

Contract Farming in Developing Countries – A Behavioral Perspective on Contract Choice and Compliance

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1 General Introduction

1.1 Economic Development and Contract Farming

1.1.1 Economic Development and the formalization of economic exchange

Economists have acknowledged that Institutions play a crucial role for economic development (Davis and North 1971; North 1990; Lin and Nugent 1995; Acemoglu, Johnson, and Robinson 2005). We can think about institutions from a dual-perspective (Davis and North 1971; Williamson 1994): The legal system and property rights build what has been referred to as the institutional environment or simply “the rules of the game”. One example for the institutional environment are for example property rights, whose importance for economic growth has been demonstrated empirically by Knack and Keefer (1995). Besides the institutional environment we can think about institutions as arrangements between economic agents. This micro-perspective on institutions comprises any arrangements that govern economic exchange between two parties. Institutions can be regarded as any rules and norms that pose behavioral constraints and therefore shaping interactions between individuals. This definition makes it clear that institutions may either be formal (constitutions, laws, written contracts) or informal (social norms, shared values, customs) (Lin and Nugent 1995). Figure 1 illustrates the differentiation between institutional environment and institutional arrangements. In both domains institutions may either be formal or informal.

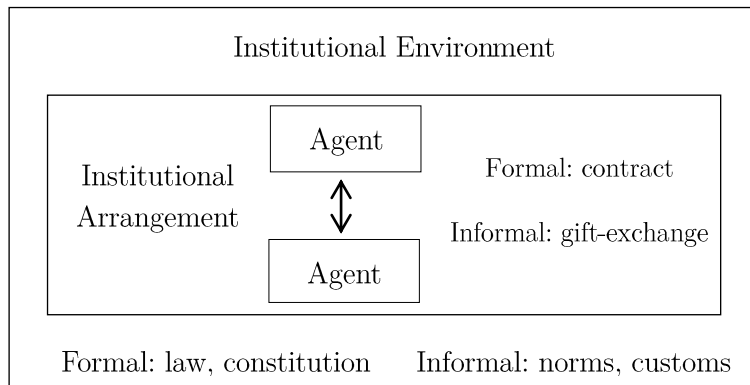


Figure 1 Formal and informal institutional sets

Along with economic development a formalization of institutional arrangements takes place. The need for formal institutions arises from changes in how economic exchange is organized. In the course of development, countries are moving from self-provision based economies to market-based economies. Self-provision based economies are based on gift-exchange as primary mode of economic governance (Date-Bah 1973). Transactions take mostly place within family clans and are based on reciprocity and risk-sharing (Fafchamps 2016). As economies develop, economic exchange passes over family boundaries and turns more and more into transactions between anonymous entities. A formalization of institutional arrangements requires at the same time a formalization of the institutional environment. Traditional norms may lose their efficiency if people are interacting with members from different social groups or face anonymous conditions, which is inevitable when economies develop. The shift from self-provision economies to market-based

economies therefore demands the development of a new institutional set and the recognition of transactions as contracts (Fafchamps 2004). With increasing specialization coordination of market activities is necessary. Contracts are a formal way to coordinate these activities.

Agriculture is a good example for this development. In traditional economies food production is based on subsistence farming, with little external interactions. With increasing specialization markets develop and farmers start to interact in more formal ways. With the globalization of agri-food-systems the need for coordination and formalization of farmer-buyer relationships has further grown. In the recent decades a fundamental transformation of agri-food systems took place, by which markets were getting more integrated (Reardon and Barrett 2000). The need for coordination in the food-sector has increased enormously in previous decades with the evolvement of public and private product standards. Tight relationships are necessary in order to secure quality and production requirements. Agricultural production is then no longer simply the production of unspecialized commodities. Contracts may play a particular role in coordinating these markets, which brings us to the core of this dissertation: Contract Farming.

1.1.2 Contract Farming as a tool for market integration and pro-poor development

Contract farming can be regarded as an institution to govern agricultural supply chains, i.e. a form of vertical coordination between a farmer and a buyer. Two major categories of contracts can be identified: Resource-providing contracts are characterized by the provision of inputs by a firm, “with the requirement that produce is marketed through that same firm.” (Prowse 2012, 11). Production-management contracts involve the control and enforcement of production conditions and usually results in higher quality products (Prowse 2012). Practically, contracts may combine elements of both categories and appear in many different shapes.

Besides the function of coordinating transactions contract farming is of particular relevance from a development perspective. Contract farming may correct market failures by ensuring access to credit and input (Kirsten and Sartorius 2002). Many firms also provide knowledge and training for farmers. Contract farming therefore can be a chance for smallholder farmers, who otherwise face constraints, to be integrated in global high value chains, which may have positive welfare effects on farmers (Wollni and Zeller 2007; Swinnen and Vandeplas 2011). There is increasing evidence that contract farming has positive welfare effects on the poor (Wang, Wang, and Delgado 2014; Otsuka, Nakano, and Takahashi 2016). For Madagascar Bellemare (2012, 1418) finds that “a 1-percent increase in the likelihood of participating in contract farming is associated with a 0.5-percent increase in house-hold income“. The development agenda sees contract farming therefore as a possibility to foster pro-poor growth.

1.1.3 Challenges in Contract Farming: Participation and Compliance

Although there is a lot of evidence for the positive welfare effects of contract farming, it is not clear how to integrate farmers into contracts and how to maintain stable long-term-relationships between farmers and agri-business firms. A lot of research has been done in order to analyze the determinants of participation in contract farming schemes. For example it has been found that farm size, access to infrastructure and education play an important role for farmers' participation in contract farming.¹ Especially small and probably poor farming households often face high entry barriers (e.g. Key and Runsten 1999). On the other hand, even when farmers are integrated, there is evidence for a high fluctuation of participants in contract farming schemes, which can be caused by contract breaches on both supply and demand sides (Barrett et al. 2012). Since the forms of contractual agreements are very diverse, there are many different shapes of contract breaches. Barrett et al. (2012, 720) give an overview of different opportunities of breach for farmers and agribusiness firms or traders: "Smallholders have opportunities to breach by diverting some of the firm-provided inputs to non-contracted crops, by not adhering to the production schedule agreed upon with the firm, by side-selling or by failing to deliver the agreed volume and quality on time. The firm may breach by not showing up to collect contracted harvest, by inappropriately rejecting product, by lowering the sales price after the supplier has incurred production costs, or by delaying or defaulting on final payment." Additionally there are special problems occurring from asymmetric information, "which enables farmers to mask side-selling as adverse production shocks, and from market power, which often allows the firm to unilaterally revise contract terms on suppliers lacking alternatives."

The problems arise from deficits in the institutional environment. While Contract Farming is a formal institutional arrangement, the institutional environment of developing countries is oftentimes developed insufficiently. Weak public institutions, such as inefficient courts and administrations, which are common in developing countries, lead to a situation where contract enforcement is reduced or not possible at all. Hence contract breach is frequent and leads to high losses for the disadvantaged party. Avoiding contract breach by abstaining from offering any contracts at all is a strategy traders may pursue in consequence. However this strategy may also result in high efficiency losses. As the example of Madagascar shows, weak legal institutions may inhibit the traders' willingness to engage in tight forms of vertical coordination in order to mitigate their risk exposure, thereby leading to higher losses than actual contract breach would produce (Fafchamps and Minten 2001).

These issues raise the question of (1) how to design contracts in a way that farmers are willing to join and stay in contract farming schemes and (2) under which conditions contracts will be fulfilled. This dissertation aims at contributing to the related literature on

¹ Several recent reviews on the determinants of contract participation and the welfare effects of contract farming are available. (Bijman 2008; Wang, Wang, and Delgado 2014; Otsuka, Nakano, and Takahashi 2016).

these challenges with two individual research studies. The first study (chapter 2) will focus on farmer's preferences for contract designs. The second study (chapter 3) focuses on contract compliance. The next subsection gives an overview of the theoretical background on these issues and leads to a behavioral perspective.

1.2 Theoretical Background

1.2.1 *Contract choice and compliance: A question of (monetary) incentives and transaction costs?*

If one wants to explain empirically observed contract relationships and make predictions about which contracts are chosen, different conceptual frameworks can be taken. *Transaction Cost Theory* can inform about why certain organizational structures emerge by postulating that transaction partners are going to engage in the organizational form that minimizes related costs of searching, bargaining and monitoring, i.e. transaction costs. Transaction Cost Economics is best understood as a comparative institutional analysis that studies the efficacy of alternative organization forms (Williamson 1994). The unit of analysis is the transaction itself, whereby transaction costs are determined by the particular characteristics of the transaction, like asset specificity, behavioral or environmental uncertainty and frequency of interaction (Williamson 1979). *Incentive Theory* provides a different analytical framework, by focusing not on the transaction per se, but on the individual and its relationships with a transactional partner, i.e. a principal and an agent. Within the principal-agent framework, Incentive Theory analyses the optimal incentive system, i.e. payment scheme in order to assure that the agent is willing to enter the relationship with the principal (participation constraint) and to fulfill the delegated tasks in the principal's interest (incentive compatibility) (Laffont and Martimort 2002).

Both the transaction cost framework and the principal agent framework are concerned with behavioral uncertainty that arises from asymmetric information. Information advantages may exist in different forms, leading to different forms of behavioral uncertainty. If agents have hidden characteristics the problem of adverse selection arises. Hidden actions that are triggered by a stochastic element that determines the output is associated to moral hazard which is a particular problem in agriculture since exogenous factors, like weather conditions are affecting the agricultural production. A third information asymmetry may be hidden intentions. Hidden intentions are associated to hold-up problems.² To what extent these behavioral uncertainties affect contract choice and the success of contract farming depends on the enforcement mechanisms. A third stream of literature, the *Incomplete Contract Theory* does not explicitly assume

² Particular aspects of contract farming do not fit in standard principal-agent models. For some advances in adapting contract theory to fit the particular problems of contract farming see (Wu 2014).

information asymmetries but focuses on the fact that enforcement institutions are incomplete (Brousseau and Glachant 2002).³

Contract theoretical models make predictions for agents with specific characteristics. These models are not able (and don't intend) to include all possible motivations that drive economic decision making and to account for heterogeneity among agents. The most important behavioral assumption that theories make is opportunistic behavior. Under this assumption the theories outlined above predict that in the absence of formal enforcement institutions contracts should always be breached if it is beneficial. Regarding contract choice we should also assume that if transaction costs and incentives are identical for farmers, everybody should use the same contract form. In reality we observe heterogeneity in contract compliance and contract choice even if seemingly the incentives are the same for everybody.

To explain these observations we take a step further and move from the new institutional economics view to a behavioral view. At the core of behavioral economics is that people have preferences and motivations that go beyond the simple reaction to extrinsic incentives. In other words, behavioral economics departs from the assumption of a self-interested, opportunistic homo economicus, which is the core of the theories outlined above.

1.2.2 Incentives, motivations and preferences: The Behavioral View

“Nothing is more fundamental in setting our research agenda and informing our research methods than our view of the nature of the human beings whose behavior we are studying.” (Simon 1985)

Behavioral economics in the broader sense deals with the motivations that drive economic behavior, going beyond rational self-interested profit maximizers but acknowledging that agents may have a multitude of motivations for their economic decisions. This multitude of motivations can be summarized as “preferences”. Preferences can be regarded as an evaluation of alternatives that takes everything (all motivations) into account (Hausman 2005)⁴. Behavioral economists study the formation of preferences as well as preference heterogeneity. Preferences as a motivation for behavior can be regarded as driver that is distinct from monetary incentives. Although the effect of monetary incentives on behavior can be explained by a preference for money, these two concepts have been discussed as separate mechanisms that can interact with each other. For example social preferences and

³ Incomplete Contract Theory argues that contracts can always be renegotiated, since it is impossible to include all possible contingencies in a contract. Which contractual outcome occurs depends then on the allocation of decision rights between the principal and the agent. Therefore the approach is also called property rights approach.

⁴ For a more critical view on the use of the term “preferences” see (Engelen 2017).

extrinsic incentives have been found to both complement and substitute each other (Bowles and Polanía-Reyes 2012).

In a more narrow sense the term behavioral economics is used to explain the incorporation of psychological factors (mostly from decision theory) into predictions of economic behavior (Camerer and Loewenstein 2004)⁵. A major emphasis is on preference inconsistencies. This view goes a long way with a more narrow view of the homo economicus which describes a human being who has consistent preferences and is able to maximize her utility by choosing the highest ranked alternative according to her preferences. Behavioral economics questions this ability and studies also preference inconsistencies.

Contract choice in the field of farming has mostly been discussed from a transaction cost perspective in the empirical literature (Hobbs and Young 2000; Kirsten and Sartorius 2002). However there is evidence that behavioral preferences do play a role for contract choice: For example Zheng, Vukina, and Shin (2008) find that US hog producers who use production contracts are more risk averse than farmers who use spot markets or marketing contracts. Trust has been found to be a precondition for vertical coordinated governance forms (Zaheer and Venkatraman 1995). Clot and Stanton (2014) find that present biasedness predicts the participation of Ugandan farmers in an environmental services program. In order to explain differences in contract choice it is therefore reasonable to not only examine observable differences like farm size, infrastructure, capital accumulation, knowledge or experiences but also unobservable **heterogeneity in preferences**. This topic will be revisited in Chapter 2.

Similarly to contract choice, contract compliance does not only depend on extrinsic incentives but also on preferences. Social preferences as part of the internal value system of a person may lead to a so-called “first-party enforcement” of contracts (Dixit 2009). For example, the role of fairness and reciprocity in economic interaction falls in this category and has been widely analyzed. It could be shown that agents exert significantly higher effort levels - due to social preferences of fairness and reciprocity - than economic theory would predict (Fehr, Gächter, and Kirchsteiger 1997). Also Keser and Willinger (2000, 2002, 2007) show in lab experiments that people deviate from full rationality towards considerations of fairness, equity and reciprocity. Especially in developing countries where weak institutions lead to limited formal enforcement mechanisms, studying preferences for compliance is crucial.

Behavioral economics has shown in many applications that preferences of individuals may be unstable, inconsistent and context-dependent. One of the most prominent examples is **reference-dependency** of preferences. For example it has been shown that individuals are averse to losses: they evaluate losses stronger than gains when comparing an economic outcome to a reference point. This behavioral feature has been formalized in Prospect Theory by (Kahneman and Tversky 1979). Reference points can have many sources like endowments (Knetsch 1989; Kahneman, Knetsch, and Thaler 1990), expectations

⁵ For an overview of the incorporation of behavioral aspects in contract theory see (Kőszegi 2014).

(Koeszegi and Rabin 2006; Marzilli Ericson and Fuster 2011) or social comparisons (Fehr and Schmidt 1999; Linde and Sonnemans 2012). Recently it has been discussed that contracts may also serve as reference points (Hart and Moore 2008; Fehr, Hart, and Zehndera 2011; Bartling and Schmidt 2015). Therefore reference points might also be an important issue, when studying contract farming, which will be further examined in Chapter 3.

1.3 Methodologies for studying economic preferences and behavior

There are different methods to elicit and study preferences. Methodological differences can be drawn between stated preference and revealed preference methods as well as between observational and experimental methods.

What is originally understood by “Revealed Preference Theory” goes back to Samuelson and his work on consumer research. The theory claims that preferences are revealed by the consumption choices that consumers make. Having a closer look, it is clear that the choice can only reveal the preferences “over” an alternative that has not been chosen. Critics of the Revealed Preference Theory argue that it is not possible to know the alternatives a person had in the first place. Therefore revealed preferences are not necessarily identical with a person’s true interest, i.e. normative preferences (Beshears et al. 2008).

Another option, than looking at observational data to elicit preferences is experimental methods. In this dissertation two distinct experimental methods are used: Discrete Choice Experiments and Lab Experiments. Discrete choice experiments consist of hypothetical survey based choices. Lab experiments follow the idea of revealed preferences, by using monetary incentives. The use of the two methods is further discussed in the following paragraphs.

1.3.1 Discrete Choice Experiments

Discrete Choice Experiments (DCEs) have been widely used in marketing as well as in environmental, agricultural and health economics to elicit preferences (e.g. Bekker-Grob, Ryan, and Gerard 2012; Chang et al. 2017). DCEs are survey based stated preference measures that are used to study preferences for certain product attributes and alternatives by confronting the subject with choice situations. The theoretical foundation for discrete choice experiments is the consumer theory of Lancaster (1966) which states that goods are not the direct objects of utility, but that consumers derive utility from the characteristics of the goods. Following this idea the experimenter chooses the attributes relevant to a good or service and identifies a range of levels that each attribute can appear in. The research design is constructed by presenting a certain number of alternatives that vary systematically in their attribute levels. It is assumed that the decision maker maximizes her utility by choosing her preferred alternative out of the presented set of alternatives.

Discrete Choice Experiments have their theoretical foundation in Random Utility Theory⁶, which can be regarded as a comprehensive behavioral theory (Louviere, Flynn, and Carson 2010).

The basic idea of the random utility theory is that choices can be attributed to a systematic and a random explanatory part. The systematic part depends on the characteristics of the alternative and the preferences of the decision maker. The random part depends on any kind of errors in the decision making process. This idea has been brought forward by (McFadden 1974) who criticizes the standard economic assumption of rationality in decision making (McFadden 2010). People may make “mistakes” in their decisions. The fact that people may interpret received information in different ways may also lead to unobserved heterogeneity in choices (McFadden 2010). Random Utility Models can account for this unobserved heterogeneity in Choice Data. Therefore Choice Models that try to analyse Choice Data from DCE’s often deploy random utility models, like mixed logit models (Train 2003), which is not usual in choice data collected from lab experiments.

The major benefit of discrete choice experiments over lab experiments is the realism of the choice situations. This is assured by designing choice alternatives very close to real existing options. There are also studies that combine the use of revealed and stated preference data in choice models (Brownstone, Bunch, and Train 2000).

1.3.2 Lab experiments

Lab experiments are another method to measure preferences. Experimental games have been widely used to measure preferences like risk preferences, pro-social behavior, time preferences, trust etc. The method is so popular that standardized games for many preference measures are available. People also use experiments to study the formation of preferences and preference heterogeneity (eg. Croson and Gneezy 2009)⁷. Historically lab experiments were developed to study the dynamics of markets (Smith 1962). From the deviations of economic theory regarding individual behaviour that were not consistent with the theory, the field of behavioral economics has developed - studying preferences that go beyond the rational profit-maximizer of homo economicus.

Unlike stated-preference measures lab experiments rely on the principle of revealed preferences. Subjects receive monetary incentives for their choices. Therefore what they choose must reflect their real preference.⁸ Lab experiments are not used to determine which alternatives people would choose in real life decisions. With lab experiments it is possible to study the preferences of people in form of underlying motivations that lead to particular actions and choices, rather than the choices itself as it is the case with discrete choice

⁶ In comparison to that, Conjoint Analysis does not take into account any error variances (Louviere, Flynn, and Carson 2010).

⁷ Lab experiments basically are used for three purposes: to test theories, to study anomalies and to test policies (Croson 2002).

⁸ Money is used as incentive because it answers the axioms of Smith’s Induced Value Theory (1976).

experiments. The study that is presented in chapter 2, in which we combine empirical evidence from DCEs and lab experiments has to be regarded from this perspective. Using lab experiments informs us about potential underlying motivations for the choices of and preferences over realistic alternatives that we observe in the DCE. The two methodologies are not considered as competing, but complementary.

1.4 Outline of empirical contributions

1.4.1 *Ghanaian students and farmers as target population*

The empirical contributions of this dissertation are based on experiments that have been conducted in Ghana. Generally the Ghanaian economy is an interesting case study for contract choice and contract compliance for several reasons: (1) Ghana is in the transition to a middle income country, which goes along with a large entrepreneurial growth and opening markets to exports. Yet traditional and formal institutions coexist and the study of preferences is of high interest. Contracts play an important role, but are often informal. Hence contract enforcement is limited and often also informal (Fafchamps 1996). (2) Agriculture and contract farming play an important role in the economy. For example cocoa, mango and pineapple are important export goods and the integration of farmers into global value chains is promoted by development organizations. However there is high diversity of market channels and contract arrangements that farmers use and the determination of farmers' contract choices and studying farmers' preferences is of high interest.

In order to derive policy implications that are relevant for the target population it is necessary to conduct the experiments with individuals from the same population. In chapter 2 we are interested particularly in the choices of farmers over contracts. Therefore the experiments are conducted directly with farmers. In chapter 3 we are interested in a behavioral mechanism as explanation for contract breach. Contract breach can be studied in lab experiments via the revealed preference approach. Although most lab experiments are done in developed countries there is increasing concern about the external validity and replicability of these results (Henrich, Heine, and Norenzayan 2010). Even within western developed student populations cultural differences between countries have been found (e.g. Willinger et al. 2003). Based on these considerations the subjects in the experiment presented in chapter 3 are Ghanaian students. We assume that from the behavior of student participants we can still derive valid behavioral insights for the behaviour of other populations, e.g. farmers within the same cultural environment, since social and cultural norms are not assumed to differ strongly within one country.⁹

⁹ It should be noted that there are behavioral differences between matrilineal and patriarchal tribes in Ghana (Asiedu and Ibanez 2014). However, since both our farmer and student sample consists of individuals of different ethnicities we assume that the average behavior is representative for the whole population.

1.4.2 Chapter 2: Contract Choice and Preference Heterogeneity

Chapter 2 presents a study that analyses how preferences affect the choice of contracts. This study aims at contributing to the question of how contracts should be designed in order to integrate farmers into high-value markets and secure stable long-term relationships. Additionally the aim is to study how behavioral preferences are related to the preferences for contract characteristics.

We study the research question with a sample of Ghanaian Pineapple Farmers. Methodically this study applies both a discrete choice experiment and lab experiments and allows for analyzing the relationship between preferences elicited with both methodologies. By using canonical lab experiments with monetary incentives to elicit behavioral preferences we can derive information on individual motivations that drive contract choices. It is reasonable to assume that whether behavioral preferences like trust, risk preferences or time preferences affect contract choice depends on the particular characteristics of a contract. Therefore we assume that these preferences play a considerable role in explaining heterogeneity in contract preferences and affect the relative importance of contract attributes.

The research question is of particular relevance in the Ghanaian Pineapple sector, since a multitude of different market channels are available for farmers and processing companies face competition for products. Gaining insights on the motivations for farmers to choose a particular contract is therefore of high relevance. Studying preferences for contracts is also relevant in order to design contracts that are attractive enough for farmers to create an incentive to maintain the relationship and not jeopardize the relationship by contract breach. This is a crucial point for the development of stable long-term relationships.

1.4.3 Chapter 3: Contract Compliance and reference-dependent preferences

Chapter 3 presents a study that examines the preferences for contract compliance if formal enforcement mechanisms are absent. Several studies have shown that people do have preferences for keeping promises (Vanberg 2008) and fulfilling contracts (Bartling and Schmidt 2015) even though explicit incentives for doing so are missing. Using a lab-in-the-field experiment among Ghanaian students it can be shown that preferences for contract compliance are reference-dependent. Unlike the second chapter we are not interested in analyzing the preference heterogeneity and identifying the exact motivations for contract compliance, but we show that preferences for contract compliance (as a combination of many different possible motivations) may be dependent on the expectations that people have.

We simulate a contract situation in which a seller and a buyer agree on a certain amount of goods that is sold. The buyer can make an investment to enhance the value of the goods. The seller then decides whether to comply with the contract and send the goods to the buyer or to breach the contract by selling the goods for a higher price to an alternative market. This is a classical hold up problem in which the sellers' intentions to comply with the contract are unknown to the buyer. Furthermore, there are no formal enforcement

mechanisms. Situations like that are often encountered in the realm of contract farming: Buyers may provide farmers with credit and inputs in order to produce high quality products. In return the farmers agree to sell the products to the particular buyer. Since the provided loan is deducted from the final product price it is possible that prices from alternative buyers exceed the prices from the actual contract partner. This may trigger side selling by farmers, especially when farmers are short-sighted and are not threatened by the loss of the contract partner for future interactions. A peculiarity of the design in this study is that sellers and buyers conclude the contract after the goods have been already produced, but before the sellers know the output. Therefore sellers are able to form clear expectations about their output and their benefits that are based on their self-assessment before entering into the agreement. The true output is revealed after the contract has been concluded, but before the seller decides whether to comply with the contract or whether to behave opportunistically. With this design we can study to what extent biased expectations may lead to contract breach. Since farmers in developing countries are often unaware of their own productivity due to a lack of book keeping systems and probably sometimes low mathematical and writing skills it is possible that they form biased expectations by using simple heuristics. If these expectations are used as reference points to which actual outcomes are compared, and the actual outcomes are below the expectations, farmers might feel disappointed from the contract. In chapter 2 we examine whether in this situations contract breach is triggered as a tool to mitigate the subjective loss.

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2 The Role of Farmer's Trust, Risk and Time Preferences for Contract Choices: Experimental Evidence from the Ghanaian Pineapple Sector

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Abstract

In the last decades global food value chains have seen the need for increasing vertical coordination in order to secure quality standards. A prominent way to govern the relationships between farmers and agribusiness firms are farming contracts. We study the role of trust, risk and time preferences for farmers' contract choices in a discrete choice experiment among Ghanaian pineapple farmers. We find that experimental measures of trust, risk and time preferences can predict preferences for contract attributes. Especially trust has economically important effects on the willingness to pay for transparent quality controls. Differences in preferences for timing of payment and timing of agreement making cannot be explained by trust levels but by time preferences. Risk-sharing in form of reduced quality requirements is less important for risk-seeking individuals compared to risk-neutral or risk-averse farmers. Including behavioral preferences can significantly improve the explanatory power of the models. Our results indicate that preferences affect farmers' participation constraints and argue that a diversification of contract offers might increase the willingness of farmers to participate in contract farming. This has implications for companies who aim at developing stable long-term relationships with farmers.

JEL Codes: O13, Q12, Q13

Keywords: lab in the field experiment, discrete choice experiment, contract choice, preferences, contract farming

2.1 Introduction

Contract farming has strongly gained in importance in developing countries in the last decades. Major reasons for this development are the modernization of agri-food chains and the evolvement of private food standards, which require tight levels of coordination in order to secure quality and production requirements as well as supply chain efficiency (Reardon and Barrett 2000; Henson and Reardon 2005). This trend goes along with a shift from traditional spot-market transactions to coordinated buyer-supplier interactions, which are characterized by oral or written agreements that predefine production requirements or transaction characteristics. Vertical coordination in the form of contract farming can have positive welfare effects for farmers by increasing market access, reducing market failures by providing production inputs, and increasing incomes of smallholders and hence leading to pro-poor growth (Glover and Kusterer 1990; Kirsten and Sartorius 2002; da Silva 2005; Barrett et al. 2012; Bellemare 2012; Prowse 2012; Wang, Wang, and Delgado 2014; Otsuka, Nakano, and Takahashi 2016; Gatto et al. 2017; Maertens and Vande Velde 2017). Development policies are therefore promoting the integration of farmers into global value chains via contract farming.

Although it has been found that contract farming can potentially increase welfare of smallholder farmers, there is evidence for high dropout rates in contract farming schemes in developing countries (Barrett et al. 2012; Wang, Wang, and Delgado 2014). One particular reason for this instability of contract relationships is contract breach. Since formal institutions to enforce contracts are oftentimes absent in developing countries, contracts often remain loose non-binding agreements. Moreover, as a result of the stochastic nature of farming, moral hazard problems arise, which promotes side-selling of products, diverting provided inputs to other crops, or non-compliance with production requirements (Key and Runsten 1999; Barrett et al. 2012). In a contract farming experiment Kunte, Wollni, and Keser (2017) show that individuals engage in contract breach, if short-term benefits can be gained. However, contract breach is reduced when individuals interact repeatedly. The key to reaching contract compliance is therefore to design contracts that involve considerable incentives for both parties in order to maintain the relationship and not to jeopardize future transactions by opportunistic behavior (Klein 1996; Gow, Streeter, and Swinnen 2000; Barrett et al. 2012). Designing contracts that consider the preferences of farmers is hence an important tool for development policies that aim at creating stable farmer-buyer relationships and fostering the participation of farmers in global value chains.

A growing body of literature analyzes farmers' preferences for contract designs, market characteristics or characteristics of transaction partners. General findings from these studies are that elements, which reduce transaction costs, mitigate risks, and avoid behavioral uncertainties, can increase the probability of choosing a specific contract or market outlet (Blandon, Henson, and Islam 2009; Schipmann and Qaim 2011; Abebe et al. 2013; Gelaw, Speelman, and Van Huylenbroeck 2016; Ochieng, Veettil, and Qaim 2017). Personal relationships also seem to play an important role for farmers' marketing choices

(Schipmann and Qaim 2011; Gelaw, Speelman, and Van Huylenbroeck 2016). Many of the above mentioned studies find considerable heterogeneity in farmers' preferences for certain contract characteristics. This heterogeneity has mostly been explained by observable characteristics like socio-demographics, empowerment status (van den Broeck, van Hoyweghen, and Maertens 2016), infrastructure, farm-size or actual contract or market experiences (Blandon, Henson, and Islam 2009; Schipmann and Qaim 2011; Abebe et al. 2013; Gelaw, Speelman, and Van Huylenbroeck 2016; Ochieng, Veettil, and Qaim 2017).

Although most of the authors of choice experimental studies on contract and market choice are discussing behavioral preferences (frequently mentioned are risk aversion and trust) as important factors that explain average preferences for choice characteristics, their role in explaining preference heterogeneity has mostly not been tested. For example Schipmann and Qaim (2011) find that the personal relationship to a buyer plays a major role in farmers' market channel choices among sweet pepper producers in Thailand, which might be due to trust preferences. Abebe et al. (2013) assume that farmers are risk averse and therefore choose contracts that mitigate production and market uncertainties. Ochieng, Veettil, and Qaim (2017) argue that delayed payment increases the "subjectively felt risk of contract partners defaulting". Furthermore they find that farmers' dislike of payment modes in supermarket contracts that are based on the amount sold to the end-consumer rather than the amount delivered to the supermarket is stronger without physical verification by the farmer. The authors argue that this may also be a trust issue. Since there is evidence that behavioral preferences, like trust, risk and time preferences play a role for participation in contracts (e.g. Zaheer and Venkatraman (1995); Zheng, Vukina, and Shin (2008); Clot and Stanton (2014)), it is reasonable to expect that these behavioral preferences may affect the preferences for particular characteristics of a contract.

We hypothesize that risk preferences, trust and time preferences play a considerable role in explaining heterogeneity in contract preferences and affect the relative importance of contract attributes. Firstly, individual risk preferences might influence how farmers evaluate the riskiness of a contract. How risky it is for a farmer to engage in a contract, depends first and foremost on production risks. Production risks may increase if contracts require the production of more risky varieties. The riskiness of a contract also depends on how production risk is distributed between seller and buyer (e.g. Hobbs and Young 2000). A relaxation of quality requirements can mitigate the economic consequences of production risks by creating a form of risk-sharing. Risk preferences may influence how farmers assess the relative importance of risk-sharing elements in a contract. For example, risk-averse farmers are likely to prefer contracts with lower quality requirements, if production is risky. Secondly, trust may play an important role for contract preferences. Houser, Schunk, and Winter (2010) show that people behave differently under exogenous risk compared to analogous situations in which risk stems from the possibility of being betrayed. Elements of a contract that increase behavioral uncertainty, like delayed payment or nontransparent quality controls, may be evaluated less negatively by farmers who have high trust levels compared to farmers with low trust levels. Whether farmers prefer contracts that are made

before the cultivation process or rather contracts that are made immediately before harvest might also depend on their trust levels. Commitments of this kind involve the risk that buyers finally do not show up to buy the products. Lastly, time preferences may play a role in how farmers evaluate the timing of agreement making and the timing of payment. Disentangling these different motivational drivers can give interesting insights on how to design contracts.

To our knowledge there is only one study that explicitly tests the effect of behavioral preferences for the relative importance of contract characteristics in a discrete choice experiment: Vassalos et al. (2015) analyze the effect of risk-aversion on contract choice among US tomato growers. They do not find any effect of risk preferences on contract choice. This may be due to the fact that they are using a very small sample size and measure risk only with stated preference measures, i.e. a multiple pricing list task (Binswanger 1980, 1981) and likert scale questions.

We add to the literature on preferences for contract designs by explicitly testing to what extent individual trust, risk and time preferences, measured with monetary incentivized lab experiments, can explain heterogeneity in preferences for contract attributes. We aim at filling this research gap by conducting experiments with 494 Ghanaian pineapple farmers. We measure farmers' risk aversion, trust and time preferences with canonical lab experiments and relate the results to farmers' contract choices in a discrete choice experiment. Our study contributes to the literature in the following ways: Firstly, we can add to the discussion on how contracts should be designed in order to meet farmers' preferences. Secondly, we are going beyond existing findings of simply stressing preferences for contract characteristics but are examining how those are affected by inherent trust, risk and time preferences and disentangle these motivational drivers. Thirdly, we are contributing to the body of literature that links experimental measures of preferences to economic outcomes. Fourthly, we are analyzing the economic relevance of trust, risk and time preferences by analyzing their effects on the willingness to pay for certain contract characteristics.

The article proceeds as follows: Section 2 gives some background information on the Ghanaian Pineapple Sector. Section 3 gives an overview of the methods and data used. Section 4 shows descriptive and estimation results. We conclude by discussing the implications of our results in Section 5.

2.2 Vertical coordination in the Ghanaian pineapple sector

The Ghanaian pineapple sector has a long history of vertical coordination between smallholder farmers and exporting and processing companies. While at the end of the 1990s and early 2000s smallholders were mostly involved in fresh exports, access to the

export market for smallholders is now mostly gained via processing companies. At the peak of the Ghanaian fresh pineapple exports in 2004 it is estimated that smallholders contributed about 50 percent of the exported produce through outgrower schemes with exporting firms (Gatune et al. 2013). Between 2001 and 2004 on average 50 exporting companies were present in Ghana (Gatune et al. 2013). Many of these companies did not produce themselves but maintained relationships with smallholders and relied on their supply. The pineapples were mostly packed directly on the field, since companies did not own pack houses. Farmers and companies usually had only loose agreements, but vertical coordination in the form of input provision or involvement in the de-greening and harvesting processes by the buyers were common. Farmers received payments after a minimum of 6 weeks for sea-freighted exports (with initial down-payments), or immediately after harvest and validation of weight (with minimal delay) for air-freighted exports.

In the last decade, the sector has scaled down due to changes in the international market. A new pineapple variety called MD2, which is characterized by longer shelf-life, has started to dominate the global market and has mostly replaced the variety Smooth Cayenne in western supermarkets. The adoption of the new variety has been a major challenge for pineapple producers and many smallholders and exporting companies dropped out of the market. At the same time, quality standards increased due to the requirement of GlobalGAP certification. These global changes have led to structural changes in the Ghanaian pineapple sector. The share of smallholders producing pineapples for fresh exports has diminished strongly in favor of large plantations (Gatune et al. 2013).

Despite the challenges the pineapple sector was facing after the sudden drop in global demands for Ghana's pineapples, pineapple is still an important export crop for the Ghanaian economy. Development programs were successful in helping some farmers to adopt the new variety MD2 and keep aiming at establishing long-term business relationships between farmers and exporting and processing companies. Farmers also receive training and information about export requirements and contract farming from development programs.

Those farmers who remained in the export market either produce for processing firms or in small quantities for fresh exporting companies. However, the majority of farmers have switched to producing exclusively for the local fresh market, selling their pineapples to market women who supply end-consumers. A small fraction of farmers also sells their pineapples to local juice producers, but their prices are not competitive in comparison to exporting companies. Apart from fresh export companies who maintain outgrower schemes with some farmers, there are four major processing companies present who export pineapple fresh cut, pineapple juice, dried pineapple, fruit bars, and pineapple concentrates to the European market. Since farmers are reluctant to sell their produce to companies and land scarcity limits vertical integration, those companies are currently competing for supply.

Forms of vertical coordination are still available in both export and local market but tend to be more formal and frequent in the export market. There are also differences in contract characteristics between companies. Contracts can either be written or verbal and are often characterized by the provision of inputs, credit and production advises. While some companies are negotiating prices beforehand, prices are mostly not predefined but depend on the current market situation. Contracts mostly do not include agreements on predefined quantities either. However farmers are informed about the necessary quality and production requirements. Contracts are made either prior to the production cycle or within the production cycle before forcing or before harvesting.

Despite the competitive prices of export companies and available trainings for producing for the export market, some farmers are reluctant to sell products to the export market. One reason relates to the risk involved. Since quality standards are high, inferior quality is frequently rejected by companies. At the same time, marketing the export varieties in the local market is difficult, since Ghanaian consumers prefer the local variety Sugarloaf. Companies may also arbitrarily reject products, if demands from import countries drop (Suzuki, Jarvis, and Sexton 2011). In particular, after the demand shift in the international market towards MD2 pineapple, contract breaches and high rejection rates were common in the Ghanaian pineapple sector. Many farmers who had sold their pineapple on credit did not receive their payments (Barrett et al. 2012). As a result, farmers' trust in exporting companies has been deteriorated. These experiences are likely to affect farmers' market channel choices and new contract designs are critical in order to reintegrate small-scale farmers in the global market.

2.3 Methods

2.3.1 *Sample*

We collected data from 494 pineapple farmers in Ghana following a multi-stage sampling strategy. First we identified the major pineapple producing regions in Ghana with help of the ministry of agriculture. We obtained lists of communities where pineapple farming is prevalent for each of the selected regions. From this community list we randomly selected communities according to the relative number of pineapple producing communities in this region. In each selected village all pineapple farmers were invited through the village head and lead farmers to participate in our behavioral experiments.¹⁰ Table 1 gives an overview of the number of interviewed farmers and villages in each region. The data collection took place from November to December 2015 in the form of individual face-to-face sessions consisting of a Discrete Choice Experiment, experimental games to elicit behavioral preferences and a survey on attitudinal, household and farm-level data. On the average, each individual session took about 1.5 hours.

¹⁰ As is common in behavioral experiments, participation was based on self-selection, which limits the external validity of our results.

Table 1 Overview of sample areas

Pineapple Growing Area	Number of communities	Number of Farmers	Percentage
Awutu Senya and Gomoa East	8	117	0,24
Ga-West	7	128	0,26
Akwapim South	7	149	0,30
Cape Coast Area (Mfantseman and Elmina)	5	100	0,20
Total	27	494	1

2.3.2 Behavioral Preferences

We measured trust, risk and time preferences using monetary incentivized experiments. The farmers were payed via mobile money the following day and/or four weeks after the survey, depending on their decisions. The order of the experiments was held constant, starting with a risk elicitation task, followed by the time preference measure and finally the trust measure.

We measured trust using a modified version of the standard investment game (Berg, Dickhaut, and McCabe 1995). In the traditional trust game senders have an initial endowment and are asked to send any amount to another person, the receiver. The amount sent is tripled by the experimenter. The receiver is then asked to decide how much to send back to the sender. We modified the game in the following ways: The receivers were randomly chosen people on the streets in a village in Ghana who made their decision using the strategy method. However, the decision was not conditional on the amount sent. In order to keep it simple the second movers only had one decision to make: Whether they would keep the money if a stranger sent something to them, or whether they would send back half. The receivers knew that they would later on be matched randomly with a participant of our main study who would decide whether to send money to them. In total we collected 20 decisions. During the main survey farmers were virtually endowed with 10 Ghana Cedi and could decide to send an amount between 0 and 10 to the receiver, which would be tripled. The farmers received the information that they play the game with a stranger of Ghana who had been interviewed in October 2015. The enumerators never knew the decision themselves before the farmer had made her choice and therefore could not influence them in any way.¹¹ From the choices of the farmers we generate a variable θ_i , which takes values from 0 to 10, corresponding to the amount sent to the stranger. We use theta as a continuous variable that reflects trust in the empirical models.

¹¹ After we finished the main survey all receivers were paid out according to one randomly selected decision of a sender. The payments were done using mobile money.

The risk preferences were measured using the Eckel-Grossmann risk elicitation method (Eckel and Grossman 2002; Dave et al. 2010). This is a rather simple method that has been found to be superior to the more complicated Holt and Laury method (2002), if subjects have low mathematical skills, and can give more stable results over time (Dave et al. 2010). Subjects can choose one out of six lotteries, with different standard deviation and expected payoffs. The lotteries were presented as bags that contain two balls with different amounts of money inside.¹² An overview of the lotteries is illustrated in Table 2. From the lottery choice, risk preferences can be derived. People who choose lotteries 1-4 are classified as risk-averse. Risk-neutral subjects are predicted to choose lottery 5 or 6, while risk-seeking subjects are predicted to choose lottery 6. We are going to use dummy variables for these three risk preference categories in the subsequent analysis¹³.

Table 2 Description of lotteries in risk elicitation tasks (Payoffs in Ghana Cedi)

Choice (50/50 Gamble)	Low payoff	High payoff	Expected return	Standard deviation
Gamble 1	14	14	14	0
Gamble 2	12	18	15	3
Gamble 3	10	22	16	6
Gamble 4	8	26	17	9
Gamble 5	6	30	18	12
Gamble 6	1	35	18	17

In order to measure time preferences we decided to use a simple money allocation task similar to a task developed by Angerer et al. (2015). Subjects have an endowment of 10 Ghana Cedi.¹⁴ They can allocate the money between two dates in time – tomorrow and four weeks later. The money that is allocated to the later date is multiplied by a factor of 1.5. The amount invested in the future is a simple measure of farmers’ future-orientation and patience, without explicitly eliciting discount factors.¹⁵ Since both points in time lie in the future, we rule out that the decision is affected by trust. Experimental measures of time preferences basically allow choosing between different income streams, not consumption streams. This makes the use of time preferences experiments difficult for the induction of intertemporal consumption preferences (Cubitt and Read 2007). However, our aim is not to make predictions about consumption preferences, but about preferences on the timing of payments in contracts, which represents an income stream. We generate a continuous variable δ_i , which takes values from 0 to 10, reflecting the amount of money a

¹² We did not put real money in the bags, but vouchers with printed bills and written amounts in order to visualize the payoffs. The real payoffs were transferred via mobile money.

¹³ Subjects who are choosing lottery 5 are classified as risk-neutral, while subjects who choose lottery 6 are classified as risk-seeking in our experiment.

¹⁴ Note that Angerer et al. (2015) are using tokens that can be exchanged in non-monetary items in a gift store instead of money.

¹⁵ The elicitation of discount factors involves complicated lottery choices that are cognitively demanding. Since we are only interested in having a simple measure for time preferences, we decided to use a task that is less cognitively demanding and therefore minimizes respondent fatigue.

farmer has invested into the future. We refer to this variable as future-orientation throughout the article.

Detailed experimental instructions for the three experiments can be found in the Appendix.

2.3.3 Choice Experiment

Design

Discrete Choice Experiments have been used in many domains to measure preferences for choice alternatives, for example to derive farmers' preferences for contract and market channel characteristics (Blandon, Henson, and Islam 2009; Schipmann and Qaim 2011; Abebe et al. 2013; Vassalos et al. 2015; Gelaw, Speelman, and Van Huylenbroeck 2016; Ochieng, Veettil, and Qaim 2017).

To gain a qualitative understanding of how behavioral preferences might affect the evaluation of contract characteristics among Ghanaian farmers, we conducted focus group discussions. These discussions helped us to assess the relevance of certain contract characteristics for farmers and decide how to design the attributes and which levels to include in the Discrete Choice Experiment. Based on farmers' qualitative statements, we selected five attributes and let them differ systematically in their levels: The unit price a farmer gets for Grade A products, the timing of making the agreement, the quality requirements (i.e. whether Grade B can be sold to the buyer), the transparency of the quality control (i.e. whether products can be rejected at the company level), and the timing of payments (see Table 3). Since there is no standardized classification system across companies we introduce two pineapple qualities, Grade A and Grade B, in the Discrete Choice Experiment. We define Grade A pineapples as high quality pineapples with larger sizes and free of sunburn and spots. Grade B pineapples are defined as pineapples with a maximum size of 1kg and being affected by sunburn, but still suitable for human consumption. This definition allows us to make sure that farmers have a common understanding of quality differences.

- (1) The price attribute can take the levels 50, 60, 70 or 80 pesowas per kg. The price range represents farmers' actual market prices and was identified in the focus group discussions.
- (2) The timing of agreement classifies whether the transaction involves a commitment of both contract partners, before the product is actually produced, or whether the contract parties are only agreeing on the purchase once the products are about to be harvested.
- (3) The quality requirements attribute has two levels: whether or not Grade B products can be sold to the same buyer for a price of 35 pesowas per kg¹⁶. As discussed earlier, quality requirements are an important aspect of the riskiness of a contract. The

¹⁶ This price was identified in focus group discussions as to cover average production costs of the product.

characterization of the export and local markets in the Ghanaian pineapple sector shows that riskiness stems mostly from the fact that modern pineapple varieties are more difficult to cultivate and that lower quality products are not accepted in the export market and achieve lower prices when sold in the local market compared to traditional pineapple varieties. Depending on whether minor quality is accepted or not, a contract therefore turns out to be more or less risky.

Table 3 Overview of contract attributes

Level	Contract Attributes				
	Price for Grade A	Timing of agreement	Quality requirements	Transparency of quality control	Timing of payment
1	50 p	Agreement before planting	Grade B can be sold to same buyer for 35 p/kg	Rejection only at farm possible	Immediately after purchase
2	60 p	Agreement before harvest	Grade B can’t be sold to same buyer	Rejection at farm and company/ pack house possible	Four weeks after purchase
3	70 p				
4	80 p				

(4) The location of product classification is included as an attribute reflecting transparency. The focus group discussions revealed that farmers are especially concerned about companies arbitrarily rejecting good quality products. Therefore the levels of the attribute are whether rejections are only possible at the field or also at a location where the farmer has no access to (i.e. company or pack house).

(5) The timing of payment was identified as important source of strategic risk and was included as either immediate payment or payment four weeks after purchase. We define payments as “immediate” if the payment occurs within a maximum of 2 days after the purchase. This was done to rule out unrealistic attribute combinations (i.e. immediate payment and rejections at the company).

Table 4 summarizes the expected preferences of farmers towards contract attributes and the expected relationships between behavioral preferences and contract preferences.

Table 4 Expected Contract Preferences and Relationship with behavioral preferences

	Contract Attribute			
	Grade B accepted	Transparency	Agreement before cultivation	Immediate Payment
Expected sign of preference coefficient	+	+	?	+
Expected influence of Trust		-	+	-
Risk aversion	+			
Future-orientation			-	-

We expect that farmers have positive preferences for risk-sharing. Since a relaxation of quality requirements can be regarded as a form of risk-sharing, we expect that the possibility to sell Grade B products is more important the more risk averse a farmer is. Further we expect that farmers prefer contracts that only allow for rejections directly at the field, rather than at a location where the classification is not transparent. However, we expect that for farmers with high trust levels, transparency is relatively less important. Generally we also expect positive preferences of farmers towards immediate payment, compared to payments four weeks after the purchase. Since delayed payment requires patience, we expect that the relative importance of immediate payment is smaller the higher the farmers’ future-orientation. At the same time delayed payment is a source of behavioral uncertainty and requires trust. We expect that farmers with high trust put less relative importance on immediate payment compared to farmers with low trust levels. For the timing of agreement making, we do not have a particular hypothesis to whether farmers have generally positive or negative preferences towards it. An early agreement may reduce the flexibility of the contract partners. On the other hand, the commitment may reduce market uncertainty for the farmer by providing security of having a buyer. However, if farmers are averse to betrayal, the fear of the buyer not showing up to buy the products might lead to a negative attitude towards early agreements. Therefore, we expect that trust increases the preference for agreements before cultivation. Farmers with high future-orientation on the other hand may be more likely to prefer flexibility in choosing the best contract partner once the products are cultivated. Therefore we expect a negative relationship between future-orientation and the preferences for agreements before cultivation.

The full factorial design of the Discrete Choice Experiment consists of 64 choice profiles, from which we created an orthogonal design with 16 runs using the statistical program R. The design was blocked into two blocks, resulting in eight choices with two alternatives for each farmer.¹⁷ The alternatives were framed as market channels that involve the production

¹⁷ For each choice set the farmer had the possibility to choose a “neither option” in the first step in order to express his preferences for the status quo. In case the “neither option” was chosen we asked

of the pineapple variety MD2, which is dominating the global market.¹⁸ In order to make sure that respondent fatigue has no systematic effects on our results, we created four different versions of every block, in which we changed the order of the eight choice tasks. An example for a choice card can be found in the Appendix.

Empirical Strategy

Since we assume that farmers have individual preferences for contract characteristics and maximize their utility through their marketing choices, we consider a random utility model. We use a random parameter logit model, also called mixed logit model, which extends the standard conditional logit model (McFadden 1974). The mixed logit model can account for unobservable preference heterogeneity among respondents, by allowing coefficients in the model to vary across decision makers. Another benefit of the model is that it does not assume independence of irrelevant alternatives.

Based on the random utility model, the utility a decision maker i derives from alternative j in choice situation k is given by

$$U_{ijk} = V_{ijk} + \varepsilon_{ijk} ,$$

where V_{ijk} is a linear function of observable attributes of the alternatives and characteristics of the decision maker, x'_{ijk} and parameters β_i , and ε_{ijk} is a random error term.

The mixed logit choice probability of choosing alternative j in a choice situation k is given by

$$P(Y_{ijk} = 1) = \int \frac{\exp(x'_{ijk}\beta)}{\sum_{j=1}^J \exp(x'_{ijk}\beta)} f \beta \, d\beta ,$$

where $x'_{ijk}\beta = V_{ijk}$ and Y_{ijk} is the choice variable of individual i for alternative j in choice situation k . The variable takes the value 1 if the alternative is chosen and 0 if it is not

the farmer in a second step to choose out of the two alternatives given. Since we are mostly interested in how farmers trade off individual contract characteristics and to avoid status quo biases, we use the farmer's second choice as dependent variable in our analyses.

¹⁸ In order to make the choice alternatives attractive to the farmers we presented training as given for both alternatives. Abebe et al. (2013) find that training is an important factor for farmers to choose contracts. Also, training for MD2 production is widely available to farmers in Ghana.

chosen. f β is the density function for the random parameters β (Train 2003). We assume a normal mixing distribution.

We model the price coefficient as fixed, since we assume homogenous preferences of farmers for high prices. This is a common approach in similar studies (e.g. Schipmann and Qaim (2011), Ochieng, Veetil, and Qaim (2017)).

We apply different specifications of V_{ij} : With model (1) we are analyzing the relative importance of different contract characteristics for farmers' contract choices:

$$(1) V_{ijk} = \beta_i X_{jk} + e_{ijk}$$

The first model consists of a vector for the individual coefficients, β_i , and a vector of contract characteristics for alternative j in choice situation k, X_{jk} , which include the product price (PR), the timing of agreement (AG), the level of risk-sharing (RS), the location of quality controls (CO) and the timing of payment (PA). e_{ijk} represents the random error term.

Model (2)-(4) include interaction terms between contract attributes and behavioral preferences according to our hypotheses. The aim is to analyze to what extent trust, risk and time preferences determine preferences for contract characteristics. As described previously, θ_i and δ_i are continuous variables measuring trust and future-orientation, respectively. Furthermore, r_i^s is a dummy for risk seeking and r_i^n is a dummy for risk neutrality. With model (2) we test the effect of trust on the preferences towards transparency of quality classification, timing of payment and timing of agreement making. The effects of risk preferences on the preference towards quality requirements are tested with model (3). Finally, model (4) tests the effect of future-orientation on farmers' preferences for the timing of payments and the timing of making agreements.

$$(2) V_{ijk} = \beta_1 PR_{jk} + \beta_{2i} AG_{jk} + \beta_{3i} RS_{jk} + \beta_{4i} CO_{jk} + \beta_{5i} PA_{jk} + \gamma_1 (AG_{jk} \times \theta_i) \\ + \gamma_2 (CO_{jk} \times \theta_i) + \gamma_3 (PA_{jk} \times \theta_i) + e_{ijk}$$

$$(3) V_{ijk} = \beta_1 PR_{jk} + \beta_{2i} AG_{jk} + \beta_{3i} RS_{jk} + \beta_{4i} CO_{jk} + \beta_{5i} PA_{jk} + \gamma_1 (RS_{jk} \times r_i^s) + \\ \gamma_2 (RS_{jk} \times r_i^n) + e_{ijk}$$

$$(4) V_{ijk} = \beta_1 PR_{jk} + \beta_{2i} AG_{jk} + \beta_{3i} RS_{jk} + \beta_{4i} CO_{jk} + \beta_{5i} PA_{jk} \\ + \gamma_1 (AG_{jk} \times \delta_i) + \gamma_2 (PA_{jk} \times \delta_i) + e_{ijk}$$

The models are estimated by maximum simulated likelihood using 500 Halton draws (Hole 2007a)¹⁹. We are estimating uncorrelated coefficients in preference space using dummy coding following Hensher, Rose, and Greene (2005).

In order to examine the economic significance of the interactions between behavioral preferences and contract characteristics we are calculating the willingness to pay (WTP) for the individual attributes m and interaction terms. The average WTP is obtained by dividing the mean of the preference coefficient for attribute m , β^m , by the negative price coefficient, β^{price} :

$$(6) E(WTP^m) = -\frac{E(\beta^m)}{\beta^{price}}$$

We calculate the WTP for each attribute and its confidence intervals by using the user written Stata command “*wtp*”. Confidence intervals are derived with the delta method (see Hole, 2007b).

Depending on individual behavioral preferences, we aim to identify different market segments. Therefore we use a latent class conditional logit model. The latent class conditional logit model estimates simultaneously preference coefficients for different classes and the probability of an individual to belong to a class based on choice patterns and individual covariates. While the mixed logit model accounts for preference heterogeneity by estimating individual taste coefficients for every decision maker, the latent class model identifies unobserved segments of individuals with homogenous preferences²⁰. The former approach has an advantage for analyzing correlations between preference coefficients and particular covariates, while the latter has an advantage for making statements about market shares and deriving policy implications.

The choice probability of choosing alternative j from a number of J alternatives in a choice situation t depending on membership in class q is given by

$$P_{ijk|q} = \frac{\exp(x'_{ijk}\beta_q)}{\sum_{j=1}^J \exp(x'_{ijk}\beta_q)}$$

We re-estimate model (1) with a latent class approach, including covariates for trust, risk and time preferences into the membership likelihood function²¹. The model is estimated using an Expectation-Maximization (EM)-Algorithm (Train 2008).

¹⁹ We use the mixlogit package in STATA.

²⁰ This means that the mixing distribution is discrete.

²¹ See Greene and Hensher (2008) for a technical overview of and comparison between the latent class approach and the mixed logit approach.

2.4 Results

2.4.1 Descriptive statistics

Socio-economic characteristics of the sample

Table 5 gives an overview of the socio-demographic characteristics of the farmers included in our sample. The majority of farmers are male, with a fraction of only 9.5 percent of farmers being female. On average, farmers are 45 years old, went to school for 10 years, and live in households with seven persons. Their pineapple farms have an average size of 3.5 acres and are located on average 33 km from the next company that buys pineapples from smallholders. 54 percent of farmers in our sample are members in farmer-based organizations (FBO). For 75 percent of farmers pineapple farming constitutes the major income source. 21.5 percent of farmers produce other crops apart from pineapples for sale, mostly cassava, maize, and yam, and 39 percent of farmers have additional income sources, either off-farm income or animal farming. Overall, 39 percent of farmers in our sample sell pineapples to the export market.

Table 5 Overview of household characteristics of sample

Variable	mean	sd	median	min	max
Female (%)	9.51				
Age	45.09	11.73	45	21	82
Number of school years	9.93	4.08	11	0	20
Pineapple major income source (%)	74.90				
Other crops for sale (%)	21.46				
Other income sources (%)	38.66				
Distance to next company in KM	22.40	30.17	7.76	0.9	155.9
Size of pineapple farm (acres)	3.53	6.49	2	0.3	100
Household size	6.90	3.41	6	1	31
Member in FBO (%)	53.85				
Selling to export market (%)	39.07				
Observations	494				

Characteristics of market transactions

Table 6 illustrates the transaction and contract characteristics that farmers in our sample face in the pineapple sector. As illustrated before, pineapple farmers in Ghana sell their products either to exporting companies or to the local market. There are no unique transaction characteristics associated with a particular market channel. Nevertheless, we can find significant differences in the frequency with which certain characteristics occur. The data is based on the description of transaction characteristics in the farmers’ actual

market channel. In case, a farmer sells in both channels, information was elicited for the preferred market channel²².

The quality classifications Grade A and Grade B refer to the predefined quality criteria that are described in section 1.3.3. After having explained the two quality grades to the farmers, they were asked to report the prices they get for a pineapple with these characteristics in their preferred market channel. Average prices for Grade A pineapples are significantly higher in the export market than in the local market, for all pineapple varieties. While there are no significant price differences between pineapple varieties in the export market, in the local market prices for the traditional pineapple variety Sugarloaf are significantly higher than for the MD2 variety. This reflects consumer preferences in Ghana, since Sugarloaf pineapples are preferred over the modern variety. This also illustrates the marketing risk involved in producing MD2. If MD2 producers are not able to market their pineapples via the export industry and have to switch to the local market, they face considerable opportunity costs²³. The same is true for lower quality products: Although for all varieties Grade B products obtain generally higher prices in the export market compared to the local market, MD2 and Smooth Cayenne reach significantly lower prices in the local market than Sugarloaf. Thus, opportunity costs in case MD2 or Smooth Cayenne pineapples are rejected in the export market are particularly high. Only 62 percent of the farmers can sell their Grade B pineapples in the export market (compared to 98 percent of farmers in the local market²⁴). This means that 38 percent of farmers in the export market need to search for an alternative buyer in the local market instead, which is associated with high transaction costs. Further risk arises, since the probability to produce minor quality is higher for MD2 pineapples due to disease susceptibility.

In the export market agreements on the purchase of the produce are significantly more often made already before the actual cultivation starts compared to the local market. 95 percent of farmers in the local market indicate that product rejections are only possible at the farm, which reflects high transparency of quality control, while this is the case for only 51 percent of farmers in the export market. Immediate payment is the dominant payment mode in the local market. On average farmers receive their payments 4 days after the sale, while in the export market farmers receive payments on average 18 days after the sale. About half of the farmers, whose preferred market channel is export, produce the pineapple variety MD2, which dominates the international market. In the local market the share is around 7 percent. Contracts tend to be more formal in the export sector, where 74 percent of farmers claim to have a written contract. In comparison, only 10 percent of farmers in the local market have written contracts with their buyers.

²² Twenty-one farmers who sell both to the local and to the export market declared local market as their preferred channel.

²³ A solution to circumvent this marketing risk would be to produce only Sugarloaf pineapples for the export market but the demand is limited.

²⁴ 92% sell Grade B to the same buyer as to whom they sell Grade A, while 6% sell it to an alternative buyer, but still in the local market.

Table 6 Transaction characteristics in different markets

Market Characteristics	(1) Local Market		(2) Export Market		Significance
	mean	sd	mean	sd	
Price for Grade A per kg	60.51 ^a	22.29	77.77 ^b	26.05	p < 0.001
MD2	46.36	17.96	74.67	26.08	p < 0.001
Smooth Cayenne	53.81	18.02	78.99	21.82	p < 0.001
Sugarloaf	61.93	22.40	83.89	30.92	p < 0.001
Price for Grade B per kg ^c	44.54 ^d	19.53	55.62	23.20	p < 0.001
MD2	35.45	13.44	51.78	15.73	p < 0.001
From other buyer			37.58	10.91	
Smooth Cayenne	36.43	17.81	53.59	22.37	p = 0.015
From other buyer			34.74	11.11	
Sugarloaf	45.66	19.78	69.25	38.54	p < 0.001
From other buyer			48.57	21.79	
Grade B sold in channel	98.14 %		61.63%		p < 0.001
Agreement before cultivation	6.21%		20.35%		p < 0.001
Agreement before harvest	74.84%		73.84%		p = 0.807
Sale on spot	18.94%		5.81%		p < 0.001
Rejection only at field	95.33%		51.16%		p < 0.001
Payment (days after purchase)	3.99	8.36	17.56	11.75	p < 0.001
Written Contract	9.97 %		73.84 %		
Observations	322		172		
MD2	22 (6.83%)		87 (50.58%)		p < 0.001
Smooth Cayenne	14 (4.35%)		51 (29.65%)		p < 0.001
Sugarloaf	286 (88.82%)		34 (19.77%)		p < 0.001

Notes: Significance has been tested using two-sided t-tests for continuous variables and Pearson's chi-squared test for categorical variables. Prices are displayed in pesowas.

^aStatistically significant differences in prices for Sugarloaf versus MD2 variety (t-test, p= 0.0017)

^bNo statistically significant difference between the different varieties

^cThis is the average price received by farmers within the particular market channel. It does not take into account prices that farmers might obtain in alternative market channels.

^dStatistically significant difference between MD2 and Sugarloaf (t-test, p=0.0182) and Smooth Cayenne and Sugarloaf (t-test, p=0.0881)

Preferences

Figures 1-3 and Table 7 display descriptive statistics of the behavioral preference measures used. Figure 2 shows the shares of chosen lotteries in the risk elicitation task. We find that in our sample 21 percent of farmers are choosing lottery 6, while 16 percent are choosing lottery 5 and 63 percent are choosing lottery 1-4. As explained earlier we classify farmers who choose lottery 6 as risk-seeking, those who choose lottery 5 as risk-neutral and those

who choose lottery 1-4 as risk-averse. Dave et al. (2010) find in their study that 77.9 percent are risk-averse, while 11.7 percent are choosing lottery 5 and only 10.7 percent are choosing lottery 6. The rather high share of risk-seeking individuals in our sample probably can be explained by the fact that our participants are farmers and not students. For example, Maart-Noelck and Musshoff (2014) find that German farmers are less risk-averse than German students. This is also consistent with the finding that self-employed individuals are less risk-averse than workers (Masclot et al. 2009). Since pineapple farming is a particularly risky business, it is possible that we are dealing with a relatively risk-seeking population. As was found by Suzuki (2016), farmers with higher risk aversion were more likely to exit the pineapple market after the global demand-shifts. It should also be mentioned that the high percentage of male individuals in our sample might further explain the higher share of risk-seeking individuals compared to Dave et al. (2010), since men tend to be less risk-averse than women (Eckel and Grossman 2002).

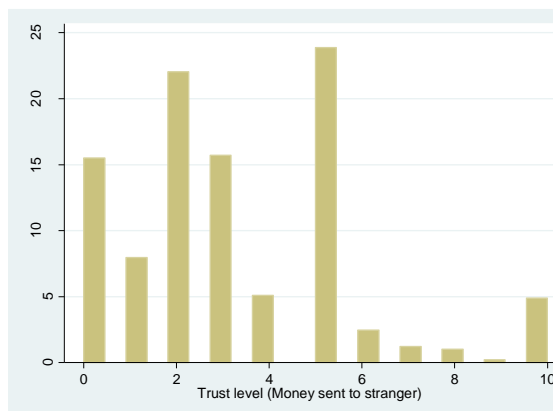


Figure 1 Overview of money invested in trust game

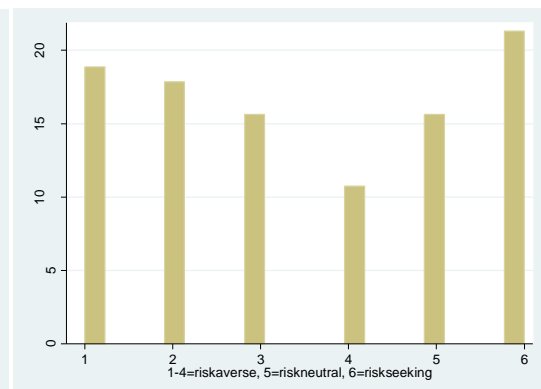


Figure 2 Overview of Lotteries chosen in risk game

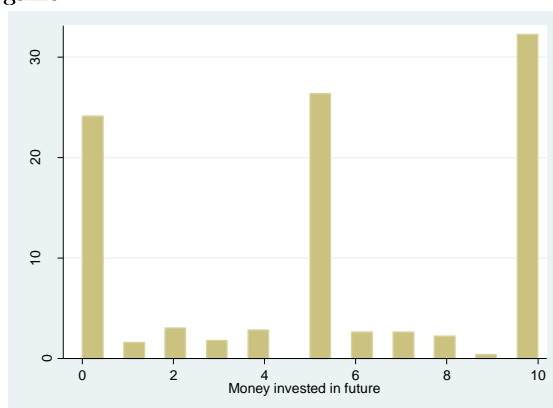


Figure 3 Overview of money invested in time experiment

Table 7 Summary Statistics on Behavioral Preferences

	mean	sd
Trust level (Money sent to stranger)	3.21	2.46
Money invested in future	5.35	3.88
Risk-averse	0.63	
Risk-neutral	0.16	
Risk-seeking	0.21	

The average amount sent by farmers in the trust game lies at 3.21 GHS, which is equal to 32 percent of the initial endowment. This amount is lower than what has been found in the standard game, where usually a fraction of around 50 percent of the endowment is sent to the second player (Berg, Dickhaut, and McCabe 1995). However, according to previous

studies, amounts sent in Africa are typically significantly lower than in North America, which may explain our results. Furthermore, it has been found that changes in the experimental protocol can significantly change amounts sent (Johnson and Mislin 2011). The fact that we use second movers that have been interviewed at different points in time and in different locations might have affected the results. It can also be seen from Figure 1 that only a small percentage of individuals sent more than 5 GHS.

Figure 3 shows a trimodal distribution of the time preference measure with peaks at 0, 5 and 10 GHS invested into the future. The peaks at 0 and 10 are consistent with findings in more complex time preference measures, in which the choice of corner solutions is frequently observed (Andreoni and Sprenger 2012; Andreoni, Kuhn, and Sprenger 2015).

2.4.2 Estimation results

Mixed Logit results

The estimation results displayed in Table 8 show farmers’ preferences for contract characteristics. We first examine the general contract preferences without covariates, displayed in column (1). As indicated by the positive coefficient signs, we find that farmers prefer transparent quality controls, immediate payments and low quality criteria – contract characteristics that are less often associated with high value chains. This is consistent with the findings of other studies (Abebe et al. 2013, 2013; Blandon, Henson, and Islam 2009; Ochieng, Veettil, and Qaim 2016). We also find positive preference coefficients for having agreements before cultivation, which is less straight-forward. Having a secure buyer before planting seems to be very important for farmers when producing modern pineapple varieties. Making agreements before cultivation facilitates planning and reduces uncertainty for the farmer. As expected, the price coefficient is also positive, indicating that utility of farmers increases with increasing prices. The magnitude of the coefficients shows the relative importance of the individual contract attributes. Having the possibility to sell Grade B products has the highest rank, followed closely by immediate payment and the contract term that rejections can only take place directly at the farm gate. Having agreements about the purchase of products before cultivation seems to be less important compared to the other attributes. The standard deviations for the contract attributes are significant, indicating that there is preference heterogeneity.

Columns (2)-(4) of Table 8 present the results of models (2)-(4), which include interaction terms between contract attributes and behavioral preferences of farmers according to the empirical framework. Risk-seeking is interacting with the preferences for low quality criteria as illustrated in column (2) of Table 8. This indicates that indeed a relaxation of quality criteria is perceived as a form of risk-sharing. Risk-seeking farmers attach less importance to being able to sell low quality pineapples to the same buyer, compared to risk-averse farmers. The interaction term between risk-sharing and the dummy for risk-neutrality is not significant, meaning that risk-neutral farmers do not evaluate the possibility of selling Grade B products significantly different than risk-averse farmers.

Table 8 Mixed Logit Results - Preference Space

	(1)	(2)	(3)	(4)	(5)
	Basic	Risk	Trust	Time	All
Mean					
Price for Grade A per kg	0.072*** (0.006)	0.072*** (0.006)	0.073*** (0.006)	0.072*** (0.006)	0.074*** (0.006)
Agreement before cultivation	0.313*** (0.076)	0.312*** (0.076)	0.274** (0.121)	0.536*** (0.128)	0.535*** (0.129)
Grade B accepted	1.796*** (0.137)	1.920*** (0.162)	1.801*** (0.137)	1.801*** (0.137)	1.901*** (0.151)
Transparent quality control	1.147*** (0.133)	1.145*** (0.133)	2.190*** (0.275)	1.153*** (0.134)	2.202*** (0.276)
Immediate payment	1.689*** (0.118)	1.685*** (0.118)	1.836*** (0.175)	2.021*** (0.186)	2.028*** (0.186)
Grade B accepted x risk-seeking		-0.461* (0.265)			-0.454* (0.259)
Grade B accepted x risk-neutral		-0.173 (0.308)			
Agreement before cultivation x trust			0.013 (0.029)		
Transparent quality control x trust			-0.526*** (0.135)		-0.529*** (0.135)
Transparent quality control x trust sq.			0.020*** (0.007)		0.020*** (0.007)
Immediate payment x trust			-0.046 (0.038)		
Agreement before cultivation x time				-0.041** (0.019)	-0.040** (0.019)
Immediate payment x time				-0.061** (0.025)	-0.063** (0.025)
SD					
Agreement before cultivation	0.682*** (0.130)	0.679*** (0.130)	0.689*** (0.128)	0.678*** (0.130)	0.687*** (0.128)
Grade B accepted	1.527*** (0.157)	1.513*** (0.157)	1.532*** (0.156)	1.528*** (0.158)	1.518*** (0.157)
Transparent quality control	2.104*** (0.167)	2.100*** (0.166)	2.025*** (0.163)	2.123*** (0.168)	2.032*** (0.163)
Immediate payment	1.297*** (0.139)	1.293*** (0.139)	1.297*** (0.139)	1.285*** (0.138)	1.284*** (0.138)
Observations	7760	7760	7760	7760	7760
AIC	3995.329	3996.280	3981.194	3989.687	3972.001
BIC	4057.939	4072.805	4071.632	4066.211	4069.395
Log Likelihood	-1988.664	-1987.140	-1977.597	-1983.844	-1972.000

Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

The coefficient for the interaction between trust and transparency of quality controls in column (3) is significant and has a negative sign. This means that farmers with high trust levels attach relatively less importance to transparency than farmers with low trust levels. The interaction of the transparency attribute with the squared trust term has the opposite sign, however, implying that the preference for transparency decreases with trust at a decreasing rate. The effect of the squared term should not be over-interpreted though, since only a small fraction of farmers invested amounts over 5 GHS in the trust game (see

figure 1). Trust does not significantly affect the preferences for agreements before cultivation and immediate payment.

As can be seen from the interactions between time preferences and contract attributes in column (4) of Table 8, future-orientation, measured by the money allocation task, affects the preferences for immediate payment and timing of agreement negatively, as expected. Farmers with higher future-orientation attach relatively less importance to immediate payment and agreements before cultivation. It is interesting that trust does not significantly interact with preferences for early commitments and immediate payment, although farmers identified these two contract characteristics as important sources of strategic risk. Apparently, time preferences play a stronger role in explaining heterogenous preferences for these two attributes than trust. Especially regarding delayed payment, it is possible that farmers are using strategic concerns, such as the fear of not being payed, as an excuse for impatience.

Column (5) in Table 8 presents the estimation results from a model that includes all significant interactions from the previous estimations. It can be seen that the results hold in this regression. Including covariates for the behavioral preferences significantly improves the model fit (Likelihood Ratio test between basic model (1) and model with interactions (column (5)): $\chi^2=33.33$, $p<0.01$). We are using this full model specification in the next step to calculate how willingness to pay for contract attributes is affected by behavioral preferences.

Willingness to pay and Latent Class Analysis

In order to illustrate the economic significance of the behavioral preferences, we calculate the average willingness to pay (WTP) for contract attributes and analyze how it is modified by trust, risk seeking and time preferences. The left side of table 9 shows the average WTP for contract attributes based on the basic regression model (1) in Table 8. The negative WTP coefficients can be interpreted as the price reduction that farmers are willing to accept for having the particular attribute compared to the other reference level. An average farmer in our sample is for example willing to accept a price reduction of 4 pesowas per kg (for Grade A products), if the purchase is agreed upon already before the farmer starts cultivating. To have the possibility of selling Grade B products for a price of 35 pesowas to the buyer, farmers are willing to accept a price reduction of around 25 pesowas per kg of Grade A products. Receiving payments immediately is worth around 24 pesowas to farmers on the average. Finally, farmers are willing to accept a price reduction of 15 pesowas per kg, if rejections are only possible at the farm gate (transparent quality control). The individual willingness to pay for the attributes will certainly depend on several factors, like the farmers' opportunity costs, beliefs about producing high or low quality, experiences with contract partners and transaction costs. We are particularly interested in the role of behavioral preferences and therefore aim to illustrate how unobserved characteristics, in our case trust, risk seeking and time preferences, change the

willingness to pay for contract characteristics. The results are displayed on the right side of Table 9 and are based on the estimations in model (5) in Table 8.

Table 9 Willingness to pay for contract attributes

Attribute	WTP	Confidence - Interval		WTP	Confidence - Interval	
		ll	ul		ll	ul
Agreement before cultivation	-4.36	-6.40	-2.33	-7.25	-10.63	-3.87
Grade B accepted	-25.03	-29.61	-20.46	-25.77	-30.52	-21.01
Transparent quality control	-15.98	-20.01	-11.96	-29.84	-37.48	-22.19
Immediate payment	-23.54	-27.35	-19.73	-27.48	-32.86	-22.10
Grade B accepted x risk seeking				6.15	-0.74	13.04
Transparent quality control x trust				7.17	3.56	10.78
Transparent quality control x trust sq.				-0.27	-0.47	-0.08
Agreement before cultivation x time				0.54	0.04	1.03
Immediate payment x time				0.85	0.20	1.51

Note: WTP means and confidence intervals derived using delta-method (Hole 2007b). Confidence intervals are given at 95%.

The estimated interaction terms show how risk-seeking, increasing trust and increasing future-orientation affect the WTP for certain contract attributes. We find that farmers who are risk-seeking have a 6.15 pesowas lower willingness to pay for the opportunity to sell Grade B products to the same buyer²⁵. For every GHS that a farmer invests into the future the WTP for immediate payment and making agreements before cultivation is reduced by 0.85 and 0.54 pesowas, respectively. Trust seems to play a particularly important role in determining the WTP for transparency. A farmer with a trust level of zero requires a price premium of around 30 pesowas in order to accept the possibility of rejections at company level, while the required price premium in order to accept this reduction of transparency is close to zero for farmers with a trust level of 5. Figures (4)-(6) illustrate the changing WTP for selected contract attributes conditional on trust²⁶ and future-orientation, respectively.

²⁵ The result is significant at the 10% level.

²⁶ Figure 4 indicates that farmers with trust levels of 6 or higher require positive price premiums for accepting transparency. This result is counterintuitive but should not be over-interpreted, since only a small fraction of farmers invested more than 5 GHS in the trust game (see figure 1).

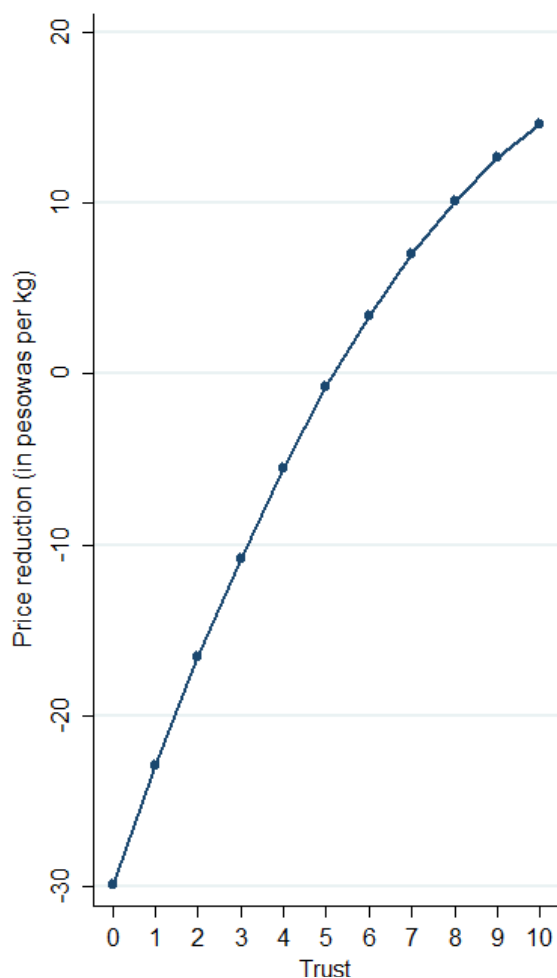


Figure 4 Effect of trust on WTP for rejections only at farm gate

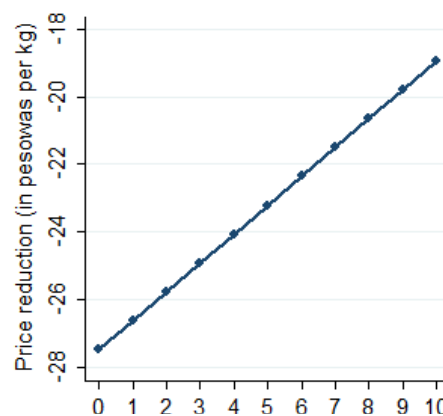


Figure 5 Effect of time preferences on WTP for immediate payment

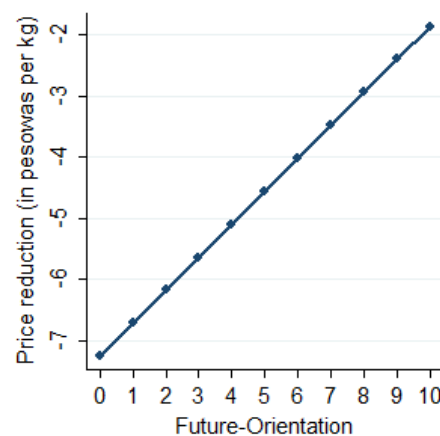


Figure 6 Effect of time preferences on WTP for agreements before cultivation

A closer look at the WTP results reveals that the ranking of attributes may differ between people according to their preferences. For example for a risk-averse or risk-neutral farmer the possibility to sell Grade B products to the same buyer is the most important characteristic for choosing a contract, while for a risk-seeking farmer immediate payment is the most important characteristic, *ceteris paribus*. This means that depending on behavioral preferences farmers may have different participation constraints for entering contract farming. This is further illustrated in an example in Table 10. For example, a risk-averse farmer with an intermediate trust level ($\theta_i = 5$), and low future-orientation ($\delta_i = 0$) would rank immediate payment first, followed by acceptance of grade B, agreements before cultivation and finally transparent quality controls. A risk-seeking farmer with low trust level ($\theta_i = 0$) and strong future-orientation ($\delta_i = 10$) would rank transparent quality controls first, followed by acceptance of Grade B, immediate payment, and agreements before cultivation as least important attribute.

Table 10 Example of shifts in ranking of attributes depending on preference profiles

Contract Attribute	Profile 1		Profile 2	
	WTP	Rank	WTP	Rank
Grade B accepted	-25,77	2	-19,62	2
Agreement before cultivation	-7,25	3	-1,87	4
Immediate payment	-27,48	1	-18,94	3
Transparent quality controls	-0,80	4	-29,84	1

Profile 1: Trust = 5, Future orientation = 0, risk-averse

Profile 2: Trust = 0, Future orientation = 10, risk-seeking

On an aggregate level, these different choice patterns may be connected to different farmer segments with similar preference profiles. In order to identify different preference segments we use a latent class analysis. The difficulty in latent class modeling lies in its vulnerability to local maxima (Sawtooth Software 2004; Train 2008). Therefore, it is necessary to estimate several models from different starting points. The optimal number of classes has to be determined by the researcher. The Bayesian Information Criterion (BIC) and the Consistent Akaike Information Criterion (CAIC) suggest a three-class solution for our data. However, the results of the three-class solution differ strongly with each estimation, depending on the starting point. This suggests that the data does not naturally support a three-class solution. The two-class solution gives more stable results when estimated repeatedly from different starting points and is therefore preferred. We include trust, risk and time preferences in the class membership function of the model in order to examine to what extent heterogeneity in behavioral preferences expresses itself in different market segments. Table 11 shows the estimation results of the two-class solution. Class 1 has an estimated share of 43 percent, whereas Class 2 accounts for 58 percent of the farmers in our sample. For farmers belonging to Class 1 transparency is the most important contract attribute. Having agreements before cultivation does not play a role for this segment. For Class 2, on the other hand, transparency is not relevant for choosing a contract. The most important contract attributes are risk-sharing and immediate payment. In contrast to Class 1, having agreements before cultivation is also relevant for choosing a contract for this segment. As expected, the class membership probability for an individual is significantly determined by trust levels. Farmers with high trust levels are more likely to be in Class 2, while farmers with low trust levels are more likely to be in Class 1. The sizes of the class shares suggest that it might be a valid strategy for companies to diversify their contract offers to target farmers with different participation constraints.

Table 11 Latent Class Conditional Logit Model

	Class 1	Class 2
Price for Grade A	0.031*** (0.005)	0.076*** (0.007)
Agreement before cultivation	0.045 (0.045)	0.251*** (0.054)
Grade B accepted	0.410*** (0.067)	0.876*** (0.081)
Transparency	0.981*** (0.099)	-0.052 (0.069)
Immediate Payment	0.434*** (0.061)	0.806*** (0.086)
Class Membership		Reference
Risk seeking	0.347 (0.283)	
Trust level	-0.117** (0.052)	
Money invested in future	-0.007 (0.031)	
Constant	0.025 (0.264)	
Class Share (%)	42.48	57.52
Observations	7760	
<i>AIC</i>	4035.238	
<i>BIC</i>	4132.632	
Log likelihood	-2003.619	

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

2.5 Conclusion

In this study we analyzed farmers’ preferences for contract designs in the Ghanaian pineapple sector. We discussed how trust, risk and time preferences may affect contract choice and studied the relationship between experimentally measured behavioral preferences and the relative importance of and willingness to pay for contract characteristics.

We establish the following results: (i) Low quality criteria and immediate payment are ranked as the most important factors for choosing a contract, followed by transparent quality controls and agreements before cultivation. Standard deviations show considerable preference heterogeneity.

(ii) We find that differences in the importance of contract characteristics are associated with differences in individual behavioral preferences, measured through monetary incentivized lab experiments. Trust affects farmers’ preferences for transparent quality controls, while risk-seeking affects the importance of the acceptance of Grade B products. This indicates that a relaxation of quality criteria is considered as a risk-sharing

mechanism of a contract. Time preferences are associated with the preferences for immediate payments and agreement-making before cultivation. By disentangling trust and time preferences we raise doubts about the common interpretation that immediate payment is preferred due to reasons of strategic concerns. Impatience or liquidity constraints might be better explanations.

(iii) We further show that the effects of trust, risk and time preferences are economically relevant, by analyzing their effects on the willingness to pay for certain contract characteristics. Especially trust seems to be a relevant factor for the willingness to pay for transparent quality controls. Additionally, we were able to show that the effects of preferences are strong enough to change the ranking of contract attributes. This means that people with different preference profiles prefer different contracts, everything else being equal.

(iv) Conducting a latent class analysis, we find two farmer segments with different preference profiles. The first segment represents 42 percent of the farmers in our sample. For this segment, transparency, which is reflected by the location of quality classification, is the most important attribute for choosing a contract. In contrast, for the second segment (58 percent of the farmers) immediate payment and the possibility of selling Grade B products are the most important criteria, while transparency is not relevant. The class membership is predicted by trust levels.

Since it is costly for firms to provide contracts that include terms that are favorable for farmers, it is practically not possible to offer a “perfect contract”, which includes all contract attributes preferred by farmers. From a firm's perspective, it could therefore be beneficial to offer different types of contracts, which trade off different attributes against each other. Farmers could then self-select into their preferred contracts. For farmers whose major participation constraint is transparency, firms could offer arrangements in which farmers have access to the grading process. For farmers whose major participation constraint is immediate payment, firms could offer arrangements that involve advanced down payments, etc. Especially in sectors in which firms compete for produce, and vertical integration is not possible due to land scarcity, as it is the case in the Ghanaian pineapple sector, diversification in contract offers might be an effective strategy to build stable long-term business relationships with producers and secure market shares.

2.6 References




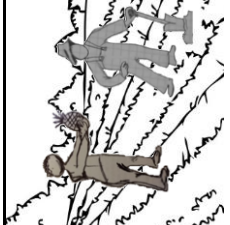

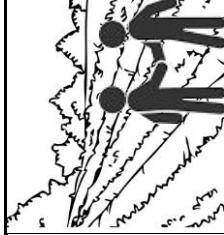


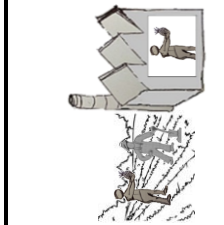
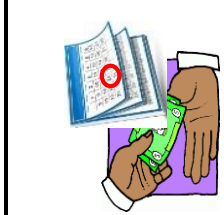
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2.7 Appendices

2.7.1 Choice Card Example

<p>Alternative 1 Producing MD2 under market channel A (Training provided)</p>	 <p>Farmer and buyer agree on purchase before harvest</p>	 <p>60 p/ Kg</p> <p>Price for Grade A</p>	 <p>35 p/ Kg</p> <p>Farmer cannot sell Grade B to same buyer</p>	 <p>Rejection only at field possible</p>	 <p>Payment immediately after purchase</p>
<p>Alternative 2 Producing MD2 under market channel B (Training provided)</p>	 <p>Farmer and buyer agree on purchase before planting</p>	 <p>50 p/ Kg</p> <p>Price for Grade A</p>	 <p>35 p/ Kg</p> <p>Farmer can sell Grade B to same buyer</p>	 <p>Rejection at field and company/ pack house possible</p>	 <p>Payment 4 weeks after purchase</p>
<p>Alternative 3</p>	<p>NONE OF THESE (My current market channel for pineapples is better.)</p>				

2.7.2 Experimental Instructions

The instructions were translated into local languages by trained enumerators. After the instructions, farmers were confronted with control questions to make sure, the experiment was understood and given the possibility to ask questions before making their decision.

General Instructions

We would like to ask you to take part in three short experiments, in which you can earn money. How much you can earn in the three experiments depends on your decisions. There are *no* right or wrong answers in the experiment. We are not expecting you to take any particular answers and your answers will be completely confidential and analyzed anonymously.

After finishing all experiments you will draw a random number, which will determine, which of the three experiments will be paid out to you. Please note that **only one** of the three experiments will be paid out to you via mobile money in the following days.

Experiment 1: Choose a bag

In this experiment you will be asked to choose one out of six bags from which you would like to draw a ball from. Each bag contains 2 balls. In each ball, there is a voucher with a certain amount of money.

Bag Number one contains two balls; the two balls contain 14 Cedi.

Bag Number two contains two balls; one contains 12 Cedi and the other contains 18 Cedi.

Bag Number three contains two balls; one contains 10 Cedi and the other contains 22 Cedi.

Bag Number four contains two balls; one contains 8 Cedi and the other contains 26 Cedi.

Bag Number five contains two balls; one contains 6 Cedi and the other contains 30 Cedi.

Bag Number six contains two balls; one contains 1 Cedi and the other contains 35 Cedi.

If this experiment is chosen for payment you will earn the amount of money that is written on the voucher in the ball that you draw.

Please ask if you have further questions to the experiment.

You can now decide from which of the six bags you would like to draw one ball. We will note your answer and you can draw the ball in the end of the survey, if this is the experiment that is randomly chosen for payment.

Experiment 2: Allocate Money

In this experiment, you start with an endowment of 10 Ghana Cedi from us. You can decide how you would like to allocate the 10 Ghana Cedi on two dates in time. The two dates are **tomorrow** and **in 4 weeks**. You can decide to allocate some money to the date of tomorrow and some money to the date of in 4 weeks. You can also decide to allocate all the money on the date of tomorrow or all the money on the date of in 4 weeks.

If this is the experiment that is randomly chosen for real payment you receive the following payoffs: Each Cedi that you allocate to the date of **tomorrow** will be transferred to you tomorrow. For Each Cedi that you allocate to the date of **in 4 weeks** you will be transferred 1.50 Cedis in 4 weeks. That means that we will add 50 pesowas to every Cedi that you allocate to the date of **in 4 weeks**.

Please decide how you would like to allocate the money between the date of tomorrow and the date of in 4 weeks.

Experiment 3: Play with a stranger

In this experiment, you can earn money by playing together with a stranger. You start with an endowment of 10 Ghana Cedi from us. You can decide to keep the money or to send money to a stranger. The stranger is a person that we have interviewed in October. In total we have interviewed 20 Ghanaians that we chose randomly. You are now randomly matched with one of these 20 persons.

We explained the stranger in October that they would play together with a stranger (that is now you) who receives 10 Ghana Cedi from us. We explained the person that you can decide to **keep the money** or to **send any amount between 1 and 10 Ghana Cedi** to the person. We explained that any amount that you would send to the person would be tripled (multiplied by three). For example, if you send one Cedi, then the person would receive three Cedi.

After we made sure that the person had understood the experiment, we asked the person if in case you would send money to him/her, the person would either keep the money or share the money equally with you. That means he/she would send back half of the received money.

If you decide to keep the money then the stranger receives nothing and can send nothing back. If you decide to send 1 Ghana Cedi then the stranger receives 3 Ghana Cedi and can decide to keep the money or to send half of the money back (1.50 Ghana Cedi). If you decide to send 2 Ghana Cedi then the stranger receives 6 Ghana Cedi and can decide to

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Experimental Evidence from the Ghanaian Pineapple Sector

keep the money or to send half of the money back (3 Ghana Cedi). If you decide to send 2 Ghana Cedi then the stranger receives 6 Ghana Cedi and can decide to keep the money or to send half of the money back (3 Ghana Cedi), and so on.

We explained the stranger that the more you would send the more both of you could potentially earn. The stranger made his/her decision whether he/she would keep the money or share it with you (in case you send something to him/her) already in October. This decision is in a sealed envelope that we have with us. We do not know which decision is written on the sheet.

In case you decide to send something, the stranger will receive his/her final payoff also via mobile money.

Now you can decide if you want to send something to the stranger and if yes which amount you would like to send. We will open the envelope with the decision of the stranger at the end of the survey, if this is the experiment that will be chosen for payment.

3 Contract Compliance under Biased Expectations

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Abstract

When sellers and buyers of a product conclude a contract before production, the agent might misjudge her output and form biased payoff expectations. This biased expectation might serve as a reference point, i.e. the agent might perceive a loss if the real payoff from a contract falls short of the targeted payoff. Engaging in non-compliant actions can enable the agent to mitigate the divergence between reference and real payoff. In this study we explore how misjudgement of performance affects contract compliance using experimental data from Ghana. We find evidence for reference-dependent behavior: overestimators breach more compared to underestimators and non-biased sellers. The effect of overestimation on contract compliance is conditional on loss aversion, but only holds in non-deterministic environments. The effect persists when controlling for individual contract offers and performance. We manipulate subjects biased expectations in an experimental treatment which in turn increases breaching, demonstrating that reported effects are causal.

JEL codes: C91, D03, D81, D84, J41, O12

Keywords: contract compliance, overestimation, reference-dependent preferences, lab-in-the-field experiment

3.1 Introduction

Contract Breach is frequent in domains in which formal enforcement institutions are absent (Chemin 2012). Especially in developing countries legal systems are oftentimes absent, corrupt or inefficient (Dixit 2003), for which reason informal contracts and contract breaches are frequently encountered. Many companies -established or in the set-up phase - depend on investments to build up their business, to enhance produce or services and to integrate into higher value chains. Investments can potentially hold high returns, but if contracts are not enforceable it is a risky endeavor in terms of post-contractual opportunistic behavior (Klein, Crawford, and Alchian 1978). This may hinder development as investors might shy away (see for example Knack and Keefer 1995). Therefore, it is important to better understand the drivers of contract compliance when contracts are not legally enforceable.

When a seller and a buyer of a product conclude a contract before production, the agent might misjudge her performance. In behavioral economics there is extensive evidence that people's judgment under uncertainty is often misguided, i.e., people often do a poor job in processing probabilities (Tversky and Kahneman 1975) and people fail in assessing their own performance (e.g. Moore and Healy 2008). If agents overestimate their performance, they might form unrealistic payoff expectations. It is well established that expectations about economic outcomes may serve as reference points that affect the evaluation of outcomes and hence economic decision making (Bell 1985; Koeszegi and Rabin 2006).

Our main hypothesis is that individual overestimation of performance fosters contract breach. The channel that we want to test is reference-dependent preferences. More precisely, payoff expectations resulting from performance misjudgment might serve as a reference point. After production, the agent might compare her real payoff from the contract with her expected payoff. If the agent overestimates her performance, the expected payoff exceeds the real payoff, and the agent might experience a subjective loss (Koeszegi and Rabin 2006). To counteract the subjective loss, she might engage in breaching behavior that enables to mitigate the difference between real payoff and reference point. Furthermore, we want to test two mediators that might bolster reference-dependent behavior. First, individual loss aversion might promote breaching if the agent overestimates her performance. Under overestimation, the expected payoff will be higher than the status quo. Along these lines, we hypothesize that with an agent's increasing loss aversion, the higher will be the utility loss from falling short of the reference point. To counteract the utility loss, highly loss averse agents, will engage in non-compliant actions to a higher extent. Second, non-deterministic environments might facilitate breaching compared to deterministic environments. Production shocks are prevalent in many businesses. Thinking of farming, there can be for instance weather shocks (positive or negative) that affect production outcomes. In such an environment, agents are able to attribute outcomes and performance to external factors according to their ex ante beliefs (Grossman and Owens 2012). Own "failure" from misjudging performance can be partly shifted to the occurrence of a production shock. Using the shock to shift accountability

from oneself to an outward event can facilitate breaching as the self-image can be kept up (Dana, Weber, and Kuang 2007).

We pursue the research question in a lab-in-the-field experiment in Ghana. In a modified investment game a buyer and a seller can agree on a (non-enforceable) contract: The seller produces goods in a real-effort task. Based on her performance estimation she makes an offer over selling a certain amount of goods to the buyer. By accepting the contract, the buyer makes an investment that enhances the value of the goods. In order to test whether the biased expectations have stronger effects on contract breach in non-deterministic environments, there is a 50% chance that the output may be affected by a random shock, that can either add or reduce 2 goods with equal probability. After having been informed about the total output and about whether a shock has occurred or not, the seller can decide to sell the produced goods to the buyer or to a more attractive alternative market.²⁷ We measure performance misjudgment by asking participants to state their guess about how many puzzles they solved correctly in the real-effort task. Since performance directly affects payoffs, we can use this guess as a proxy for payoff expectations. The major novelty of our design is that reference points can emerge endogenously as a result of (biased) estimations about own performance. This is a major distinction to studies where reference points are either exogenous or where reference points emerge through rational expectations based on prior experience (e.g. Abeler et al. 2011; Camerer et al. 1997).

We establish the following results: Sellers with high overestimation breach contracts to a higher extent than underestimators and correct estimators. This effect is mediated by (1) loss aversion, and (2) the occurrence of production shocks. Sellers who are underestimating their performance “overfulfill” the contract by selling more to the buyer than they promised to.

In order to identify if the effect of biased expectations is causal, we manipulate expectations by an experimental treatment called *Anchor*. We find that once biased expectations are instrumented, the effect on contract breach remains significant implying that we do not have an endogeneity issue.²⁸

The next Section summarizes the related literature. Section 3 describes our study design. Results are presented in Section 4, discussed in Section 5 and Section 6 concludes.

²⁷ Sellers are informed about the occurrence of a production shock and only learn about their total output *after* the shock had affected their production. In the shock condition, sellers are not informed about their real performance, only about the total output.

²⁸ This approach is comparable to (Hill et al., 2012), who examine if observing peers alters the decision to reciprocate in a trust game. By using a treatment, they instrument their explanatory variable of interest and justify therewith that their reported effect is indeed causal.

3.2 Related Literature

Our study primarily builds on the theory of reference-dependent preferences (Bell 1985; Koeszegi and Rabin 2006). It has been shown experimentally and empirically that reference points play a role in different realms such as contract behavior or effort provision. For example, Hart and Moore (2008) demonstrated theoretically and Fehr, Hart, and Zehndera (2011) showed experimentally that agents breach less under a rigid contract, i.e. a contract where the price for the agent's output is fixed *ex ante*, than under a flexible contract, i.e. the price is not fixed *ex ante* but can vary within a certain range. Under flexible contracts, agents engage in costly punishment if the principal pays a lower price than expected. There is also evidence that agents alter effort levels under different reference points. Camerer et al. (1997) find that cab drivers in New York set a daily income target and use it as a reference point. Once this target is reached, they stop working and do not use the chance of potentially high-income days. Abeler et al. (2011) manipulate reference points in an experiment by exogenously raising expectations of earnings. They show that people exert more effort in a real-effort task to avoid the experience of a felt loss. This empirical evidence is hard to reconcile with standard economic assumptions. However, the findings are consistent with the idea that people hold reference-dependent preferences. Here, utility is not only dependent on a factual payoff *per se* but also on a reference payoff the factual payoff is compared to (Bell 1985; Gul 1991; Hart and Moore 2008; Koeszegi and Rabin 2006; Loomes and Sugden 1986). That means an individual would derive less utility in a situation where payoff expectations (reference point) exceeded the real payoff compared to a situation in which expectations are in line with the real payoff. Similarly, a reference payoff below the real payoff leads to a surplus in utility. To our knowledge, this paper is the first to test effects of potential reference points that may emerge endogenously as a result of misjudgment of own performance.

We are examining to what extent reference-dependent preferences play a role in a contract scenario without formal enforcement. There are different forms of enforcement mechanisms that can be distinguished into first-party, second-party or third-party enforcement (Dixit 2009). Due to limited functioning of legal systems especially in developing countries, third-party enforcement by courts is often ineffective. Instead, agents oftentimes rely on self-enforcing contracts with repeated interaction. Contracts of this form are enforced by private ordering, also called second-party enforcement. Second-party enforcement works through the fear of losing future benefits from the contractual relationship or the fear of reputational loss (Klein 2000). In distinction to these two mechanisms first-party enforcement is based on a party's internal value system (Dixit 2009) at which individual preferences such as guilt aversion, fairness concerns and social preferences affect decisions to comply or not to comply to a contract (e.g. Fehr and Fischbacher 2002). In order to better pin down the effect of reference-dependent preferences on compliance, buyer and seller in our set-up only interact once and not repeatedly. This rules out any effects of second-party enforcement.

Finally, we draw from evidence on biased self-assessment of own performance, that is overestimation or underestimation. There are several reasons why people fail to correctly

assess their own performance under uncertainty (e.g. Moore and Healy 2008). A large stream of literature focuses on cognitive mechanisms such as people’s use of judgmental heuristics and faulty integration of relevant information in the assessment process (e.g. Tversky and Kahneman 1975; Fischhoff et al. 1978). Another reason might be that people are incompetent in a task and too incompetent to even realize their incompetency (Kruger and Dunning 1999; Ehrlinger, Mitchum, and Dweck 2016). Cognitive limitations are not the only reason for holding unrealistic views about own performance. Blanton et al. (2001) found that people are concerned about their self-image and want to avoid cognitive dissonance. Therefore cognitive biases might be self-sustaining via a confirmation bias. Behavioral biases are influencing economic decision making. For example, overestimating employees are more likely to make “mistakes” in choosing incentive schemes, meaning that payments could have been higher for the employee in a different task or job (Larkin and Leider 2012; Sautmann 2011). Another example is Camerer and Lovallo (1999), who showed experimentally that due to biases too many agents enter a competitive market leading to a dead-weight loss. We add to this literature and show that biased performance estimates can result in non-compliant behavior of agents in a contract situation via reference dependency. Additionally, we contribute to the literature by analyzing how the effects of misjudgments on contract compliance differ between deterministic and non-deterministic environments. The incidence of a shock could serve as an extended wiggle room (Dana, Weber, and Kuang 2007) and gives people an opportunity to keep up their self-image. In our research design we therefore vary the occurrence of random shocks, at which the sign of the shock is unknown.

In summary, our contribution to the literature is threefold: First, we examine how false assessment of own performance, which translates into biased payoff expectations affects contract compliance. Second, we study whether loss aversion triggers contract breach among overestimating subjects. Third, we analyze to what extent the effects are conditional on non-deterministic environments.

3.3 Study design

The experimental design consists of two major sections. In the first section, we elicit baseline (social) preferences, in particular Social Value Orientation (henceforth SVO), inequality aversion, risk preferences and loss aversion. In the second section, we first measure individual overestimation and afterwards participants engage in a modified investment game with cheap talk. The experiment ends with a cheating game which is followed by an ex-post questionnaire. The experiment was programmed with the software “otree” (Chen, Schonger, and Wickens 2016) and conducted with tablet computers. Participants were pay out in the end of the experiment in GHS²⁹. Instructions can be found in the appendix. We will first explain the major part of the experiment which is the second section, before we briefly introduce the preference measures used in the first section of the experiment.

²⁹ Exchange rate at the time of the study approximately 1 GHS = 0.25 USD

3.3.1 Individual expectation bias and investment game

At the beginning of this section, participants were informed that the following three different elements of this section are interconnected:

Baseline Performance

Participants exerted a real-effort task in the form of 25 logical multiple-choice puzzles³⁰ with 4 possible answers each. The puzzles were framed as a production task. For every correct answer one virtual good was produced. Before they started working on the task, they were informed that in part 3, they might “produce goods again” and work on similar puzzles. Each correctly given answer (“one good”) was worth GHS 0.20. Time was limited to 15 seconds per task and the first answer was always logged in as a default.³¹

Baseline Estimation

Then, participants assessed their (relative) performance in the real-effort task. We asked three different questions and for each correct guess, participants earned GHS 5. Firstly, participants made a guess on the amount of correctly solved puzzles. Secondly, participants made a guess about the average performance of women and thirdly about the average performance of men in the room.³²

Investment game

Afterwards, participants engaged in a modified investment game. Participants were fully informed about the entire course of action in advance. After all participants had read the instructions, the roles of buyers and sellers were assigned. Then each buyer was matched with one seller and seller and buyer made their decisions. We explain the different steps of the game in detail:

1. Real-effort task and performance guess: Similar to the elicitation of individual baseline performance, sellers were confronted with 25 similar puzzles and each correctly solved puzzle, one good produced, was worth GHS 0.20. Afterwards, sellers were asked to estimate their performance and earned GHS 5 if the guess was exactly correct.
2. Contract offer: The buyer received an endowment of GHS 4. Sellers could decide whether they wanted to offer a contract to the buyer and if so how many goods they chose to offer. Any amount of goods between zero and the expected output, i.e. the performance guess could be offered. We informed participants about the values of goods: For each good sold to the buyer, sellers would earn GHS 1. Goods can also be sold to an alternative

³⁰ An example for the type of puzzles can be found in the instructions in the appendix.

³¹ We decided for a default answer as otherwise there might be strategically acting participants not working at all on the task who are then perfectly able to assess their performance.

³² If less than two women were present in the experimental session, the question on average performance of women was not asked. The gender-related questions are meant to be analyzed in a different research study.

market for a unit price of GHS 2.5. However, only if the buyer accepted the seller's offer, these prices come into effect. Otherwise, the buyer does not make an investment that "enhances" the value of the goods and goods are only worth GHS 0.20 at the alternative market. To facilitate the seller's calculations for different offers, we provided sellers with a calculation table. If the seller decided not to offer any contract the buyer kept her endowment of GHS 4 and the seller earns GHS 0.20 per good.

3. Contract acceptance: The buyer was informed about the seller's performance in the first round of the real-effort task. She could decide to accept or to reject the seller's offer. If the buyer had accepted the contract, GHS 4 were invested in the seller's production. By making the investment, the buyer received GHS 1 for each good the seller sold to the buyer. If the buyer rejected the offer, she kept her endowment. Payoffs for the seller are as described in step 2. Buyer and seller are informed about their payoffs and the game ends.

4. Information about total output and occurrences of production shocks: After agreement on a contract, sellers and buyers were informed about the total output. The total output equals the real performance in the real-effort task if no shock affected "the production". A shock affected the production with a 50% chance and output is either topped up by 2 goods or reduced by 2 goods (each case was equally likely). The two parties learned if a shock occurred or not and learned about the resulting total output. They were not informed about the real performance under the shock treatment but only about the resulting total output.

5. Selling of goods: To remind the parties on the agreement made, the contract was summarized and displayed on the screen. Then, the seller could decide on the amount of goods she finally wanted to sell to the buyer. For this purpose, the seller was provided with a calculation table again, while this time the payoff expectation and the real payoff if the contract will be honored is displayed at the top of the screen. The seller then decided how many goods to sell to the buyer and how many goods to sell to the alternative market. Here, we observe which sellers comply to the contract (sell the amount offered to the buyer), breach the contract (sell fewer goods than offered) or even over-fulfill the contract (sell more goods than offered). The game ended with information on payments for buyers and sellers.

The steps of the game are illustrated in Figure 1. Payoffs for seller and buyer respectively are presented in brackets, while t is the amount of goods produced, prior to the occurrence of shocks and s is the amount of goods sold the buyer.

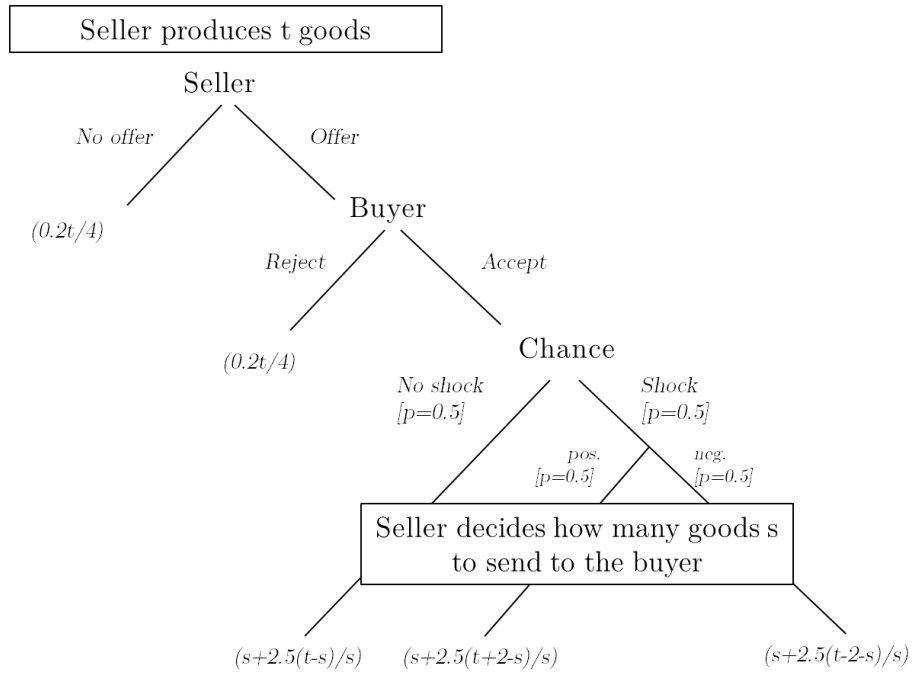


Figure 1 Sequence of actions in the modified investment game

3.3.2 Experimental treatment for manipulating expectations

We use an experimental treatment to exogenously manipulate payoff expectations by raising performance guesses exogenously. For that purpose, we use an anchor before participants made their performance guess in the phase of the investment game. In the *Anchor* treatment, an additional question was asked before sellers stated their guess: “Do you think you have produced more than 20 goods?”, which was a simple yes-no question. Recall that the maximum of correctly given answers is 25. Less than 1% of the participants reached a total performance of more than 20 goods. Therefore, the *Anchor* set is extremely high and effectively not reachable by the vast majority of participants. However, participants use this initial number of 20 to make their subsequent performance guess (Tversky and Kahneman 1975) and start iterating downwards until they reached their final guess. The number of 20 goods was chosen to implement a substantially high anchor to raise performance guesses. We use the treatment to ensure that reported effects from biased expectations on contract compliance are causal. Instrumenting biased expectations by using the *Anchor* treatment serves as an experimental robustness check for the effects of interest.

3.3.3 Discussion of Design Decisions

As we want to apply our findings to contract situations, our investment-game framework resembles a business encounter. We are aware that the studied scenario does not mimic a real-life contract situation. The first goal of this study is not to perfectly simulate a real-life contract situation. Instead, we make use of the advantages of controlled-laboratory

experiments as our main interest lies on the behavioral channels (i.e., overestimation) and their causes on compliance behavior (i.e., contract breach).

(1) Contracts are concluded *after* the production phase: In order to have control over agents' expectations we need to be able to have a comparable measure of beliefs before and after the treatment manipulation. We elicit beliefs about performance twice - after production task I and after production task II. By doing so we can examine whether the manipulation of expectations through the anchor was successful. In order to test the effect of expectations on contract compliance the agent is offering the contract based on her ex-post expectations which we elicited using incentives. Although this situation is not common in real life one can think about comparable situations: For example in farming, seeds may already be planted when companies can decide to invest in the production by providing value enhancing inputs (e.g. fertilizers). However, the aim of the design is not to resemble real life situations but to allow us to identify the effects of interest.

(2) Sellers (and not buyers) offer the contract: In our design agents can make an offer to the buyer. With this procedure, we want to assure a certain level of agent's commitment and counteract potential non-compliance to contracts because agent's might perceive the contract as unfair.³³ We cannot control for heterogeneity in fairness perceptions within the investment game. Hence, we decided to turn the more intuitive order of offer and acceptance of buyer and seller around and let the seller make the offer.³⁴

(3) Higher profits at the alternative market: Breaching the promise and selling more to the alternative market is always monetary beneficial for the seller. In our set-up sellers shirk by selling less goods to the buyer than promised. Similar moral-hazard situations exist in real-life e.g. in contract farming when sellers reduce their effort or only sell low quality produce once a contract is signed. Also side-selling of produce can be named as an example for a high alternative price³⁵.

(4) Choice of real-effort task: We chose a rather difficult task as it has been shown that difficult tasks lead to more overestimation (Larrick, Burson, and Soll 2007). Moreover, logical puzzles seemed to be a task participants were unfamiliar with, making it harder for

33 Let us imagine that the buyer makes the offer. Then, the seller might accept the offer mainly because the buyer's investment enhances the value of seller's goods. The seller might accept nearly any offer as it holds substantial benefits in any case. However, the seller might perceive the offer as unfair and the seller behaves non-compliant not because of biased payoff expectations but because she did not find the offer fair in the first place.

34 For the same reason we allowed for self-selection into contracts, that is sellers could decide to offer a contract and buyers could decide to accept the contract. Not allowing for voluntary agreements and assigning predefined contracts could have led to a situation in which sellers breach because they do not feel committed to the contract and perceive the contract as unfair. It is also common when studying ex-post contracting behavior to allow subjects to choose their preferred contract (if any) (Fehr, Hart, and Zehndera 2011; Bartling and Schmidt 2015).

35 If farmers receive inputs or credit from buyers for the production, the loan is usually deducted from the final product price. Therefore prices outside the contract may turn out to be higher.

them to estimate their real performance. The chosen task type was suitable to evoke variance in the (mis-) judgment of performance, our explanatory variable of interest.

3.3.4 Individual preferences and ex post survey

We applied stranger matching when measuring Social Value Orientation and inequality aversion. Games eliciting aversion to risk and loss were played individually. Information about decisions made and payoffs earned were only given at the very end of the experimental session.

Social value orientation: We apply the method of Murphy, Ackermann, and Handgraaf (2011) and the reduced set of six decision sets to proxy social value orientation (henceforth SVO). Participants were matched in dyads and had to decide out of nine money allocation for their most preferred one. The game was played with the strategy method. The original amounts from Murphy, Ackermann, and Handgraaf (2011) were kept for decision-making and an exchange rate of 1 unit = GHS 0.03 was introduced. At the end, one decision set was selected for payment and one player was randomly assigned the role of the active decision-maker. An angle, the SVO angle, can be calculated from the decisions made and expresses peoples' magnitude of concern for another person's payoff.

Inequality aversion: We apply a simplified version of the method of Blanco, Engelmann, and Normann (2011) to measure envy. Participants are matched in dyads and are first in the role of a proposer and then in the role of a responder. The proposer is endowed with GHS 8 and makes an offer GHS x to the responder, keeping GHS $8 - x$ to herself. The amount x in this modified ultimatum game will be referred to as "Share given" in the result section. Then, the responder can accept or reject the offer. In the case of rejection both players earn zero. The parameter α captures the level of envy and is estimated by the minimum amount a responder is willing to accept in an ultimatum game. After decision-making, the computer assigned randomly the roles in the dyad and the respective payments were calculated.

Risk preferences: The method from Eckel and Grossman (2002) is a simple method to measure risk preferences. Here, participants were presented six different gambles and are asked to choose their preferred one. Each of the gambles involve a 50% chance of receiving a low payoff and a 50% chance of receiving a high payoff. There is one non-risky gamble with a certain payoff of GHS 2.5 in both states. For the subsequent 4 lotteries, the expected payoff increases with the risk involved in the lotteries, measured by the standard deviation. The last lottery increases only in riskiness but not in expected payoff. The measure results in a continuous variable from 1 to 6, reflecting the lottery chosen, which we use in our analyses.

Loss aversion: Loss aversion is measured by a simple method following Gächter, Johnson, and Herrmann (2007). Participants faced seven different gambles³⁶ with a good state and a bad state; each coming into effect with a 50% chance. The good outcome is always GHS 9 whereas the bad outcome increases from a loss of GHS 1.5 to a loss of GHS 10.5 in gamble 7. For each gamble, participants have to decide if they want to take the risk and play the lottery or not. Only one lottery is randomly chosen for payment. Rejection of a lottery gives a payoff of GHS 0.³⁷ The subjects did not get an endowment for this game but could actually lose money from their total experimental payoff. From the loss aversion task we derive a continuous variable from zero to 7, reflecting the lotteries chosen.³⁸

Cheating game and ex post survey: We played a modified version of the cheating game from Fischbacher and Föllmi-Heusi (2013) at the end of the experimental session.³⁹ The ex-post questionnaire started off with questions about the experiment. Additionally, we used well-established scales such as the locus of control scale (Rotter 1975), self-evaluation (Judge and Bono 2001), optimism (Scheier and Carver 1985) and guilt and shame aversion (Cohen et al. 2011). We also collected data on experience in experiments and on how many other persons they knew in the room. At the very end, we asked about socio-demographic background such as education and income.

3.3.5 Subjects, Payments and Procedures

Sessions lasted approximately 120 minutes and students were paid in total about GHS 44 (\$11), relative to a stated daily income for free disposal of GHS 7. Payments varied between GHS 22 and GHS 90. To attract participants to join our experimental sessions, we announced a show-up fee of GHS 20.⁴⁰ The study is approved by the ethical board of Social Sciences of the University of Goettingen.

Participants were recruited at the two largest cities in Ghana, the capital Accra and the university town Kumasi. Our study was publicly announced and students could register in advance for a particular session. The data was collected in November and December 2016. In total, we conducted 52 sessions, over the course of five weeks. The sessions comprised between 16 to 24 participants each. We implemented four different treatments.⁴¹ Two

³⁶ Note the original game has only 6 gambles. We added a first gamble with a potential loss of GHS 1.5 to increase variance in choices.

³⁷ As the gambles become riskier with each gamble, it is irrational to switch once accepting a gamble to rejecting a riskier gamble. Therefore, we restricted choice-making and participants could only switch one time from acceptance to rejection.

³⁸ If all seven lotteries were accepted the variable takes the value zero, if all lotteries were rejected the variable takes the value seven.

³⁹ This game is part of another project and will not be analyzed in this paper.

⁴⁰ Apart from money, we also used non-monetary incentives such as certificates of appreciation for volunteering to participate in a study and drinks after the session to attract students to join our sessions.

⁴¹ Before the experiment started we took scans of the participant's hands to calculate the finger's digit ratio, a proxy for prenatal testosterone level as part of a different research study.

treatments are part of a different study and are not analyzed here.⁴² The Treatments and shock conditions were randomized within sessions. In the two treatments - *Control* and *Anchor* - that we focus on in this study, we had in total 478 participants, that is 239 sellers and 239 buyers.

Overall, the majority of the participants are male (about 70 % men and 30 % women). In average participants are 21 years old and have GHS 200 a month for free disposal (corresponds to about US\$ 40). Most of the students participated in a lab experiment for the first time.

3.4 Behavioral Predictions

In this section, we will derive our main hypotheses on reference points and contract compliance behavior. Before that, we will briefly discuss expected compliance behavior under the assumption that sellers are profit-maximizers and that sellers have other-regarding preferences.

According to standard economic theory, profit-maximizers breach the contract (once accepted by the buyer) to the full extent. In other words, profit-maximizing sellers sell their total output to the alternative market independent of any promises made to the buyer *ex ante*. However, behavioral economics has shown that people may be concerned by other regarding behavior and do reward pro-social actions by reciprocating (Berg, Dickhaut, and McCabe 1995; Fehr, Kirchsteiger, and Riedl 1998; Fehr and Fischbacher 2002) and have a preference to hold promises (Vanberg 2008). Hence, we expect that a substantial share of agents will comply to contracts.

Predictions if expectations serve as reference points

There is evidence that people use expectations about economic outcomes as reference points to which they compare actual outcomes as soon as it may materialize (e.g. Bell, 1985). We argue that payoff expectations play a role in determining contract compliance. In our design payoff expectations are a direct consequence of performance. As discussed before, the seller earns 1 GHC for each good that is sold to the buyer and 2.5 GHC for each good sold to the alternative market if the buyer had accepted the contract. Assuming that the seller sticks to his promise of selling a certain amount (q_p) to the buyer, the seller's payoff ($\pi_{i,s,real}$) is

$$\pi_{i,s,real} = 1 \cdot q_p + 2.5 \cdot (y_{real} - q_p),$$

⁴² In addition to the Anchor and Control Treatment we implemented two other treatments in which we gave performance feedback; an exact and a noisy feedback. As we use a between-subjects design and randomized treatments within sessions, we do not have any concerns that we can analyze the data of our *Control* and *Anchor* separately.

where y_{real} is the realized output that is resulting from the seller's performance and the occurrence of a production shock. Since the shock can be positive or negative with equal probability the expected value of the shock is zero. The seller's ex ante expectation about his payoff therefore depends on his performance guess, y_{exp} , which we elicited using monetary incentives. The ex-ante payoff expectation ($\pi_{i,s,exp}$) would then be:

$$\pi_{i,s,exp} = 1 \cdot q_p + 2.5 \cdot (y_{exp} - q_p).$$

We expect that the seller uses the ex-ante payoff expectation as a reference point to which she compares the actual payoff. If people were overestimating themselves - i.e. the actual payoff lies below the payoff expectation - people might internalize a subjective loss. The experienced disappointment might lead to the abandonment of the initial goal of complying to the contract (Zeelenberg et al. 2000). Sellers might try to offset the disutility from overestimation by behaving opportunistically and therefore reducing the subjective loss. We expect that sellers who are loss-averse will react more strongly to these virtual losses. Based on the theoretical assumptions the discussed effects are supposed to be independent of unobserved characteristics between over- and underestimators but stem from the misalignment between expectation-based reference points and realized outcomes. As discussed earlier, in order to account for possible unobserved characteristics we manipulate expectations by using the *anchor* treatment. We assume that there is more contract breach in the *Anchor* treatment compared to the *Control* treatment. Based on the above discussion, we deduce the following hypotheses:

Hypothesis I: a) *Overestimation has a positive effect on contract breach.* b) *The effect of overestimation on contract breach is conditional on loss aversion.* c) *Sellers breach more in the Anchor treatment compared to the Control treatment*

Predictions under non-deterministic environments

In our set-up, opportunistic behavior pays off but people might still want to retain their positive self-image and try to delude themselves for the profitable action (Mazar, Amir, and Ariely 2008). Sellers ending up in the shock condition can interpret the shock in either direction, positive or negative, in a self-serving manner.⁴³ Therefore the shock environment opens a moral wiggle room for sellers. Especially, overestimators may shift responsibility of failed expectations to the production shock. The shock gives sellers the possibility to avoid negative self-signals from failing in the task and to avoid updating their self-concept (Sackeim and Gur 1979). This way, the *Shock* might reduce moral costs of deviating from the promise.

Hypothesis II: a) *Sellers in the shock condition will breach the contract to a higher extent than sellers in the no shock condition.* b) *The effect of biased expectations on contract breach is stronger in the shock condition than in the no shock condition.*

⁴³ Recall that positive and negative shocks are equally likely.

3.5 Results

3.5.1 Descriptive Statistics

In this section, we will evaluate compliance behavior for subjects with different biased expectations in a descriptive way. First, we classify subjects based on their performance estimations. Therefore, Table 1 gives an overview of the percentage of subjects who overestimated, underestimated, or correctly estimated their performance. The presentation also conditions whether these subjects complied to or breached a contract.⁴⁴ Second, to demonstrate that the *Anchor* treatment raised guesses, we compare the means of the main variables of interest and present non-parametric test results.

We categorize sellers as correct estimators either if the guess equals exactly the performance or if the guess deviates 1 unit from the real performance. Sellers who overestimate themselves have a guess higher than the real performance and vice versa for sellers underestimating themselves. The majority of sellers, about 62%, overestimate their performance in the real-effort task whereas about 38% of the sellers correctly assess or underestimate their performance.

Table 1 Frequency of Estimation Types and Compliance Behavior

	underestimator		correct estimator		overestimator		Total ^a	Total ^b		
compliance ^a	17	(24.29%)	20	(24.69%)	33	(47.14%)	70	(37.63%)	70	(48.95%)
breach dummy 1 ^a	5	(4.95%)	20	(19.80%)	76	(75.25%)	101	(54.30%)		
breach dummy 2 ^b	5	(8.62%)	18	(31.03%)	35	(60.34%)			58	(40.56%)
over-fulfillment ^a	14	(93.33%)	0	(0.00%)	1	(6.67%)	15	(8.06%)	15	(10.49%)
Total							186	(100%)	143	(100%)

^a full sample ^b only fulfillable contracts

In total 228 out of 239 sellers made an offer to the buyer and 186 buyers accepted the offer. Some sellers offered more goods than they really produced. These contracts were by nature not “fulfillable”. In total, 143 contracts were fulfillable, meaning that the seller had an actual choice between compliance and non-compliance. We are especially interested in the fulfillable contracts and use only this reduced sample for all our analyses throughout the study. An overview of observation numbers across estimation types across the different stages of the investment game and also on treatments can be looked up in the Appendix in Table 6.

In Table 1 we summarize the frequency of contract compliance or breach for the three different estimation types. Generally, we see that among the fulfillable contracts almost half of the participants comply to the contract, whereas a share of 41% breaches the contract⁴⁵; a small fraction over-fulfills the contract, meaning that they sold more goods than actually promised to the buyer. Strikingly, overestimators breached the contract

⁴⁴ When focusing on contract breach, we distinguish our analysis between data of the whole sample (*breach dummy 1*) and data of fulfillable contracts (*breach dummy 2*).

⁴⁵ *Breach* is here defined as selling less goods to the buyer than offered.

significantly more often than underestimators among the fulfillable contracts (χ^2 -test, p-value 0.018).

Table 2 Means of main variables by treatment

	all	anchor	control	p-values
Baseline				
performance	8.80	8.82	9.22	0.116
guess	13.74	14.19	14.30	0.374
expectation bias I	4.94	5.38	5.08	0.810
Investment game				
performance	11.59	11.20	11.97	0.116
guess	14.38	15.27	13.50	0.017**
expectation bias II	2.79	4.07	1.53	0.000***
Contract offer & breach				
offer (relative to guess)	0.63	0.64	0.62	0.217
offer (absolute)	8.81	9.54	8.09	0.002***
breach 1	2.46	3.25	1.68	0.001***
breach 2	1.34	1.90	0.93	0.025**

*** $p < 0.01$, ** $p < 0.05$. The last column is obtained by running a Mann-Whitney test between *Anchor* and *Control*.

Now, we will turn from the classification of subjects to summary statistics on the means of performance and guesses in the baseline- and the investment-game stage. Moreover, we report the resulting mean offers and breach levels of sellers. To evaluate if our *Anchor* treatment raised guesses, we present a detailed overview of the means of the main variables by treatments in Table 2. We calculate the biased expectations as the difference between seller's performance guesses and their real performance. We distinguish between *expectation bias I*, that is before treatment exposure, and *expectation bias II*, that is after treatment exposure. Interestingly, in both treatments seller's biased expectations reduce between the first production task and the investment game. But the reduction is significantly smaller in the *Anchor* treatment.⁴⁶ Whereas *expectation bias I* is not significantly different between the two treatments (Mann-Whitney test, $p = 0.698$), *Anchor* leads to a substantially higher *expectation bias II* than the *Control* (Mann-Whitney test, $p < 0.001$).⁴⁷

The variable *breach* is defined as the difference between offered goods and sold goods, for the full sample (breach 1) and the reduced sample consisting of only fulfillable contracts (breach 2), respectively. The descriptive data suggest a strong correlation of overestimation and contract breach: Under *Anchor*, where *expectation bias II* is substantially higher, sellers sell on average about 1.9 goods less to the buyer than promised whereas in the *Control* treatment sellers shortchange only 0.9 goods within the reduced sample.

⁴⁶ We can only speculate why *Overestimation* reduces in a contract situation. Partly, the reduction can be assigned to a learning effect in the real-effort task, meaning that performance increased. However, as we did not give any performance feedback, we can rule out that sellers could better assess their real performance. Other than that, anticipated shame feelings might play a role: sellers might consider that the buyer learns about the real performance.

⁴⁷ This is also supported by differences in the distribution of estimation types across the treatments *Control* and *Anchor* ($\chi^2 = 16.860$, $p < 0.001$).

Sellers offer roughly 60% of their expected output and relative offers are similar across treatments. However, the absolute amount of seller's offers is about 10 goods in the *Anchor* treatment and 8 goods in the *Control* treatment. This difference is significantly different (Mann-Whitney test, $p=0.002$). As the Anchor drives up performance guesses and relative offers remain similar, it is not surprising that absolute amounts of goods offered are higher in the *Anchor* treatment.

Result I: *Among the contracts that are theoretically fulfillable an overall share of 49% of sellers complied to contracts. Among the sellers who breached the contract are mainly overestimators and among the sellers who over-fulfilled the contract are mainly underestimators. Sellers breach to a higher extent in the Anchor treatment as compared to the Control treatment.*

In the Appendix in Table 8 we present an overview of socio-economic characteristics and individual-level preferences across the three estimation types. There are not many differences apart from overestimators who are slightly older than correct estimators and underestimators and the share of students enrolled in an econ program is higher among overestimators. We will control for the variables for which we find differences and also for variables which might have independent effects on contract breach in the regressions in the next section. Moreover, we reduce the sample to the number of contracts that we call “fulfillable”, since we want to exclude automatic contract breach.⁴⁸

3.5.2 Estimation results

In this section, we first test our hypotheses on compliance behavior with regression analysis. As we will see, the seller’s offer seems to play a crucial role. Therefore, we add a brief paragraph on the determinants of the amount of seller’s goods.

Do biased expectations affect contract breach?

In a first step we analyze the relationship between expectation bias and contract breach graphically. Figure 2 illustrates that there is a positive correlation between expectation bias and contract breach: Sellers underestimating their performance hold biased expectations that are below the real payoff from the contract. These sellers range left from 0 on the x-axis. In contrast, sellers ranging right from 0 on the x-axis expected to earn more than they really did from the contract.

⁴⁸ Due to power outages in the field we have missing values for certain covariates. In order to keep the sample over different regressions constant we had to remove in total 14 observations of the 228 in which contracts were offered (resulting in 214 offers, 172 accepted contracts and 132 fulfillable contracts).

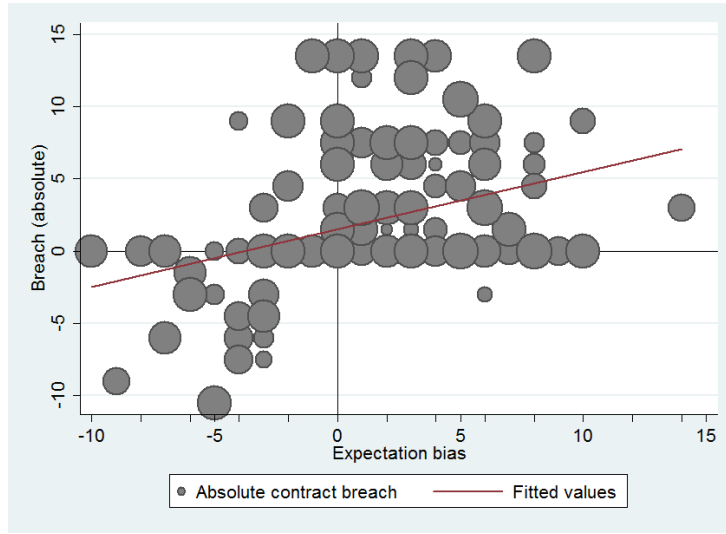


Figure 2 Effect of biased expectations on contract breach (N=143)

In Table 3 we present regression results for testing the effect from biased expectations on contract breach. We use OLS regressions for columns (1) and (3) and an IV approach for columns (2) and (4). In the following, we describe the model specifications we use.

The OLS Model is of the following form:

$$1 \quad Y_i = \beta_0 + \beta_1 X_i + \beta_2 P_i + \beta_3 S_i + \beta_4 C_i + \varepsilon_i,$$

where Y_i is the level of absolute contract breach measured by the difference between offered goods and sold goods. X_i is the level of *expectation bias II* and is measured by the difference between estimated performance and real performance; P_i is individual seller's performance;⁴⁹ S_i is a dummy for shock occurrence; C_i represents a vector of covariates at the individual level and ε_i represents the error term.

In the IV approach, we use the *Anchor* treatment as an instrumental variable for *expectation bias II*. We estimate a model with 2SLS regression, where equation (2) is the first-stage regression and equation (3) the second-stage regression.

$$2 \quad X_i = \pi_0 + \pi_1 T_i + \pi_2 P_i + \pi_3 S_i + \pi_4 C_i + \nu_i,$$

where T_i is the dummy for the *Anchor* treatment, and ν_i is an individual error term. Because T_i is uncorrelated with the error term ε_i we can isolate the part of X_i that is uncorrelated with ε_i and derive the predicted values \hat{X}_i . The second stage is the regression of interest in which we replace X_i by \hat{X}_i :

⁴⁹ We control for performance in all our regressions since sellers with very high performance cannot overestimate themselves as strongly as sellers with very low performance.

$$3 \quad Y_i = \beta_0 + \beta_1 X_i + \beta_2 P_i + \beta_3 F_i + \beta_4 S_i + \beta_5 C_i + \epsilon_i$$

Results from the first stage regression can be looked up in the Appendix where it can be seen that the *Anchor* treatment has a significant effect on *expectation bias II* (Table 7). All models presented in Table 3 show that *expectation bias II* has a significant positive effect on contract breach. That means, the more sellers overestimate their performance, the more they will breach the contract. The significant regression results clearly support the pattern observed in Figure 2.

The IV regressions (columns (2) and (4)) reveal that we do not have to deal with endogeneity.⁵⁰ As OLS regressions are more efficient, we will use OLS in subsequent regressions.

Result II: *With increasing expectation bias, sellers engage in non-compliant actions that mitigate the divergence between payoff expectations and real payoff; this is in line with predictions based on sellers with expectation-based reference-dependent preferences. The result does not stem from unobserved heterogeneity.*

Table 3 Biased Expectations and Contract Breach - OLS and IV Results

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Expectation bias II	0.297*** (0.057)	0.531** (0.253)	0.297*** (0.058)	0.427** (0.204)
Shock	0.165 (0.522)	0.076 (0.545)	0.100 (0.548)	0.046 (0.533)
Performance	0.163** (0.072)	0.196*** (0.074)	0.130 (0.083)	0.157** (0.079)
Constant	-1.145 (0.977)	-1.794* (1.057)	-0.003 (3.471)	-0.843 (3.733)
Observations	132	132	132	132
Adjusted R ²	0.157	0.054	0.170	0.138
Dep. var	breach	breach	breach	breach
Fstat		8.84		10.13
WuHausman		0.319		0.548
Covariates	No	No	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01, Robust standard errors in parentheses

Covariates: SVO, Share given in UG, risk seeking, loss aversion, dummy for female, Location dummy (Kumasi or Accra), Income per month (in GHS), age in years, dummy for enrolment in an economics program

⁵⁰ The Wu-Hausman test (tested for non-robust standard errors) reveals that we can reject the hypothesis that the variable *expectation bias II* is endogenous. When controlling for covariates, the instrument has an F-statistic above 10, indicating that we do not have a problem with weak instruments (Staiger and Stock 1997).

Does the effect of biased expectations stem from internalized losses?

We further want to examine whether the effect of expectation bias stems from reference-dependency and internalization of losses. According to our hypotheses we expect that biased expectations have an effect on contract breach if sellers overestimate themselves, i.e. subjective losses occur and if sellers are loss averse, i.e. try to avoid subjective losses. In order to test these assumptions we first split up the variable expectation bias in overestimation and underestimation, resulting in the following model:

$$4 \quad Y_i = \beta_0 + \beta_1 X_{i.o} + \beta_2 X_{i.u} + \beta_3 P_i + \beta_4 S_i + \beta_5 C_i + \epsilon_i,$$

where $X_{i.o}$ is seller's overestimation and $X_{i.u}$ seller's underestimation. Here, the variable overestimation takes up the value of zero if a seller under- or correctly estimates her performance and increasing positive values with increasing overestimation. Similarly, underestimation takes up the value of zero if sellers over- or correctly estimate their performance and increasing positive values with increasing underestimation.

The results of model (4) are displayed in column (1) in Table 4. Overestimation per se has here no significant effect on contract breach. Interestingly the variable underestimation is highly significant. This reflects, what has been found already in the descriptive statistics, namely that underestimators to a strong extent "overfulfill" contracts, leading to a negative effect on contract breach. We can speculate that apparently underestimation leads to an experienced win, which is shared with the buyer. None of the included covariates are significant except *Location*: Subjects in the city Kumasi breach less than in the capital Accra ($p=0.064$).⁵¹

⁵¹ There is no difference in the distribution of estimation types across cities, as illustrated in the appendix in Table 8.

Table 4 Overestimation and Loss Aversion

	(1)	(2)	(3)	(4)	(5)
	Pooled	Pooled	No shock	Shock	Shock
Overestimation	0.074 (0.100)	-0.125 (0.121)	0.119 (0.359)	-0.247* (0.136)	-0.269** (0.124)
Underestimation	-0.598*** (0.123)	-0.599*** (0.119)	-0.710*** (0.171)	-0.556*** (0.175)	-0.343* (0.160)
Loss Aversion	-0.119 (0.120)	-0.267** (0.132)	-0.253 (0.255)	-0.287 (0.175)	-0.265 (0.164)
Overest. x Loss Aversion		0.082* (0.044)	-0.009 (0.088)	0.183*** (0.065)	0.178*** (0.064)
Shock	0.017 (0.527)	0.131 (0.536)			
Performance	0.115 (0.078)	0.106 (0.080)	0.098 (0.127)	0.112 (0.118)	-0.106 (0.131)
Goods offered					0.368*** (0.094)
Constant	0.545 (3.306)	0.200 (3.416)	6.885 (4.958)	-5.996 (5.116)	-4.482 (4.883)
Observations	132	132	56	76	76
Adjusted R^2	0.215	0.225	0.204	0.256	0.326
Dep.Var.	breach	breach	breach	breach	breach
Covariates	Yes	Yes	Yes	Yes	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, Robust standard errors in parentheses

Covariates: Risk seeking, Female, Location, Income, Age, Econ-Dummy, SVO-Angle, Share given in UG

We include now an interaction term between loss aversion λ_i and overestimation $X_{i,o}$ in the previous model specification:

$$5 \quad Y_i = \beta_0 + \beta_1 X_{i,o} + \beta_2 X_{i,u} + \beta_3 \lambda_i + \beta_4 \lambda_i X_{i,o} + \beta_5 P_i + \beta_6 S_i + \beta_7 C_i + \epsilon_i,$$

where λ_i is a continuous variable from zero to 7, capturing the degree of loss aversion as explained in the design section. Results are presented in column (2) of Table 4. The variable underestimation is highly significant.⁵² As expected, we find now a significant effect of overestimation on contract breach, which is conditional on loss aversion, as indicated by the positive and significant coefficient of the interaction term between overestimation and loss aversion. This means that sellers with high overestimation and loss aversion are breaching contracts stronger than sellers with low overestimation or low loss aversion. The negative and significant coefficient of overestimation suggests that overestimators with very low levels of loss aversion are breaching contracts to a smaller extent than correct estimators, which is an unexpected result. However, this finding is not robust; the coefficient turns insignificant when using bootstrap method for estimating standard errors. This indicates that only a few particular observations were responsible for

⁵² As in the precedent Model (1), none of the included covariates are significant except *Location*: Subjects in the city Kumasi breach less than in the capital Accra ($p=0.048$).

the significance of the variable, while the coefficients of the other covariates are robust. Results for bootstrap estimations with 10000 repetitions for the regressions in Table 4 can be found in the appendix.

Does the occurrence of shocks facilitate contract breach?

Learning that a production shock affected their total output might give sellers an excuse for breaching and at the same time enables them to keep a good self-image. Recall that the shock can be negative or positive and sellers are not informed about the direction of the shock. In order to test this *Hypothesis II* we will run the precedent model shown in equation (5) disaggregated for the two different shock conditions. This way, we can test if the occurrence of production shocks amplifies the effects of biased expectations on contract breach.

The results are presented in Table 4 in column (3) and (4). We indeed find a very significant positive effect of overestimation among loss-averse sellers in a non-deterministic environment of a shock but not in the *No shock* condition. This supports the idea that in the *No shock* condition sellers might feel more accountable for their decisions compared to the *Shock* condition. As discussed earlier the shock can be interpreted in a self-serving manner: Overestimators may interpret the shock as negative in order to avoid updating their self-image. However, also the negative effect of underestimation on contract breach is reduced in the *Shock* condition as compared to the *No shock* condition. This indicates that also underestimators might interpret the shock as negative in order to make use of the moral wiggle room. None of the included covariates is significant in the two discussed models.

In general, when focusing at the frequency of breaching, 43.42% sellers breach the contract in the *Shock* condition whereas only 35.71% of sellers engage in breaching in the *No-shock* condition. However, this difference is not statistically significant ($\chi^2 = 0.797$, $p=0.372$).

Result III: *The effect of overestimation on contract breach is conditional on loss aversion and only holds in non-deterministic environments. The negative effect of underestimation on contract breach is stronger in deterministic environments compared to non-deterministic environments.*

3.6 Discussion and Robustness Checks

In this Section, we will discuss the evidence for expectation-based reference-dependent preferences in our experiment and present further evidence that suggests that payoff expectations serve indeed as reference points.

Sellers' loss aversion

We have shown that the effect of overestimation on contract breach is conditional on loss aversion. This result suggests that a deviation from payoff expectations, the alleged reference point, is perceived as a loss. The perception of a loss can only eventuate if sellers indeed compared their real payoff to the reference payoff. The fact that the results only hold for high loss aversion and overestimation and only hold in non-deterministic environments might be due to the strong promotion of contract compliance in our design. By allowing for reciprocity and letting the seller make the contract offer, which can be interpreted as giving a promise, moral costs of breaching might be particularly high. In addition, we used a strong framing in the experiment by stating that the seller "is supposed" to sell the amount of goods offered.

Sellers' offers

It can be found that the share of the expected output that is offered to the buyer is significantly correlated with SVO (corr=0.134, p=0.075) and the share given in the Ultimatum Game⁵³ (corr=0.184, p=0.013)⁵⁴. Therefore one can assume that the offers made by the sellers are not solely strategic, but also partly reflect social preferences. Since overestimators by definition have higher expectations about the total output, offers may end up being higher than intended, meaning that ex post the offer made does not satisfy social preferences of the seller anymore⁵⁵. Therefore, it is a legitimate argument that potentially the effect of overestimation on contract breach is driven by the amount of goods offered. A deviation from the amount offered could - under this reasoning - be regarded as an adjustment of the income distribution between buyer and seller according to the seller's social preferences. In order to show that the effect of overestimation on contract breach, which was illustrated in Column 4 of Table 4, is not only driven by the amount offered, we include the amount of offered goods as covariate in the regression. The results are shown in Column 5. Clearly, the amount offered has a positive effect on contract breach. However, it can be seen that the effect of overestimation on contract breach is robust. The positive effect of offered goods on contract breach can be interpreted on the one hand as a "contract renegotiation" based on the social preferences of sellers as discussed above. On the other hand it may also reflect strategic behavior, in the sense that sellers who offer very high amounts, are the ones who plan to breach the contract in the

⁵³ The amount given in that game may reflect both social preferences and strategic behavior

⁵⁴ N = 185 (all offers in reduced sample)

⁵⁵ Overestimators are offering significantly more goods than non-overestimators (under- and correct estimators) (t-stat= -7.9817, p<0.001). However, the share offered - relative to the expected output - does not significantly differ between the two groups (p=0.172).

first place. We cannot and do not intend to disentangle these mechanisms but rather want to emphasize that the effect of overestimation on contract breach is independent of the offers made ex ante, which further supports our idea of reference-dependency.

Sellers' income satisfaction

Another indicator for reference points could be the income satisfaction from the contract payoff. The seller might be less satisfied with the income if the payoff expectation is not met, that is when sellers overestimated themselves. We tested the effect of overestimation and seller's income on her income satisfaction stated at the end of the experimental session in the questionnaire.⁵⁶ Results are presented in Table 5.

Table 5 Sellers' income satisfaction

	(1)	(2)
Payoff	0.064*	0.085**
	(0.036)	(0.037)
Overestimation	0.444**	0.547**
	(0.214)	(0.223)
Underestimation	-0.102	0.294
	(0.072)	(0.381)
Payoff x Overest.	-0.027**	-0.032***
	(0.010)	(0.011)
Payoff x Underest.		-0.017
		(0.015)
Performance	-0.000	-0.003
	(0.083)	(0.084)
Shock	0.356	0.358
	(0.309)	(0.304)
Constant	3.356	3.172
	(2.047)	(2.037)
Observations	132	132
Adjusted R ²	0.141	0.145
Dep. Var.	satisfaction	satisfaction

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Robust Standard errors in parentheses

Covariates: Risk seeking, Female, Location, Income, Age, Econ-Dummy, SVO-Angle, Loss aversion, Share given in UG

Here, we see that with increasing overestimation, people become significantly less satisfied with their income from the contract. This is perfectly in line with predictions from theory. People evaluate their outcome in comparison to a reference point and are less satisfied with the same outcome if their expectation had exceeded the real payoff compared to a situation where expectations were correct or even below the real payoff. In column (2), we include an interaction term of *Income* and *Underestimation* in the model. Underestimation did not increase the effect of income on satisfaction.

⁵⁶ We asked sellers "How satisfied are you with your income?" They could grade their answer on a scale from 1 to 10 whereas 1 meant very low satisfaction and 10 very high satisfaction.

3.7 Conclusion

In this study, we analyzed the effect of expectation biases on compliance to contracts. Experimental evidence from a modified investment game with Ghanaian students support our idea that payoff expectations serve as a reference point and affect the decision to comply. We find that a large share of about 49% agents honor contracts if contracts are theoretically fulfillable. Among agents who breached contracts are mainly overestimators whereas among the agents who overfulfilled contracts are mainly underestimators. Regression results provide more detailed insights: We find that agents with high overestimation breach contracts to a higher extent. This effect is mediated by loss aversion and the occurrence of production shocks and holds when controlling for individual contract offers. These experimental results as well as the ex-post questionnaire statements strongly suggest that sellers' payoff expectations serve as reference points and ultimately trigger contract breach.

Opportunistic behavior in business relationships is a huge problem, especially in developing countries where formal contract enforcement mechanisms are absent. By showing that opportunistic behavior may be reference-dependent we can raise a number of important policy issues: (1) The result shows the importance of supporting people in learning to judge own abilities correctly especially in non-deterministic environments. In a different study we will examine to what extent feedback about prior performance can reduce expectation biases (Fischer and Grosch 2017). (2) Policies have to make sure to not raise unrealistic expectations. Many development projects aim at raising aspirations. Our results give justified concerns about whether these policies may backfire in fostering opportunistic behavior if expectations are not met. (3) Subjects seem to be very susceptible to exogenous triggers in forming own expectations. This is illustrated by the anchor treatment that we applied. A simple question in our case can already raise expectations strongly. Again, this illustrates the importance for development policies or also private investors to not evoke misjudgment of own abilities and may be of particular importance if unknown tasks have to be performed or environments are non-deterministic.

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3.9 Appendices

3.9.1 Tables and Figures

Table 6 Differences in distribution of estimation types

	underestimator	correct estimator	overestimator	Total
Treatments				
Control	36 (29.75%)	25 (20.66%)	60 (49.59%)	121 (50.63%)
Anchor	13 (11.02%)	18 (15.25%)	87 (73.73%)	118 (49.37%)
Total	49 (20.50%)	43 (17.99%)	147 (61.51%)	239 (100%)
Contracting				
offers (seller)	46 (20.18%)	41 (17.98%)	141 (61.84%)	228 (100%)
acceptances (buyer)	36 (19.35%)	40 (21.51%)	110 (59.14%)	186 (100%)
feasible contracts	36 (25.17%)	38 (26.57%)	69 (48.25%)	143 (100%)

Table 7 First stage results for Table 3

	(1) OLS	(2) 2SLS
Shock	0.472 (0.737)	0.517 (0.735)
Performance	-0.110 (0.092)	-0.167* (0.099)
Anchor	2.150*** (0.723)	2.352*** (0.739)
Constant	1.473 (1.386)	4.578 (6.270)
Observations	132	132
Adjusted R ²	0.053	0.060
Dep. var	abs. breach	abs. breach
Covariates	No	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors in parentheses

Covariates: Social Value Orientation, Share given in UG, Risk Seeking, Female, Location dummy (Kumasi or Accra), Income, Age, Econ-Dummy

Table 8 Differences in characteristics of estimation types

	All	under -estimator	correct estimator	over -estimator	p-value
Demographics					
Age ^a	21.33	21.84	21.73	21.04	0.005***
Female ^b (%)	28.45	32.65	20.93	29.25	0.729
Income ^c	307.79	229.39	236.75	354.86	0.193
Econ ^d (%)	26.54	18.37	23.26	34.01	0.027**
Location ^e (%)	35.38	36.73	48.84	36.05	0.327
Behavioral^f					
Alpha	0.47	0.28	0.19	0.39	0.144
Loss aversion	2.72	2.75	3.09	2.68	0.403
Risk seeking	3.22	3.02	3.00	3.33	0.192
Share given	3.84	3.88	3.81	3.82	0.862
Social value orientation	26.76	25.58	24.48	27.62	0.237

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Significance is tested for the difference between overestimators and non-overestimators (under- and correct estimators) with a χ^2 -test for categorical variables and with a two-sided t-test between for continuous variables.

Variable definitions (see instructions/ questionnaires for additional detail): ^aage in years, ^bproportion of females, ^cincome in GHS per month, ^dshare of participants enrolled in an econ program, ^eshare of participants from Kumasi ^fbehavioral variables that are explained in experimental design section.

Contract Breach and Loss Aversion (Estimation with bootstrap 10000 replications)

Table 9 Overestimation and Loss Aversion (Results with Bootstrap, 10000 repetitions)

	(1)	(2)	(3)	(4)	(5)
	Pooled	Pooled	No Shock	Shock	Shock
Overestimation	0.074 (0.104)	-0.125 (0.142)	0.119 (0.440)	-0.247 (0.168)	-0.26 (0.16)
Underestimation	-0.598*** (0.130)	-0.599*** (0.128)	-0.710*** (0.229)	-0.556*** (0.198)	-0.34 (0.19)
Loss Aversion	-0.119 (0.123)	-0.267* (0.139)	-0.253 (0.288)	-0.287 (0.200)	-0.26 (0.19)
Overest. x Loss aversion		0.082* (0.048)	-0.009 (0.112)	0.183** (0.072)	0.178 (0.07)
Shock	0.017 (0.533)	0.131 (0.541)			
Performance	0.115 (0.080)	0.106 (0.082)	0.098 (0.136)	0.112 (0.129)	-0.10 (0.14)
Offered goods					0.368* (0.11)
Constant	0.545 (3.482)	0.200 (3.592)	6.885 (5.676)	-5.996 (5.562)	-4.48 (5.47)
Observations	132	132	56	76	76
Adjusted R^2	0.215	0.225	0.204	0.256	0.326
Dep. Var.	breach	breach	breach	breach	breach
Covariates	Yes	Yes	Yes	Yes	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, Standard errors in parentheses

Covariates: Risk, Female, Location, Income, Age, Econ-Dummy, SVO-Angle, Share given in UG

3.9.2 Experimental Instructions

We would like to welcome you to today's session! We start when all participants are in the room. If all participants are seated, you will get a little introduction and further information on today's session.

Two short questions before we start...

1. Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people? Please answer on a scale from 1 to 10 whereas 1 means "need to be very careful" and 10 means "most people can be trusted". Please choose one number between 1 and 10. You may grade your answers with values in between.

2. Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair? Please answer on a scale from 1 to 10 whereas 1 means "people would try to take advantage" and 10 means "people would try to be fair". Please choose one number between 1 and 10. You may grade your answer with values in between.

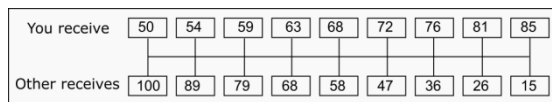
3.9.2.1 Section 1

Section 1 contains 4 subsections: 1A, 1B, 1C and 1D. We start with subsection 1A.

3.9.2.1.1 Section 1A: Social Value Orientation

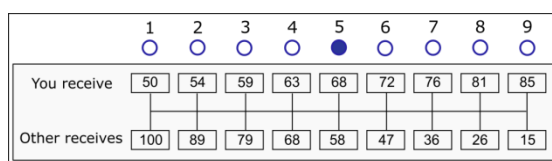
In this section, you will be paired with one other participant in the room. You will not learn who this other participant is and the participant you are matched with will not learn who you are. There are **two roles** in this activity: role A (in the following person A) and role B (in the following person B). Person A has to actively decide how to allocate coins between person B and himself/herself. Person B has to accept the preferred allocation by person A. All persons will actively decide in the role of person A - however, for which role (A or B) you will be paid will be randomly chosen by the computer. On the following page, we will explain the activity in further detail.

You will be presented a series of decision like this one:



Each of the middle lines determines how much person A and person B receives. Looking at the first middle line, person A (that is you if you are selected into this role) receives 50 coins and person B (that is the person you are matched with) receives 100 coins. As we move to the right, the payment for the person in role A increases to 54, 59 up to 85. The payment of participant B decreases from 100 to 15 at the same time. The task of the person in role A is to **decide on the preferred allocation** by choosing one of nine money allocations. The chosen distribution will determine the payments of the person in role A and the person in role B. Only one distribution can be marked in each question. On the next slide, we will give you an example of how such a decision can look like.

A person in role A decided for the coin-allocation you see here:



A participant in role A decided for allocation 5. If this decision set is chosen for payment, person A would receive 68 coins. The person he/she is matched with, would receive 58 coins. On the next page, we show you a second example.

A person in role A decided for the coin-allocation you see here:

	1	2	3	4	5	6	7	8	9
	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive	85	87	89	91	93	94	96	98	100
Other receives	15	19	24	28	33	37	41	46	50

A participant in role A decided for allocation 3. If this decision set is chosen for payment, person A would receive 89 coins. The person he/she is matched with, would receive 24 coins. On the next page, we will explain how the payoff will be calculated.

Payment: You will make decisions for six different decision sets. You make your decisions with "coins" whereas 1 coin = GHC 0.03. The computer will randomly decide for which role you are paid. The computer will randomly pick one of the decision sets for payment. You will only learn which decision set was drawn, for which role you are paid and how much you earned at the very end of today's workshop. We have finished the instructions for this subsection. Now, we move on to the control questions.

[...] Control questions [...]

Decision 1/6. Please decide your preferred money allocation!

	1	2	3	4	5	6	7	8	9
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive	85	85	85	85	85	85	85	85	85
Other receives	85	76	68	59	50	41	33	24	15

Decision 2/6. Please decide your preferred money allocation!

	1	2	3	4	5	6	7	8	9
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive	85	87	89	91	93	94	96	98	100
Other receives	15	19	24	28	33	37	41	46	50

Decision 3/6. Please decide your preferred money allocation!

	1	2	3	4	5	6	7	8	9
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive	50	54	59	63	68	72	76	81	85
Other receives	100	98	96	94	93	91	89	87	85

Decision 4/6. Please decide your preferred money allocation!

	1	2	3	4	5	6	7	8	9
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive	100	98	96	94	93	91	89	87	85
Other receives	50	54	59	63	68	72	76	81	85

Decision 5/6. Please decide your preferred money allocation!

	1	2	3	4	5	6	7	8	9
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive	100	94	88	81	75	69	63	56	50
Other receives	50	56	63	69	75	81	88	94	100

Decision 6/6. Please decide your preferred money allocation!

	1	2	3	4	5	6	7	8	9
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You receive	50	54	59	63	68	72	76	81	85
Other receives	100	89	79	68	58	47	36	26	15

You finished section 1A. We will now start with section 1B. We wait until all other participants have finished this subsection.

3.9.2.1.2 Section 1B: Inequality Aversion

We start now with the instructions for subsection 1B. In 1B, the computer will randomly pair you with one other participant in the room. You will not learn who this other participant is and the participant you are matched with will not learn who you are. In this section, the situation is as follows: Person 1 is matched with person 2. **Person 1 will receive GHC 8** and can decide how much of the GHC 8, he/she wants to **pass on to person 2**. Person 2 knows that person 1 has been called to make this decision, and may either accept the distribution chosen by person 1, or reject it. In case that person 2 accepts person 1's proposed distribution, that distribution will be implemented. If person 2 rejects the offer, both receive nothing. **You will have to make decisions as if you were person 1 and also as if you were person 2**. In the latter case, you will have to decide when you would accept or reject the distribution by person 1.

Payment: The computer will randomly chose if you will be paid for the role of person 1 or the role of person 2. If the computer **picks you to take up the role of person 1, there are two cases:**

- 1) Person 2 accepts your offer. Then your decision will be implemented: You earn GHC 8 minus the amount you pass on. (And Person 2 receives the amount you pass on).
- 2) Person 2 does not accept your offer. Then your decision will not be implemented. You and Person 2 both earn GHC 0.

If the computer **picks you to take up the role of person 2**, you will earn the payoff that person 1 (the participant in the role of Person 1 you are paired with) chose for person 2 but only if you had accepted that particular offer. Otherwise, you both earn nothing. You will only learn at the very end of today's session how much you earned in this activity. We will give you an example on decisions of a person 1 and a person 2 and the resulting payoffs on the following pages.

Person 1 is asked: How much of the GHC 8 would you pass on to person 2? It could be any amount between 0 and 8 but only full amounts (0, 1, 2, 3, 4, 5, 6, 7 or 8). **Decision of person 1: GHC 3**

Person 2 is asked at the same time: Person 1 received GHC 8. What is the minimum amount Person 2 has to offer you that you accepted the offer? **Decision of person 2: GHC 2**

Payment: Person 1 would pass on GHC 3. Person 2 only claims GHC 2 to accept the offer. Therefore this distribution will be implemented. Person 1 earns GHC 5 (GHC 8 - 3 = GHC 5). Person 2 earns GHC 3. We will give you one other example on the next page.

Person 1 is asked: How much of the GHC 8 would you pass on to person 2? It could be any amount between 0 and 8 but only full amounts (0, 1, 2, 3, 4, 5, 6, 7 or 8). **Decision of person 1: GHC 5**

Person 2 is asked at the same time: Person 1 received GHC 8. What is the minimum amount Person 2 has to offer you that you accepted the offer? **Decision of person 2: GHC 7**

Payment: Person 1 would pass on GHC 5. However, person 2 claims GHC 7 to accept the offer. Therefore this distribution will not be implemented. Person 1 earns GHC 0. Person 2 earns GHC 0.

[...] Control questions [...]

You finished reading the instructions and answered the control questions. You are now ready to make your final decisions. You will first make your decision in the role of person 1. Afterwards, you will make your decision in the role of person 2.

You are now making your decision for the role of person 1: How much of the GHC 8 would you pass on to person 2? It could be any amount between 0 and 8 but only full amounts (0, 1, 2, 3, 4, 5, 6, 7 or 8).

Your decision GHC: ...

You now make your decision for the role of person 2: What is the minimum amount Person 2 has to offer you that you accepted the offer?

Your decision GHC: ...

You finished section 1B. We will now start with section 1C. We wait until all other participants have finished this subsection.

3.9.2.1.3 Section 1C: Risk Preferences

In this subsection, we will offer you six different lotteries. These lotteries can have two outcomes: a high outcome (state A) or a low outcome (state B). It is randomly decided by a coin flip by the computer, which state will be realized. (Heads and tails are equally likely). You have to select one of the six lotteries. That should be the one that you prefer most. On the next page, we give you an example how the lotteries will look like.

Example I: In the table you see six different lotteries. Each row defines one lottery. There are two states A and B. If a participant decides for the first lottery, then he/she receives **GHC 2.5 for sure because the payoff is GHC 2.5 for heads and tails.**

Example II: If a participant **decides for lottery 4**, the coin flip will be relevant for the outcome: If the **coin shows heads**, the participant earns GHC 1.4. If the **coin shows tails**, the participant earns GHC 4.6.

Lottery	State A (coin shows heads)	State B (coin shows tails)	Select one Lottery
1	GHC 2.5	GHC 2.5	○
2	GHC 2.1	GHC 3.2	○
3	GHC 1.8	GHC 3.9	○
4	GHC 1.4	GHC 4.6	○
5	GHC 1.1	GHC 5.4	○
6	GHC 0.2	GHC 6.3	○

Payment: In this activity, you will only make one decision. The computer will randomly pick which state (A or B) will be realized in the lottery you picked. You will be paid for this decision for sure. You will only learn how much you earned at the very end of today's workshop. We have now finished the instructions for this subsection and will now check for your understanding with three control questions.

[...] Control questions [...]

As announced, you have six lotteries to choose from! Please choose now the lottery that you would like to play most of all six lotteries.

1 2 3 4 5 6

You finished section 1C. We will now start with section 1D. We wait until all other participants have finished this subsection.

3.9.2.1.4 Section 1D: Loss Aversion

In the following activity, you can again decide on if to play a lottery. However, this time you can choose more than one lottery that you would like to play. If you accept the lottery, **you can either win or lose money** . Whether you win or lose is decided randomly by a coin flip. **If you reject the lottery, you earn 0**. Please press next to see how such a lottery would look like.

Lottery	Accept	Reject
If the coin turns up heads, then you lose GHC 2; if the coin turns up tails, you win GHC 6	<input type="radio"/>	<input type="radio"/>

Above you see an example of a lottery. Left is described what you can lose if the coin turns up heads and what you can gain if the coin turns up tails. Right you can decide for acceptance or rejection of the lottery. In the example above, the participant has to decide if he/she wants to accept the lottery of winning GHC 6 if the coin turns up tails and lose GHC 2 if the coin turns up heads. If the participant decides to accept the lottery, the computer will toss a coin. If tails is up, the participant wins GHC 6. However, if the computer coin turns up heads, the earnings from the participant are reduced by GHC 2. If the participant decides to reject the lottery, the participant will earn 0.

Payment: You will make decisions for six different lotteries. The computer will randomly pick one of the lotteries for payment. If you accept a lottery, there will be a random "coin toss" by the computer. This coin toss is decisive for your earnings - if you gain something or lose something - in the lottery. You will only learn which lottery was drawn and how much you have earned or lost at the very end of today's workshop. If you lose money, it will be deducted from your total payoff in today's session. Of course, you will never end up with less than GHC 20 (your participation fee). **Please note that the lotteries will be ordered in the final decision. The amount that can be lost will increase while the amount that can be won is the same in all lotteries. Therefore, you can only switch once.** We have finished the instructions for this subsection. We now move on to the control questions.

[...] Control questions [...]

Please make your decision for each of the following lotteries now. **Please note that the lotteries will be ordered in the final decision. The amount that can be lost will increase while the amount that can be won is the same in all lotteries. Therefore, you can only switch once.**

Lottery

#1. If the coin turns up heads, then you lose GHC 1.5; if the coin turns up tails, you win GHC 9 **accept** **reject**

#2. If the coin turns up heads, then you lose GHC 3; if the coin turns up tails, you win GHC 9 **accept** **reject**

#3. If the coin turns up heads, then you lose GHC 4.5; if the coin turns up tails, you win GHC 9 **accept** **reject**

#4. If the coin turns up heads, then you lose GHC 6; if the coin turns up tails, you win GHC 9 **accept** **reject**

#5. If the coin turns up heads, then you lose GHC 7.5; if the coin turns up tails, you win GHC 9 **accept** **reject**

#6. If the coin turns up heads, then you lose GHC 9; if the coin turns up tails, you win GHC 9 **accept** **reject**

#7. If the coin turns up heads, then you lose GHC 10.5; if the coin turns up tails, you win GHC 9 **accept** **reject**

You finished section 1! We will now start with section 2. Please press the next button. Please press Next. We wait until all other participants have finished this subsection. Please be patient.

3.9.2.2 Section 2

All other participants have finished Section 1. Now we are ready to start with Section 2. Before we start, please answer the following question: Are you male or female?

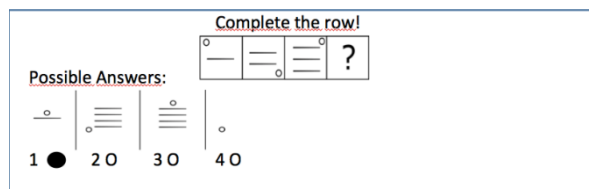
Section 2 consists of three different parts. The three parts are associated with each other. In Part 1 you are going to work on a production task in which you will solve puzzles. In Part 2 you will assess your own performance and the performance of others. In Part 3 you will perform the task with similar puzzles again. We will explain each part separately in detail one after another.

3.9.2.2.1 Section 2 Part 1

We start now with the instructions for Section 2 Part 1. In this part you will work on a production task, that is producing goods by solving puzzles. For each puzzle that will be solved correctly one good will be produced. You will be confronted with 25 puzzles in form of multiple choice questions. For each puzzle you will have 15 seconds time to choose the right answer. After 15 seconds the next question will appear automatically. It will not be possible to go back to previous questions.

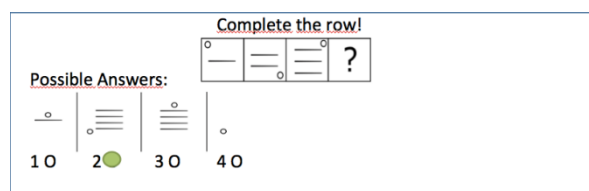
As a default always the first answer in every question is logged in automatically. If you do not make any entry the computer will keep answer 1. Please note that it is completely random which number belongs to the correct answer. Not choosing actively the right answer and always leaving the default answer logged in does not increase your chances of having correct answers. On the next page, we give you an example of how such a puzzle could look like.

In this task you will have to choose the symbol that fits into the pattern. Example (1):



There is only one correct answer for each question. Note that by default the first answer is logged in. Is that the right answer? Think about the right answer and check if you are right on the next page.

In this task you will have to choose the symbol that fits into the pattern. Example (2):



The correct answer is answer number 2.

You will earn GHC 0.20 for each correct answer. We have finished the instructions for Part 1. Now, we move on to the control questions.

[...] Control questions [...]

You finished the control questions! Now you are ready to produce goods!

3.9.2.2.2 Section 2 Part 1: Task 1

Complete the row!

[...] 25 Tasks [...]

You finished Section 2 Part 1! We will now start with Part 2.

3.9.2.2.3 Section 2 Part 2

We start now with the instructions for Part 2. In this part we will ask you questions about how you evaluate your own performance and also the performance of other people in the production task.

Payment: For each correct guess you can earn 5 Ghana Cedi. You will be informed at the end of the session about how much you earned in this part.

Estimate how many goods you have produced in the production task in Part 1! **Recall that you worked on 25 tasks in total.** If your estimation is correct you will earn GHC 5. What do you think, how many goods did you produce in Part 1?

I think I produced

...

goods.

Please give us your estimation on how many goods have been produced by men on average. If your estimation is correct you will earn GHC 5. What do you think, how many goods have been produced on average by other men in the room (excluding your own performance).

I think other men produced on average

...

goods.

Now we would like you to estimate how many goods have been produced by other participants in the room. Please give us your estimation on how many goods have been produced by the other female participants on average. If your estimation is correct you will earn GHC 5. What do you think, how many goods have been produced on average by other women in the room (excluding your own performance).

I think other women produced on average

...

goods.

We have finished Part 2 of Section 2.

3.9.2.2.4 Section 2 Part 3

We start now with the instructions of Part 3. Instructions for this part are a little bit longer than for the other activities. We explain the procedure therefore first only in words. Afterwards you will see illustrated instructions again. So do not worry if you do not get everything the first time. In this section, you will be paired with one other participant in the room. You will not learn who this other participant is and the participant you are matched with will not learn who you are.

The two persons who are matched with each other will be assigned different roles. One person will be selected to be a **buyer** and the other person will be selected to be a **seller**. The buyer receives an endowment of GHC 4. It will be random whether you will have the role of the buyer or the role of the seller.

The buyer and the seller will be able to earn money by trading with each other. The seller produces low value goods. Buyer and seller can decide to virtually sign a contract under which the buyer makes an investment that increases the value of the seller's goods and the seller delivers high value goods to the buyer. The steps of trading are explained in detail on the following pages:

3.9.2.2.5 Step 1: Production of goods (1)

The seller gets the opportunity to produce goods by answering 25 questions that are very similar to the ones in Part 1. For every correct answer a low value good will be generated. That means that if all 25 questions will be answered correctly, a maximum of 25 goods can be produced by the seller. The value of one low value good produced is GHC 0.20.

3.9.2.2.6 Step 1: Production of goods (2)

It is possible that a shock occurs and affects the production of the seller. If the shock occurs, the production of the seller can be affected positively or negatively. That means that some more goods

are generated or some less goods are generated by chance, independently from the performance of the seller.

3.9.2.2.7 Step 2: Decision of Seller

The seller can decide **to offer a contract to the buyer** on selling a certain quantity of goods to the buyer or **choose to sell the goods to an alternative market** for 0.20 GHC. The seller does not know yet the number of goods that he or she produced but will be asked to give an estimation about his production similar as in Part 2. If the seller does not offer a contract then the buyer keeps his endowment of GHC 4. If the seller decides to offer a contract she/he will choose the number of goods that she/he is willing to sell to the buyer. Only when the seller decides to offer a contract to the buyer, we continue with step 3.

3.9.2.2.8 Step 3: Decision of Buyer

The buyer can decide whether to accept or to reject the contract. If the buyer accepts the contract the endowment of GHC 4 will be invested in the seller's production. The investment of the buyer increases the value of the seller's goods. **The goods are transformed by the buyer's investment to high value goods.** If the buyer rejects the offer, the buyer keeps his endowment and the seller sells each good to the alternative market for 0.20 GHC.

3.9.2.2.9 Step 4: Selling goods (1)

After the contract has been made, the seller and the buyer will be informed about the amount of goods produced. Seller and Buyer also get the information on whether or not a random shock could have affected the production. In case there was a shock neither the seller nor the buyer will be informed about whether the shock was positive or negative.

3.9.2.2.10 Step 4: Selling goods (2)

The seller has two different opportunities for selling high value goods. High value goods can be sold to the buyer for GHC 1 per good. High value goods can also be sold to the alternative market for GHC 2.5 per good. The seller is supposed to sell the number of goods to the buyer, that has been agreed upon in the contract. The surplus in produced goods are not supposed to be sold to the buyer and can be sold to the alternative market.

3.9.2.2.11 Step 4: Selling goods (3)

The contract is not enforceable: The seller has the final decision on how many goods to sell to the buyer. The buyer earns GHC 1 for each good that the seller sells to him. The buyer does not earn anything for goods that are sold to the alternative market.

Please remember that in Part 1, you all engaged in a similar production task already. Please note that the buyers will be informed about the performance of the sellers during the test questions in Part 1.

We have finished the instructions for Part 3. Now, we move on to the control questions.

[...] Control questions [...]

You finished the control questions. You are now randomly matched with another person and randomly assigned by the computer to either the role of the buyer or the role of the seller.

3.9.2.2.12 Seller (before working on re-task)

You have been randomly selected to be a **seller**. You will stay a **seller** for the entire second part of this section.

3.9.2.2.13 Treatment: Exact Feedback

Before you start to produce goods we would like to inform you about the amount of goods you produced in Part 1.

Your performance in Part 1 was ... **goods** .

3.9.2.2.14 Treatment: Noisy Feedback

Before you start to produce goods we would like to inform you about how many goods you produced in Part 1. You will not learn the exact amount of produced goods but you receive a range in which your real performance lies in. It is equally likely that your real performance is on the lower end, somewhere in the middle or at the upper end of the range.

Your performance of Part 1 lies between ... **and ... goods**.

3.9.2.2.15 Re-task (all treatments)

You can now start to produce goods. Be reminded that the task consists of 25 puzzles and you will have 15 seconds for each puzzle. For every correct answer one low value good with a value of GHC 0.20 will be produced.

[...] 25 Tasks [...]

3.9.2.2.16 Buyer (before working on re-task)

You have been randomly selected to be a **Buyer**. You will stay a **Buyer** for the entire second part of this section.

Before you start to produce goods we would like to inform you about how many goods you produced in Part 1.

Your performance in Part 1 was ... **goods** .

The seller is now producing goods. In the meantime you have two different options, while you are waiting. You can

1. Do the task of Part 1 with similar puzzles again for yourself. You will get 1 candy if your performance is above 3 goods. OR

2. Do the task of Part 1 with similar puzzles again in a competition against another randomly selected player. You will compete against the performance of a randomly selected player in Part 1. If you win the competition you will earn 4 candies.

You will learn about how many candies you earned only at the very end of today's session.

Please decide what you want to do while the seller is producing goods. (The first option is logged in automatically. If you want to switch, please press the button for option 2.)

I want to do the task again for myself.

I want to do the task again and compete against another participant.

[...] 25 Tasks [...]

3.9.2.2.17 Seller (after re-task)

Time's up! Do you think you gave more than **20** correct answers?

Contract Compliance under Biased Expectations

Yes No

What do you think, how many correct answers did you give? I think my performance was

...

correct answers.

If your guess is correct you will earn GHC 5. How sure are you that your guess is correct? The more you move the slider to the right the more sure you are. The more you move the slider to the left the less sure you are.

Not Sure - - - — - - - Sure

Does the position of the slider represent how sure you are with your estimation?

Yes

If not, please adjust the ruler, so that it fits you.

You can now **decide to offer a contract to the buyer** or not to offer any contract and **sell your goods for GHC 0.20 per piece** to the alternative market. If you offer a contract: You will make a decision on the amount of produced goods you want to sell to the buyer for a price of GHC 1. If the buyer accepts the contract by making an investment the value of your goods will increase. According to the contract terms you will be supposed to sell the number of goods to the buyer that you have agreed upon.

You stated that you estimate that you produced ... goods. The buyer will only be informed about the amount of goods that you produced in the trial round in Part 1. Please remember that the value of your goods will only increase if the buyer agrees to make an investment. Therefore, think carefully about your offer.

Calculate Profits

With this tool you can calculate the expected profit from the contract depending on your expected performance and your offer. You can change your entry as often as you want. You can also see your profit and the buyers profit.

My expected performance is ... goods

I offer ... goods to the buyer.

Your income from selling to the buyer: GHC ...

Your income from selling to outside option: GHC ...

Your total income: GHC ...

The buyers' total income: GHC ...

Your expected performance is ... goods. **Will you offer the buyer a contract?**

Yes No

Your expected performance is ... goods. **How many goods do you want to offer?**

...

Waiting for other participant.

Offer accepted

The buyer decided to accept your contract and made the investment. Your goods are now transformed to high value goods.

3.9.2.2.18 No Shock Treatment

Your production has **not** been affected by a shock.

You produced ... **goods**.

The buyer has been informed about the number of goods that you produced and that your production has not been affected by a random shock. The buyer also knows your performance in Part 1.

Contract Overview

Your expected performance was ... **goods** . You produced ... **goods**. According to the contract you are supposed to sell ... **goods** to the buyer. According to your expected performance and the contract that you signed your expected payoff was ... **GHC** . If you stuck to the contract you and the buyer would earn the payoffs written below:

Please note that if your number of produced goods is not enough in order to fulfill the contract this overview assumes that you sell all produced goods to the buyer and nothing to the alternative market.

Your income from selling to the buyer: GHC ...

Your income from selling to outside option: GHC ...

Your total income: GHC ...

The buyers' total income: GHC ...

Your expected performance was ... **goods** . You produced ... **goods**. According to the contract you are supposed to sell ... **goods** to the buyer. According to your expected performance and the contract that you signed your expected payoff was ... **GHC**.

Please make now your final decision on how much you want to sell to the buyer. You can see your profit and the buyer's profit depending on your decision. You can **try out scenarios in the upper part** of the page. You **make your final decision on the bottom** of the page.

Please note that you can't sell more than the maximum amount of produced goods.

I sell ... goods to the buyer.

Your income from selling to the buyer: GHC ...

Your income from selling to outside option: GHC ...

Your total income: GHC ...

The buyers' total income: GHC ...

How much do you want to sell to the buyer?

...

You sold ... **goods** to the buyer. Your income from the contract is GHC...

3.9.2.2.19 Shock Treatment

Your production has been affected by a shock.

The shock could have been positive or negative. That means that the number of goods you produced was either increased by two or decreased by two. Your final output is ... **goods**.

The buyer has been informed about the number of goods that you produced and that your production has been affected by a random shock. The buyer also knows your performance in Part 1.

Contract Overview

Your expected performance was ... **goods** . You produced ... **goods**. According to the contract you are supposed to sell ... **goods** to the buyer. According to your expected performance and the contract that you signed your expected payoff was ... **GHC** . If you stuck to the contract you and the buyer would earn the payoffs written below:

Please note that if your number of produced goods is not enough in order to fulfill the contract this overview assumes that you sell all produced goods to the buyer and nothing to the alternative market.

Your income from selling to the buyer: GHC ...

Your income from selling to outside option: GHC ...

Your total income: GHC ...

The buyers' total income: GHC ...

Your expected performance was ... **goods** . You produced ... **goods**. According to the contract you are supposed to sell ... **goods** to the buyer. According to your expected performance and the contract that you signed your expected payoff was ... **GHC**.

Please make now your final decision on how much you want to sell to the buyer. You can see your profit and the buyer's profit depending on your decision. You can **try out scenarios in the upper part** of the page. You **make your final decision on the bottom** of the page.

Please note that you can't sell more than the maximum amount of produced goods.

I sell ... goods to the buyer.

Your income from selling to the buyer: GHC ...

Your income from selling to outside option: GHC ...

Your total income: GHC ...

The buyers' total income: GHC ...

How much do you want to sell to the buyer?

...

You sold ... **goods** to the buyer. Your income from the contract is GHC...

You finished section 2! Before you proceed to the questionnaire, we want to give you an extra payment for answering the questionnaire. For that, we do a short activity with dice. There will be two questions and one of these questions will be randomly chosen for payment at the end of today's session. We will now distribute dice and cups.

3.9.2.2.20 Buyer (after re-task)

The seller produced in the trial round in Part 1 ... **goods**. Now you have been offered ... **goods**. **Do you want to accept the contract?**

Yes No

Waiting for the other participant.

3.9.2.2.21 No Shock Treatment

The seller's production has not been affected by a shock.

The Seller's output is ... **goods**.

3.9.2.2.22 Shock Treatment

The seller's production has been affected by a shock.

The shock could have been positive or negative. That means that the number of goods the seller produced was either increased by two or decreased by two. The Seller's final output is ... **goods**.

The seller sold ... **goods** to you. Your income from the contract is GHC...

4 General Conclusion

4.1 Contract Farming from a behavioral perspective - What have we learned?

This dissertation aimed at pointing out some behavioral issues related to contract farming. In chapter 2 it was shown that behavioral preferences are associated to differences in preferences for contract design. Chapter 3 pointed out reference-dependent preferences may affect contract compliance.

Institutional environments are often informal in developing countries and third-party enforcement is very limited. In order to facilitate stable long-term relationships via contract farming, it is necessary to rely on self-enforcing, relational contracts. Relational contracts are enforced by the threat of losing future benefits from a contract. Therefore contracts must be designed in a way that maintaining the relationship holds a larger value than breaching the contract. Under this consideration it becomes clear that it is necessary to understand the preferences of farmers for contracts, in order to design contracts that fulfill this criterion. This is particularly important if many outside options for farmers exist since under high competition coordination breaks down through contract breach by farmers (Swinnen and Vandeplass 2011). This is partly happening in the Ghanaian Pineapple Sector where processing companies are competing for products and vertical integration is limited due to land scarcity. Under these conditions high price premiums are necessary. However, from a behavioral perspective the utility of the contract is not only determined by monetary incentives but also by other aspects.

In chapter 2 we show that farmers are willing to trade off price against other attributes. In particular we find that risk-sharing, transparency, early agreements and immediate payment play a crucial role for contract choice. These attributes may reduce opportunity costs for farmers. But more interestingly, we find that preferences for these contract characteristics are partly related to behavioral preferences. Trust, risk aversion and time preferences change the willingness to pay for these attributes and are therefore economically meaningful. We found high heterogeneity in contract preferences and could identify two distinct market segments with different preferences for contracts. On the one hand there is a segment of about 58% of farmers who have relatively high preferences for risk-sharing and immediate payoff, whereas transparency is not important for this group. On the other hand we identified a market segment of about 42 % of farmers who evaluate transparency as the most important contract attribute. We find that trust levels significantly affect the probability for a farmer to be in one of the particular groups. Our findings illustrate that the behavioral perspective in studying farming contracts is relevant. Considering the discussion above companies might gain market share if they diversified their contract offers in order to be attractive for farmers from both market segments.

Another important behavioral insight that might be relevant for contract farming, but also for other domains, is that preferences for contract compliance are reference-dependent. In Chapter 3 it could be clearly shown that contract compliance depends partly on whether contract outcomes are in line with expected outcomes, everything else being equal. If sellers overestimate their performance and therefore their payoffs they experience

subjective losses. If at the same time the sellers are loss averse, contract breach is used to mitigate the virtual loss that results from the difference between expected and actual outcome.

Strikingly, these results could only be found in non-deterministic environments. We argue that the incidence of production shocks opens a moral wiggle-room that facilitates breaching behavior, while in deterministic environments individuals don't have the possibility to shift responsibility for outcomes to exogenous events. Therefore moral costs for breaching are higher in deterministic environments. Since farming is a domain in which exogenous production shocks are frequent by nature, the results are particularly relevant for this domain.

It should be also emphasized that a very large portion of individuals in this study complied with their contract although there were no extrinsic incentives to do so. This result illustrates once again that individuals have preferences for fairness and reciprocity. The design that was used in this study allows sellers to self-select into their desired contract and therefore ensures that sellers could choose a contract that is in line with their preferences. This might be one reason for the high share of contract compliance observed and reinforces the motivation and results of Chapter 2. Analyzing the preferences of farmers and designing contracts that are in line with those preferences may contribute to contract compliance. Furthermore, a diversification in contract offers which gives the farmers the possibility to self-select into desired contracts according to their preferences may not only increase market shares for companies but may also increase farmers' perceived procedural fairness and therefore strengthen contract compliance.

The research question that we studied in Chapter 3 is of a particular interest for the area of contract farming in developing countries. Feedback and Book-keeping systems are widely absent. This may lead to wrong expectations about benefits that can be derived from contract farming. If farmers' real benefits are lower than expected, farmers may breach contracts out of disappointment. Recent studies show that farmers have preference for mandatory book keeping (Meemken, Veetil, and Qaim 2016). The authors argue that farmers realize the benefits that are associated to this kind of information system. Keeping track about own productivity is crucial for forming correct expectations about benefits. The issue is equally relevant when farmers are engaging in new, unknown tasks, like novel production technologies, which often goes along with contract farming. In the third chapter we showed that individuals overestimate their performance strongly in tasks in which they have no experience and that individuals are very susceptible to external triggers, like a simple question that includes an anchor. The behavioral literature also shows that people are overestimating their performance *ex ante*, before having even conducted the task (e.g. Grossman and Owens 2012). All this indicates that policies that aim at integrating farmers into value chains with novel production techniques via contract farming have to be very considerate not to raise unrealistic expectations when promoting market outlets or production techniques. Policies that help shaping accurate information about performance and benefits is key to avoid disappointment and opportunistic behaviour that may result

from it. Especially policies that are targeted to raise aspirations among farmers should be careful in not evoking unrealistic expectations (e.g. Janzen et al).

It should be noted that information policies of this kind are not only of crucial importance to avoid disappointment, but also in order to avoid mechanical contract breach. Our study showed that 23 % of all accepted contracts were involuntarily breached, by exorbitant contract offers that were technically not able to be fulfilled. Although these results do not have any external validity, it is likely that automatic contract breach of this kind is frequently happening and is leading to welfare losses.

To conclude, it is important to take the behavioral perspective into account when making policies related to contract farming. We now want to put the research findings into a broader developmental and cultural perspective.

4.2 The broader picture: Putting the research findings in developmental and cultural perspective

This dissertation started out with a broad picture on economic development and informal and formal institutions. Contract farming can be understood as a formal institutional arrangement which faces challenges in developing countries due to a weak formal institutional environment. It was argued that the introduction of informal or formal contracts into the economic system requires also the development of enforcement institutions that go beyond social norms.

However, there is no clear shift from informal to formal institutions. Traditional norms may persist when formal institutions are already in place. Even though formal institutions develop, economic exchange is still embedded in social interactions (Granovetter 1985). Fafchamps (2016) argues that formal institutions are supposed to reinforce social norms and ensure that informal institutions work efficiently. He argues that in order to understand market development one needs to study primarily informal institutions, like societal norms. Societal norms are a form of collective preferences. There is empirical evidence that individual preferences may reflect social norms (Tucker 2012). It is therefore necessary to study preferences on the individual level to understand the norms of a society.

The results of this dissertation can be regarded in this light: Chapter 3 shows that individuals have strong preferences for contract compliance. This may reflect the social norms that are prevalent in the society and illustrates the importance of informal aspects of the institutional environment. Social norms and preferences may differ between cultures and ethnicities even within countries (e.g. Tucker 2012). The finding that individuals in Kumasi, the centre of the Ashanti ethnicity in Ghana, are breaching contracts to a higher extent than individuals in the capital Accra, which is dominated by the Ga ethnicity, could potentially also be interpreted from this perspective.

Understanding preferences and social norms also requires an understanding of their formation and development. There is evidence that preferences might be path-dependent. For example Wuepper and Sauer (2016) argue that the success of contract farming depends on social capital, which is significantly lower in areas where Christian missionaries had established missionary schools in the 19th century. This might also further explain the generally low trust levels that we found in chapter 2 and the difference between the two market segments that differ in trust levels.

Changes in the institutional environment, i.e. a formalization of institutions may also go along with changes in norms and preferences (Inglehart and Baker 2000). For example participation in formal markets may lower inter-personal trust (Siziba and Bulte 2012). Future research should take into account intergenerational data in order to further analyze the relationship between formal market exchange, particularly contract farming, and the evolvement of individual preferences and hence societal norms.

On the other hand, as mentioned before, there are many traditional norms and values that persist when countries develop (Inglehart and Baker 2000). The strong demand for risk-sharing that we found in chapter 2 and that is consistent with findings from many other studies might be symptomatic of an incomplete institutional change. For example formal contracts are introduced that impose clear obligations on parties, but formal risk-insurances in case the obligations cannot be or are difficult to fulfil are oftentimes not available. Traditional norms of risk-sharing that might govern exchange between family members might still be considered as relevant within formal contract relationships under these conditions. For example individuals might consider it as fair to share risks and losses with a contract partner, even though this is not foreseen in the contract. The results in chapter 3 could also be regarded from this perspective. If sellers face losses in a risky environment they might consider it as fair to share the losses with the buyer and therefore breach the contract.

4.3 Limitations and scope for future research

One of the major limitations for deriving policy recommendations for contract farming is that the research conducted usually only takes into account the farmer perspective. More information on firm perspectives is needed. For example we analysed farmers' willingness to pay for certain contract attributes. But we do not have information on the costs to offer and implement these attributes from the firm side. This makes it difficult to give concrete policy implications. This is a symptomatic problem in the research on contract farming that has been pointed out before (e.g. Abebe et al. (2013) recommend research on contract choice for firms), but practically access to data from companies is difficult. Another point from the contract compliance side is that empirical data on contract breach is not available. Collaborations with firms in order to receive information on costs, firm strategies and contract breaches would be of crucial importance. However, the limited interest of companies in cooperation might stem from different factors: Probably firms are breaching

contracts with farmers themselves which has often been reported by farmers (e.g. Bellemare 2012). Another reason might be that companies have low expectations towards the policy relevance of research projects. However, linking researchers with companies is an important challenge that has to be targeted.

Also from a behavioral perspective there is scope for further research: First, future research could potentially also focus on other behavioral drivers that might be relevant for contract farming. Chapter 3 has pointed out that loss aversion plays an important role for contract compliance. It could be interesting to analyse also its effects on contract choice. If markets are volatile, loss averse farmers might prefer stable incomes and therefore choose contracts with fixed, rather than variable prices. Second, research should focus on the trade-off between aspirations and disappointment, when aiming at integration of farmers into markets and businesses. Third, in our study we used an anchor that raised expectations of individuals and we could observe an increase in opportunistic behaviour in contract relationships. It would be interesting for future research to examine how a low anchor or actual feedback could alter expectations about future benefits and if opportunistic behaviour could be reduced by these policies. Fourth, we examined the influence of biased expectations on contract breach in situations where third-party enforcement is completely absent and contract compliance only depends on individual-level preferences. It would also be interesting to analyze whether biased expectations lead to more contract breach in cases where third-party enforcement is possible but imperfect. Imagine a situation in which contract breach would lead to third-party punishment, but in which contract breach cannot be detected perfectly. Potentially, the desire to mitigate subjective losses, that we found evidence for, might even dominate the fear of punishment and increase opportunistic behavior.

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