0.2997***	0.0918**	−0.0626	−0.0091
	(0.0262)	(0.0512)	(0.0426)	(0.0474)	(0.0395)
Education(R)	0.1371***	0.2372***	0.1488**	0.2165***	−0.1961***
	(0.0445)	(0.0869)	(0.0722)	(0.0804)	(0.067)
Dealer dummy	−0.2095***	−0.109**	0.2948***	−0.1171***	0.0037
	(0.0231)	(0.0452)	(0.0376)	(0.0418)	(0.0348)
Trader dummy	0.0511***	0.0482	0.1537***	0.0152	−0.1752***
	(0.0177)	(0.0346)	(0.0288)	(0.032)	(0.0267)
R^2	0.0348	0.013	0.0474	0.0182	0.0195
Adj. R^2	0.0332	0.0113	0.0458	0.0166	0.0178
Number of obs.	3590	3590	3590	3590	3590

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Note: This table shows the results of a multiple regression analysis. The dependent variable is the self-rating given by the ratees and the main independent variable is ratee's gender. The dimensions based on which the self-ratings are given are overall average (model 1), location (model 2), quality (model 3), price (model 4) and reputation (model 5). R refers to ratees.

Table 6: Regression results looking at the impact of ratee's gender on their self-ratings.

	Dependent variable: Differences between farmer ratings and ratee self-ratings									
	Overall		Location		Quality		Price		Reputation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-1.0243^{***}	-1.0274^{***}	-0.2722	-0.2709	-1.3808^{***}	-1.3832^{***}	-0.7194^{***}	-0.72^{***}	-1.551^{***}	-1.5536^{***}
	(0.2342)	(0.2344)	(0.5088)	(0.5094)	(0.4441)	(0.4439)	(0.3809)	(0.3809)	(0.3107)	(0.3104)
Gender(F)	0.1162^{***}	0.1287^{***}	0.2076^{***}	0.2022^{***}	0.0489	0.0583	0.1568^{***}	0.1591^{***}	0.0727	0.0829^{*}
	(0.0385)	(0.0408)	(0.0732)	(0.0762)	(0.0488)	(0.0516)	(0.0552)	(0.058)	(0.0546)	(0.0579)
Gender(R)	0.0077	0.0656	-0.0861	-0.1113	-0.2201^{***}	-0.1761^{*}	-0.2987^{***}	-0.288^{***}	0.3189^{***}	0.3665^{***}
	(0.1145)	(0.1191)	(0.2935)	(0.324)	(0.1146)	(0.1305)	(0.2049)	(0.1922)	(0.1609)	(0.1573)
Age of farmer	0.0009	0.1251^{***}	0.0005	0.147^{*}	-0.0004	0.1084	0.0018	0.1765^{**}	0.0007	0.0845
	(0.0014)	(0.0501)	(0.0024)	(0.0844)	(0.0019)	(0.0763)	(0.002)	(0.0753)	(0.0017)	(0.0571)
Interaction	0.4285^{***}	0.4287^{***}	0.2959^{***}	0.2958^{***}	0.5191^{***}	0.5192^{***}	0.3076^{***}	0.3076^{***}	0.5046^{***}	0.5047^{***}
	(0.0552)	(0.0552)	(0.0876)	(0.0877)	(0.0758)	(0.0759)	(0.0751)	(0.0751)	(0.0676)	(0.0676)
Education(F)	0.1239^{***}	0.0009	0.1476^{*}	0.0005	0.1074	-0.0004	0.1763^{**}	0.0018	0.0834	0.0007
	(0.0501)	(0.0014)	(0.084)	(0.0024)	(0.0762)	(0.0019)	(0.0752)	(0.002)	(0.0571)	(0.0017)
Tarmac	-0.0025	-0.0025	-0.0027	-0.0027	-0.006^{**}	-0.006^{**}	0.0011	0.0011	0.0045^{*}	0.0045^{*}
	(0.0031)	(0.0031)	(0.0072)	(0.0072)	(0.0051)	(0.0051)	(0.0055)	(0.0055)	(0.0047)	(0.0047)
Murram	-0.0132	-0.0129	-0.0404^{**}	-0.0405^{**}	0.0052	0.0054	-0.0105	-0.0104	0.0097	0.0099
	(0.0118)	(0.0119)	(0.0227)	(0.0227)	(0.0189)	(0.0189)	(0.0203)	(0.0204)	(0.0163)	(0.0163)
Farmer marital status	-0.09^{*}	-0.0909^{*}	-0.1365^{*}	-0.1361^{*}	0.0026	0.0019	-0.081	-0.0811	-0.1088	-0.1096
	(0.0492)	(0.0492)	(0.0792)	(0.0793)	(0.0629)	(0.063)	(0.077)	(0.0771)	(0.0686)	(0.0686)
Age of ratee	-0.0002	-0.0003	-0.0056^{**}	-0.0056^{**}	0.0057^{***}	0.0057^{***}	-0.0074^{***}	-0.0074^{***}	0.0018	0.0017
	(0.003)	(0.003)	(0.0068)	(0.0068)	(0.0051)	(0.0051)	(0.0048)	(0.0048)	(0.0038)	(0.0038)
Ratee marital status	-0.0548	-0.0535	0.1778^{**}	0.1773^{**}	-0.2526^{***}	-0.2517^{***}	-0.073	-0.0728	-0.0734	-0.0724
	(0.1028)	(0.1028)	(0.2444)	(0.2446)	(0.1751)	(0.1751)	(0.2266)	(0.2267)	(0.1459)	(0.146)
Education(R)	-0.1266	-0.1283	-0.3417^{**}	-0.341^{**}	0.0909	0.0896	-0.3628^{***}	-0.3632^{***}	0.2685^{**}	0.2671^{**}
	(0.1579)	(0.1585)	(0.3158)	(0.3156)	(0.3717)	(0.3718)	(0.2083)	(0.2088)	(0.2288)	(0.2285)
Dealer dummy	0.307^{***}	0.3058^{***}	0.0292	0.0297	-0.0605	-0.0614	0.1353^{**}	0.135^{**}	0.0486	0.0476
	(0.0891)	(0.089)	(0.2554)	(0.2554)	(0.1303)	(0.1305)	(0.1714)	(0.1714)	(0.1156)	(0.1157)
Trader dummy	0.1431^{***}	0.143^{***}	0.2913^{***}	0.2913^{***}	0.0669	0.0668	0.0829	0.0829	0.2534^{***}	0.2533^{***}
	(0.0749)	(0.0749)	(0.145)	(0.1451)	(0.126)	(0.126)	(0.1285)	(0.1285)	(0.1077)	(0.1078)
Gender(F):Gender(R)		-0.1568		0.0682		-0.119		-0.029		-0.129
		(0.0985)		(0.2547)		(0.1151)		(0.1461)		(0.1338)
R^2	0.0417	0.0422	0.0248	0.0248	0.0278	0.0279	0.0202	0.0203	0.03	0.0302
Adj. R^2	0.0382	0.0385	0.0212	0.021	0.0242	0.0241	0.0167	0.0164	0.0265	0.0264
Number of obs.	3589	3589	3589	3589	3589	3589	3589	3589	3589	3589

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Note: Standard errors are clustered at the ratee level (agro-input dealers, traders, and millers). The dependent variable is the differences between ratings given by the farmers and the ratee self-ratings and the main independent variables are farmer's and ratee's gender. The dimensions based on which the ratings are given by farmers and ratees are overall average (models 1, 2), location (models 3, 4), quality (models 5, 6), price (models 7, 8) and reputation (models 9, 10). Models 2, 4, 6, 8 and 10 include an interaction between the farmer's and ratee's gender while the other models do not. F refers to farmers and R refers to ratees.

Table 7: Regression results for the impact of farmer's (rater's) and ratee's gender on the differences between farmer ratings and ratee self-ratings.

7 Conclusion

The aim of this study was to investigate the perceptions of maize farmers about the input and service providers in the maize value chain and the perceptions of these input and service providers about themselves. Focusing on gender, I tested if gender-based heterogeneity can be observed in perceptions. The perceptions were captured through the ratings given on dimensions like ease of access, quality of service, price competitiveness and reputation.

The main findings suggest that women give more favourable scores. They have significant positive perceptions, particularly across the dimensions of location and price competitiveness. This tendency of women to rate more favourably can have some repercussions. The input and service providers can take advantage of the leniency of female farmers and provide them with lower quality inputs and services. Also, the prices may not be too favourable for these female farmers. In this context, policy interventions are needed to ensure that all farmers are aware of the standard prices and the quality of inputs and services they deserve. However, sex of the individual being rated does not matter significantly.

Self-assessments are always significantly more positive than the ratings from the farmers across most of the dimensions (overall, quality, price competitiveness and reputation). In other words, input dealers, traders and processors have more positive perceptions about themselves compared to the perceptions (ratings) of the farmers. In particular, women's ratings are noticeably different from the self-assessments obtained. This indicates a gap between the farmers and the input and service providers. The interactions between these actors need to be structured in a way where perceived performance information can be conveyed easily, creating the opportunity for improvements.

This study shows that while self-assessing, the gender of the individual does not matter for the overall ratings. However, women give significantly less favourable self-assessments for reputation and more favourable for quality and price competitiveness. This is a very important finding about how women already perceive that they do not have good reputation among the farmers even if they provide favourable prices and good quality. These perceptions can be very close to the reality of the mechanisms in these supply chains. Women in business may be less favourable due to gender bias and traditional societal thoughts where women are expected to have less potential and capabilities to do well in businesses. Henceforth, provision of policies is necessary for greater opportunities, training facilities, spread of awareness, credit availabilities and support for women. However, homophily in gender was not evident in this study.

From the average ratings, it can be inferred that traders receive the highest ratings, followed by input dealers. Millers obtain the lowest scores. Millers' quality of services and reputation suffer from lowest ratings. More focus is thus needed on the processors of maize in Uganda. Female agro-input dealers, traders and millers always are perceived to be performing better in terms of quality. This is consistent with the self-perceptions of women. Thus, may be women are more prone to caring about the quality of services and inputs compared to the men. Interestingly, male dealers and millers are perceived to be easily accessible and have better prices. Male millers and female input dealers and traders obtain good scores for reputation.

Surprisingly, price competitiveness is always scored the lowest. Thus, standardized prices are needed in the sector. Highly volatile prices threaten price protection for the farmers and can create mistrust among the farmers and the input and service providers. Among all the input and service providers, traders are the most easily reachable actors and dealers and millers are the best reputed ones. Input dealers are perceived to be performing worst in the case of location and price competitiveness. Hence, it is essential to ensure that agro-input dealers are easily reachable to encourage higher usage of improved seed. This can be one of the reasons explaining why lower usage of improved seed has consistently been a matter of concern. Subsidies for the sale prices of inputs and transportation aid from the government can improve the sale prices and ease of access to these dealers. However, ratings for quality are the highest in the case of dealers (indicating provision of good quality seeds).

These perceptions are very important in the maize supply chain and give a lot of insight about the perceived performance levels of the input and service providers. Gender-based perceptions prominently indicate gendered preferences in the supply chain which is essential to be addressed. More women with greater support and business knowledge are needed in this sector to tackle the imbalance of preferences revealed in the perceptions (ratings) analysed in this study. Since the share of female millers and traders is very small in this study, more balanced samples of the supply chain actors could reveal better and highly significant results.

Future research should focus on perceptions of the input and service providers about the farmers, investigating similar trends in ratings and the change in perceptions over time captured through future surveys. A compelling addition to the literature can be the relationship between competition in this sector and the perceived performances of the actors. Investigating perceptions in the maize demand chain and then linking those perceptions with the perceived performances of the supply chain actors can reveal interesting results. Thus, the maize value chain holds a lot of opportunities for future research in different directions using perceptions of the value chain actors.

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