Transaction risks and trust: A tale of two regions
Sesame markets in Ethiopia

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June 7th , 2009

Presented at the 13th Annual Conference of The International Society for New Institutional Economics

University of California at Berkeley, Walter A. Haas School of Business, USA, June 18-20, 2009.

Abstract

Markets play an important role in Africa. Studies of the actual performance of markets in Africa have found that institutional arrangements and transaction costs shape patterns of trade and partly determine the extent to which allocative efficiency is achieved. Yet we know little about how markets operate in practice. The problems African market institutions attempt to solve are the usual ones – commitment failure, asymmetric information, and transaction risks and costs – but the solutions are often are new. The paper develops a framework to identify how transaction risks lead to transaction costs and it builds on literature on trust and risk to identify how these concepts are related and can be identified in trader relationships in Ethiopia. The paper uses a database of farmers, intermediate traders and wholesalers in two sesame producing regions of Ethiopia. The results give an insight into which risks buyers and sellers face, how they lead to transaction costs and what mechanisms are employed by buyers and sellers to reduce these risks and costs. An interesting result is that it seems that geography leads to different production circumstances, risk, specialisation and therefore different trust relations between farmers and traders, leading to different transaction costs.

1. Introduction

This paper studies the mechanisms that facilitate (honest) trade, also termed the governance (mechanisms) of trade or exchange (Aoki, 2001), or institutional arrangements. To understand the role and complexity of institutional arrangements, two dimensions are important: (i) coordination, linked to information and (ii) enforcement (Gabre-Madhin, 2006; Aoki, 2001).

Information is at the heart of coordination[1]. The transmission of information on prices, quantities supplied, quantities demanded, actors and their actions, product quality and attributes, and processes are key to market coordination. An important body of economic literature has focused on the problems of imperfect, asymmetric, or incomplete information, which in turn lead to decision-making with "bounded rationality" (Simon, 1982), missing markets and risk (Stiglitz, 1982; Akerlof,1970), and high transaction costs (Williamson, 1981). Thus coordination is linked to the transaction costs that are involved in gathering the necessary information (e.g. search, negotiation, monitoring).

The second dimension focuses on how interactions in the market, embodied in contracts, are enforced? What are the informal and formal rules that define interaction? How are the rules enforced? What is the role of trust, community norms, morality, and social capital in enforcement? What is the motivation, or incentive-compatibility, of enforcement? What is the impact of breakdown or limitations in enforcement mechanisms on markets?

As in many African countries, the institutional environment in Ethiopia is weak in terms of providing information and enforcing contracts. This means that market participants must devise mechanisms to overcome problems related to information (coordination) and enforcement. In this paper, we use the term "transaction risks" to denote these problems. Market agents must balance costs related to market risk with costs related to overcoming these transaction risks (i.e. transaction costs).

In the absence of suitable mechanisms to deter cheating, exchange can only take a rudimentary form, which Fafchamps (2004) has called a flea market economy, which consists of a cash-and-carry form of exchange: goods are inspected on the spot and delivery takes place against instant payment in cash. Cash-and-carry transactions require little trust but only allow very limited forms of exchange. They are the least developed form of market institution. Basically, this is a situation where there is only a minimum of institutions. We use the definition by Aoki (2001) of institutions: "*a self-sustaining systems of shared beliefs about a salient way in which the game is repeatedly played*." The way in which the game is repeatedly played can be identified as the rules of the game, which are endogenously created through the strategic interaction of agents, held in the minds of agents, and thus self-sustaining. The content of the shared beliefs is a summary representation of an equilibrium of the game.

A flea market thus has a minimum of rules, because the probability of breach of rules is deemed too high (i.e. transaction risks are too high). Only a basic form of exchange is possible. A main feature of such basic exchange is that there is no time between the quid and the quo (Greif, 2005). In many markets time is inherent to the nature of the transaction itself since, by definition, one party fulfils its obligation before the other. Time also enters sales transaction in many ways, e.g. order, warranty, invoicing, payment by check or credit card. The capacity to enter in contracts with delayed obligations is thus an essential condition for a good business environment. Trust becomes more essential

[1] . In order to better understand how an "institution" can coordinate, Hurwicz (1987) suggested that an institution is conceptualized as the information mechanism that coordinates the actions of different agents (Ménard, .

when the contract implies the passage of time (Fafchamps, 2006). By contrast, cash-and-carry forms of exchange have no delayed obligation and hence require little trust.

Much recent literature in NIE has been dedicated to explain or model the role of trust in contracts with delayed obligations (Aoki, 2001; Fafchamps, 2004, 2006; Greif, 2006). Simply put, in order to trust a trading partners, there must be a belief that the other person has adequate incentives to behave in a trustworthy manner. Such incentives include guilt, enforcement mechanisms (e.g. punishment which can take many forms) or a quid pro quo strategy, which has been described in repeated game theory. If the other trading partner does not comply, the first trading partner retaliates by also not complying. It is the threat of retaliation that induces compliance with contractual obligations. However, for such mechanisms to work, parties must interact repeatedly over time and know each other. This strategy can be implemented between two parties, but may also involve group punishment. Group punishment requires a coordination mechanism and the circulation of information about contractual breach. Reputation is this coordination and information sharing device (Fafchamps, 2006).

However, a situation with many buyers and sellers who trade only a few times a year represents a one-off Prisoner's dilemma, with traders finding themselves in the Nash equilibrium in which they both breach the contract. Incentives such as guilt, enforcement mechanisms or quid-pro-quo are no longer useful. Enforcement mechanisms or quid-pro-quo strategies require at least repeated exchange between the same buyers and sellers, future benefits from trade are not discounted too heavily and that a one-time gain from cheating is not too large. However, if traders randomly change their trading partners every week, reputation mechanisms (news spreading very quickly about the rogue trader) can lead to no trade with cheating traders, which will give the same result. This makes clear a generic information requirement for this mechanism. Aoki (2001) notes that there will always be tension between the assumption of random matching (impersonal exchange) and that of perfect information dissemination.

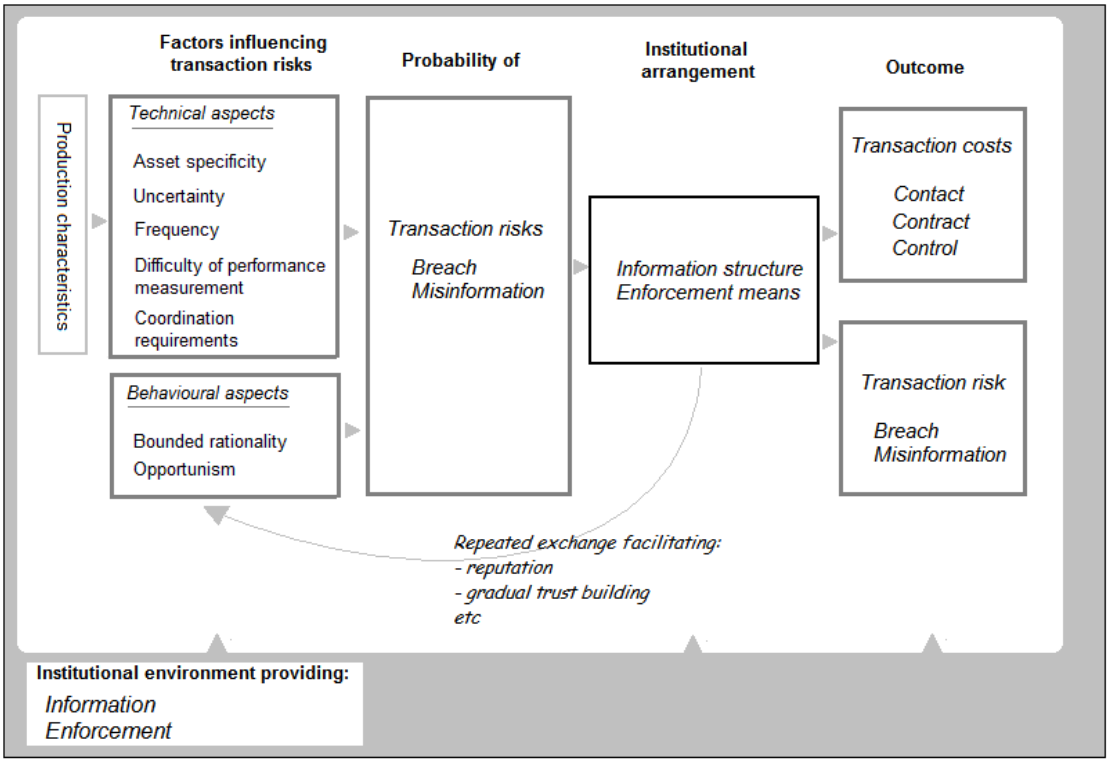
However, Ghosh & Ray (1996) discuss cooperation possibilities in community interaction when information flows are absent. Although cooperation possibilities seem very restricted in this situation, they identify a pair of fairly plausible conditions under which cooperative behaviour may be expected. First, matching is not completely random, players having the *option* of continuing to play old opponents. Second, the population is non-homogeneous, while some players have a stake in the future, there is a fraction of players who are myopic and therefore prone to playing short-run best responses (which often are equal to cheating or breaching a contract). An equilibrium is possible in which patient players are seen to offer an "experimental" level of cooperation to newly met opponents, reciprocation of which serves as a signal that the opponent in non-myopic. Pairs of non-myopic players go on to form long-term relationships once they have successfully revealed their types to each other through such experimental cooperation. The equilibrium is characterized by the phenomenon of "gradual trust-building"– any long term relationship involves a low, initial level of cooperation (when players are uncertain about the other's type), which increases to a higher level when the initial phase is successfully passed without termination of the relationship.

The sesame trade in Ethiopia at the level of trade between farmers and traders can be characterised as a low trust equilibrium with almost no long-term personal relationships. In this paper we will analyze what factors explain this equilibrium, as well as what factors may lead to increased trust, potential long-term relationships and the role of information, that are described in the literature which facilitate extended forms of trade. To do this, we will first introduce a conceptual framework that disentangles the concepts transaction costs, transaction risks, trust and institutions (institutional arrangements and institutional environment). We think this is important because there if often some confusion about the exact definition, delineation and role of these concepts.

2. Conceptual framework: clarifying concepts transaction costs, transaction risks, trust and institutions

Figure 1 depicts the conceptual framework and how the different elements are related.

Figure 1: Relation between transaction risks, transaction costs, and institutions.



NB: transaction is unit of analysis

The framework takes the transaction as unit of analysis (following Williamson, 2005). It therefore focuses on comparable transactions of specific agricultural goods that are being

traded in a specific location. The aim is to understand the transaction risks that are particular to these transactions and how these lead to transaction costs. The framework does not predict which type of institutional arrangements will be used by the transactors, as these may differ widely (Aoki, 2001). However, the framework does help to understand the purpose of the institutional arrangement in reducing transaction costs.

Institutions: institutional arrangements and environment

We will start in the centre and focus on the institutional arrangement. First a quick overview and definition of institutions. The seminal work by North (1990) on institutions has been further developed and elaborated by Aoki (2001) and Greif (2005). North (1990) defined institutions as the rules of the game in a society. These may be formal (constitutions, regulations) or informal (social norms, conventions and moral codes). However, this is quite a broad definition and Aoki suggests that the definition of an institution depends on the purpose of the analysis. He does provide a tentative definition, which is more precise: "a self-sustaining system of shared beliefs about a salient way in which the game is repeatedly played." The way a game is repeatedly played can be identified as the rules of the game. However, these rules are not exogenously given or conditioned only by polity or culture, but endogenously created through the strategic interactions of agents, held in the minds of agents, and thus self-sustaining. The content of the shared beliefs is a *summary representation (compressed information) of an equilibrium* of the game. We will revisit this later.

We can discern two categories of institutions:

1. *Institutional arrangement* which refers to a set of rules or agreements governing the activities of a specific group of people pursuing a certain objective.

Institutional environment which consists of the broader socio-economic framework within which different institutional arrangements take place, such as market transactions (agreements to exchange goods and services), or organizations (formal groups involving individuals working towards a common purpose).

For the purpose of this paper, we assume institutional arrangements to be endogenous and the institutional environmental as exogenously given. One may envisage one end of an extreme situation, in which there are hardly any institutions, formal or informal. Opportunism in this case is unchecked. Traders have incentives to cheat (give wrong information on prices, weight, market situation etc). Transaction risks are high for farmers in this case. In many countries the institutional environment is underdeveloped: market information systems are missing or incomplete, measures and standards are missing, conflict resolution mechanisms (such as the police, court systems) are inefficient. In such situations, formal institutions (or the institutional environment) that reduce transaction risks can be assumed to be missing or incomplete. This conceptual framework does not include an in-depth analysis of these formal institutions (include references), and they are assumed to be exogenous and not to have a great impact on reducing opportunism in certain cases (such as in Ethiopia). Informal institutions, such as norms and values may also reduce opportunism. Again, this framework does not include an in-depth analysis of such informal institutions, they are assumed to be exogenous.

Outcome: Transaction risks and transaction costs

Dorward and Kydd (2004) propose that the purpose of institutional arrangements is not to minimise transaction costs as such but to minimise transaction risks. For various reasons, parties in an exchange face risks that individual transactions will fail, with the loss of any investments in that transaction. They may therefore need to incur costs to protect themselves against such transaction failure. Dorward and Kydd (*ibid*) view transaction costs as necessary investments. We adopt this view in this paper and elaborate on this. Our focus is thus not on reducing transaction costs but on reducing transaction risks and finding the most appropriate institutional arrangement that will reduce these risks. However, reducing transaction risks are linked to transaction costs and there is a trade-off between them. One might be able to reduce transaction risks to a minimum by expending transaction costs, e.g. by obtaining a lot of information about trading partners that will minimize the risk of contracting with a rogue trader, or expecting all goods thoroughly before committing to payment, thus reducing the risk of purchasing bad quality produce. Or one might accept high transaction risks by not expending much transaction costs (not collecting information about trading partners, not inspecting goods etc).

Transaction costs

Transaction costs are the resources expended in exchange relations, in other words, to agreements to exchange goods or services (i.e. buyer-seller relations). In general, three types of transaction costs related to commercial exchange can be distinguished:

Search and information costs: someone considering a certain transaction must search for a suitable party with whom to trade and this search process involves costs. These costs may consist of visits to possible traders (e.g. in markets), communication (e.g. telephone calls), looking up prices, testing and quality control etc. Acquiring information plays an important role.

Bargaining and decision costs: these costs relate to time and (legal) advice that is put into bargaining and negotiating the agreement between parties. This agreement can be put into a formal (written) contract or an informal (verbal) deal. Again information plays an important role as some parties may have information that they do not disclose (asymmetric information).

Supervision and enforcement costs: these costs are related to time put into and costs made to monitor whether the agreement is implemented, to avoid opportunistic behaviour by parties, and to enforce agreements. Information also plays here an important role, as monitoring consists basically of gathering information, which may be costly. Parties may have an incentive to hide their actions and the fact that they are not complying with the agreement made.

Feedback loop

Thus, the desired outcome is to strike a balance between transaction costs and transaction risks. This is the purpose of the institutional arrangement. However, this balance depends on:

the initial transaction risks that exist before the institutional arrangement is implemented (left hand side)

feed-back loop that includes the effect of an existing institutional arrangement.

The possibility of a feed-back loop (i.e. of the effect of an institutional arrangement) depends on the requirements identified above, namely that there is repeated exchange within a community or network so that (i) personalised relationships can be established (trust) or (ii) information about rogue traders can be disseminated (reputation effects).

Probability of transaction risks
In Figure 1, we have denoted that transaction risks consist of breach (of contract) and misinformation. Both include a variety of different transaction risks. Breach of contract can include non-payment, or late payment, non-delivery of goods, or late delivery, or delivery of goods of an inferior quality. Misinformation includes paying a price that is too high, or accepting a price that is too low (due to asymmetric information). Before any transaction, these transaction risks *potentially* exist, with a certain probability.

Factors influencing transaction risks
The probability of these transaction risks occurring depend on two sets of factors that influence transaction risks. We have identified technical factors and behavioural factors, both are based on the work of Williamson (1979, 1981, 1991) (see also Eaton et al., 2008). Technical factors consists of five attributes of the transaction in question:
Asset specificity (the specificity of investments required)
Uncertainty
Frequency (of transactions, e.g. per year)
Difficulty of measuring performance in fulfilling the terms of an agreed transaction
The need for coordination with other transactions with other actors

The first four are based on Williamson (1979) the fifth is based on Dorward et al., (2007). We will not go into these factors but refer to Eaton et al (2008).

It is important to recognize that these technical factors depend in turn on the production characteristics of the good exchanged when the seller also produces the good, as is the case in farmer-trader transactions[2]. Different types of goods require different investments, which may impact on the subsequent transaction and related risks. For instance, asset specificity may lead to hold-up problems with the seller. Different goods may also differ in terms of frequency of transacting. Milk, for instance, is sold every day, while coffee is sold only once a year. Prices may fluctuate more or less depending on the good, leading to more or less uncertainty. For some goods it is difficult to measure performance (for instance organic goods which need to be certified) while for others it is easy (e.g. the quality of tomatoes is relatively easy to detect). Finally, investments may require coordination with other transactions (e.g. with input markets for fertiliser etc or financial institutions for credit).

Two behavioural assumptions on which transaction costs economics relies are bounded rationality and opportunism (Williamson, 1979). Combined with asymmetric information it becomes very costly to distinguish opportunistic from non-opportunistic behaviour ex ante. Bounded rationality implies that agents experience limits in formulating and solving

[2] With minor adjustments, production characteristics can also apply to the "production" of services, e.g. that traders provide.

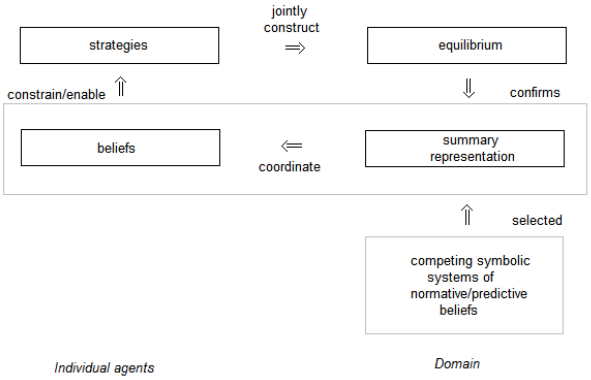
complex problems and in processing (receiving, storing, retrieving, transmitting) information. The main consequences of these behavioural assumptions for economic organisation are that all (complex) contracts are unavoidably incomplete and thus many complex incentive alignment processes cannot be implemented. Relying on "contract-as-promised" is fraught with transaction risks (Williamson, 1981, 1991).

Feedback loops of institutional arrangements: institutional development

We will extend the conceptual framework by elaborating the feed-back loop, which was represented by only a thin line in Figure 1. For this, we revisit Aoki's (2001:10) definition of institutions being "a self-sustaining system of shared beliefs about a salient way in which the game is repeatedly played". Aoki identifies "a way by which the game is repeatedly played" as the rules of the game. He points out that these rules are not necessarily exogenously given or conditioned by the polity, culture, or a meta-game only (as rules-of-the-game theorists do). Rules, by contrast, are endogenously created through the strategic interactions of agents, held in the minds of agents, and thus self-sustaining (as equilibrium-of-the-game theorists do). The key concept are thus *equilibrium beliefs* that are shared by agents in a self-sustaining manner and regarded by them as relevant to the consequences of their choices.

The content of the shared beliefs is a summary representation (compressed information) of an equilibrium of the game (out of the many that are theoretically possible). Agents may not be able to infer (or may not need to), every detailed characteristic of the others' action-choice rules but come to perceive some salient features of (private) rules that relevant agents are believed to apply in making their action choices. Relying on such compressed information, each agent may also develop his/her own private rules or strategies to make an action choice. Complex feedback mechanisms are at play. All agents form their own action-choice rules as their strategies in response to their subjective perceptions (i.e. beliefs) of others' action-choice rules even though in an incomplete and compressed form. According to Aoki, institutions can refer to that portion of agents' equilibrium beliefs common to (almost) all of them regarding how the game is actually played. Although institutions are equilibrium phenomena, they should be regarded as neither a "result of perfect deductive reasoning in a one shot game, nor a complete stasis to which no inductive reasoning needs to be applied by agents". Institutions represent the substantive, self-sustaining expectations of the agents who have actually played the game repeatedly. Aoki summarises this in Figure 2.

Figure 2: An institutions as shared beliefs formed as summary representations of an equilibrium



Source: Aoki, 2001
NB. An institution is represented by the grey line box.

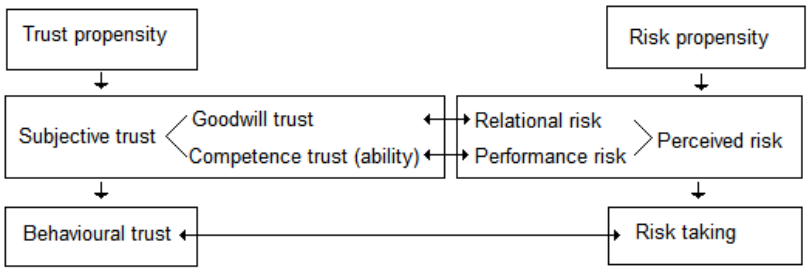
On the concepts of institutions, Aoki (ibid) comments that this may be represented in some explicit, codified and/or symbolic form, including statutory laws, agreements, social structures or organisations as systemic arrangements of differentiated roles and so on. However, the point is that such a representation is an institution only if the agents *mutually believe in it*. Thus, certain informal practices can be institutions as long as the agents believe in them. The link between trust, risk and institutions as defined by Aoki (ibid) lies in the beliefs or expectations of agents. We can redefine trust and risk in a more precise way to be a *belief* or *expectation*.

Trust and risk

There is a broad literature on trust[3]. The literature on the relation between trust and risk is much smaller though, especially when combined with (economic) exchange. Williamson (1993) is one of the early contributors, claiming that trust amounts to calculated risk. In this vein, Chiles and McMackin (1996) analyse risk preferences, trust, and transaction cost economics. Cook et al. (2005) argue that trust is built via risk taking and measure this for Japan and United states. Schechter (2007) analyses the traditional trust measurement and the risk confound in an experiment in rural Paraguay. Jøsang and Lo Presti (2004) analyse the relationship between trust and risk in a more general (and mathematical setting). We adopt the framework of Das & Teng (2004) to distinguish the various types of trust and risk (Figure 3). Das & Teng (ibid) suggest that risk and trust are "mirror images" but actually imply different things[4].

[3] see Das and Teng (2004) for an extensive overview. Kramer (2007) provides a useful reader on trust and organisation with authors from several disciplines
[4] A person's trust propensity is not the reverse of a person's risk propensity, for instance.

Figure 3: Types of trust and risk



Trust consists of:

1. **Trust propensity**: or "trust antecedent" personality characteristics that make a person "trusting" and "trustworthy"
2. **Subjective trust**: a belief, attitude, or expectation concerning the likelihood that the actions or outcomes of another individual, group or organisation will be acceptable or will serve the actor's interest. This can be defined in terms of the assessment of probability that the other party will perform as expected. There are two subcategories:
    a. **Goodwill trust**: intention to perform according to agreement
    b. **Competence trust**: ability to perform according to agreement

Behavioural trust: or the behavioural manifestation of trust is defined the behavioural results of having subjective trust in someone (i.e. as relying on (or being vulnerable to) another party).

The "mirror image" of trust is relational risk which is linked to opportunism in Figure 1. This relational risk consists of:

1. **Risk propensity**: personality characteristic that make a person risk averse or a risk lover
2. **Perceived risk**: Trustor's belief or expectation about the trustee's behaviour. Two subcategories:
    a. **Relational risk**: probability and consequences of a partner not fully committing to a relationship/agreement and not acting in the manner expected
    b. **Performance risk**: probability and consequences of not achieving the goals in a relationship, given good intentions and efforts of the partner.

Risk taking: the behavioural manifestation of perceived risk.

Das and Teng's definitions of trust and risk fit into the box "beliefs" in Figure 2. Trust and risk propensity can be though of a starting point in Figure 2 whereby an agent bases his/her strategies on his/her trust propensity without having had feed-back or information as represented by the box "summary representation". Subjective trust and perceived risk fit in the beliefs box with prior information or feedback (summary representation). Behavioural trust and risk taking can be seen as the actual strategies pursued by the agent in Figure 2 on the basis of a prior beliefs.

If the institutional environment cannot check opportunistic behaviour of trading partners, relational risk will be potentially very high (due to unfettered opportunistic behaviour). The factors that influence transaction risks (asset specificity, uncertainty etc), will give

rise to specific types of relational risks (e.g. in the case of asset specificity, the buyer will threaten to buy the produce only at a reduced price) or performance risks (e.g. in the case of asset specificity, the producer has not been able to make the investments necessary).

Figure 1 explains where risk emanates from, but not where trust emanates from. We do not see trust as an exogenous factor, but as a belief as described in Figure 2, which is based on "complex feedback mechanisms". This feedback mechanism can be the experience with a particular trading partner, leading either to more trust (in which trading partners did behave according to agreement) or less trust (in which trading partners did not behave according to agreement). It may be that the feedback mechanisms includes also the experience with a particular group[5].

3. Application: The case of sesame markets in Ethiopia

3.1 Data

Data related to primary producers and local buyers was collected in two important sesame-producing regions (Humera in Humera and Wellega in Oromia). These areas were selected on the basis of their important contribution to sesame production and marketing and speciality of their sesame. Within the study areas, the target woredas[6] were selected on the basis of the number of farmers producing sesame and volume of sesame produced by those farmers. Finally, the farmers targeted for interview were identified by a simple random sampling technique. Local buyers (collectors) usually travel from place to place in search of a sesame supply and their number is not known by any agency in either area. This made it difficult to calculate a representative sample of this group. This problem was addressed by interviewing as many local buyers as possible. Similarly, at central markets, as many operators and exporters were interviewed as possible. The types of data collected at all levels are both quantitative and qualitative in nature.

In the Humera and Wellega areas, 1,000 and 500 smallholder producers respectively, and as many local buyers (collectors) as possible were targeted for interview. However, due to the seasonal migration of some target interviewees from their area and the impossibility of replacing them with others, the total number of producers interviewed both in Humera and Wellega area amounted to 891 (89.1%) and 491 (98.2%), respectively. In total, 37 collectors were interviewed.

[5] In this case, the experience with one or several members of that group is extrapolated to the whole group. In Aoki's framework, the feedback mechanisms may also be much broader, in which individual beliefs are based on shared beliefs among members of a certain community, which then becomes part of the institutional environment of Figure 1 (formal or informal).

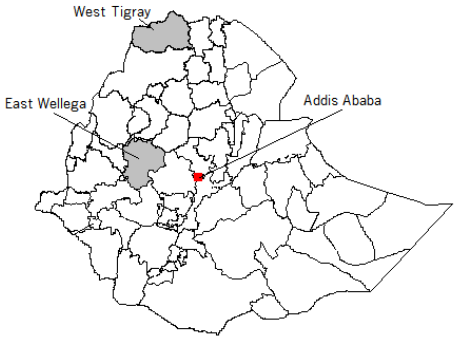
[6] Administrative division of Ethiopia (managed by a local government), equivalent to a district

3.2 Background: Sesame markets in Ethiopia: Humera and Wellega

Humera is part of Tigray Region which lies in northern Ethiopia (Figure 4). Tigray Region belongs to the African drylands and is characterized by sparse and highly uneven distribution of seasonal rainfall, and by frequent drought. Rainfall is highly variable temporally as well as spatially. Poverty and food insecurity are very severe in Tigray. (Fitsum Hagos et al., 2002).

Wellega (Figure 4) is part of Oromia region. It has a climate and rainfall which are suitable for agricultural production. Generally, because of relatively abundant rainfall, suitable soils and other agricultural potentials, Wellega remains the major crop producing region in the country. Wellega in particular, is considered to be a high potential area for cereals. The region's varied agro-ecology zones permit the cultivation of an equally varied range of crops (OSG, 2009).

Figure 4: Map of Ethiopia, Humera and Wellega



NB Wellega is part of the Oromia region; Humera is part of Tigray region.

Because farmers in Humera face agro-ecological limitations they focus on crops that do well in dry circumstances. One of the consequences is that farmers in Humera cultivate larger areas with sesame (5.5 hectare compared to 0.7 hectare in Wellega) and consequently produce larger quantities (17.2 quintals[7] compared to 1.17 quintals in Wellega). Farmers is Wellega do diversify, which explains their small areas of sesame. Because farmers in Humera produce larger quantities of sesame, village collectors in Humera need to visit fewer farmers to collect a certain quantity than village collectors in Wellega.

In general, price information systems do not exist in Ethiopia[8]. Sesame is an export crop and the prices at the main market in Addis Ababa are determined by world markets. Most farmers have very little or now information what prices are and especially about price developments (i.e. whether prices are rising or falling). Prices in the main markets (that

[7] A quintal is 100 kg

[8] The newly established Ethiopian Commodity Exchange which opens for sesame trade in 2009 will aim to set up price information systems in major sesame growing areas

then become the official prices) are determined on the highest quality sesame (i.e. without any contamination or admixture). Determining prices when there is a high degree of admixture is not easy – one has to estimate correctly the share of other materials mixed in with sesame[9]. There is thus quite some leeway in negotiations, even when there would be price information. This gives traders the upper hand, as they have much better information on prices (in regional markets, the main markets in Addis Ababa, the extent of supply and demand) and price developments and gives them room for opportunistic behaviour.

Marketing sesame

Farmers have several options as to where to sell their sesame. Most sell at nearby markets where they usually meet collectors, or collectors meet farmers at their home. Collectors is a general term for small-scale traders that buy sesame from farmers. These traders either work as brokers commissioned by large traders (e.g. wholesalers) or as independent traders who resell sesame to other traders in larger (regional) markets.

Contract farming does involve a time period between the quid and the quo. Typically, a farmer will receive an advance payment from a trader for his harvest. At the time of the harvest the farmer is obliged to sell to the trader, and the advance is deducted from the payment. However, those who use this institutional arrangement do not significantly trust traders more than those who do not use this.

Only 8.2% of farmers report that they sell to the same collector. The other 91.8% sell to different collectors. The farmers give different reasons for selling to the same collector. Some 40% of those (effectively 3.3%) state that there are no other traders. Around 67% percent (effectively 5.5 percent) state they have a long-term relationship. Almost 60% state it is because they trust the buyer (effectively 5%) and over 53% state that the trader offers the farmer a good price (effectively 4.3%).

Those who sell to different buyers also gave different reasons for this. Almost 61% said it was because traders come at different times, almost 91% it was because they will sell to the trader who offers the highest price, 75% said it does not make a difference to whom they sell. Almost 40% said the farmer cannot really choose the trader.

These results indicate the importance of price offered to farmers. Around 54% of the farmers said that the price offered is based on the quality of sesame. Less than 8% of the farmers said the quantity offered determined the price. Just over 40% said that the price is based on the "goodwill of traders". This indicates that there is much scope for negotiations over price (quality is not a fixed indicator) and that many farmers feel that they are relatively powerless in terms of price setting.

Only 37 collectors were interviewed (21 from Humera and 16 from Wellega). Of these collectors, only 3 bought sesame from farmers' homes. The majority (31) buys sesame from farmers in the market. A few bought from small traders. Nine out of 35 said they

[9] If one wants to be precise, all bags should be emptied, which would increase transaction costs

always bought from the same farmers (26%). None of these traders gave reasons that reflected long-term relationships and trust, or that they agreed with other collectors which farmers they would buy from (sometimes traders will "divide farmers" amongst themselves in an effort to coordinate the trade). The main reason given was that they have limited financial capacity. It is unclear what this means. Reasons for buying from different farmers is mixed. Some 14% said it depended on the harvest, almost 30% said it depends on price, and over 32% said they needed to buy from several farmers to get sufficient supply.

Eleven out of the 37 collectors admitted that they agree on prices at which they buy from farmers. Only 5 out of 11 (26 did not respond) said they based their prices on the central Addis Ababa market price, another 6 out of 11 said they based prices on local sesame markets prices. The low response was due to the fact that only 11 out of 37 collectors set the price themselves, while 28 indicated that others determine the purchase prices (local big buyers accounted for 40% and the Addis Ababa Central market accounted for 27% of the responses). Over 60% of the 37 collectors sell to local big buyers and over 32% to big buyers in the Addis Ababa market. Only 4 out of 37 (almost 11%) sell to the same buyers. Of these, only one said he had a long term relationship with buyers. All four said that they trusted the buyer. Thirty collectors said they go to different buyers because they choose the buyer who offers the highest price. A few (4) said they sell to the first buyer they meet, while others (6) say they sell to the buyer who is willing to buy. Some (3) say they sell to the buyer from whom they have received credit.

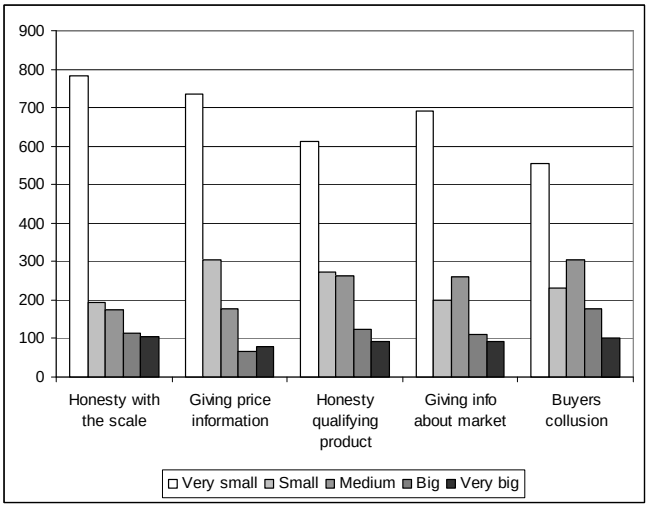
According to collectors, prices are determined by level of purity (i.e. share of sesame that is not mixed with other materials, such as leaves, twigs, sand), together with colour, and maturity of seed. The origin of seed (usually linked with type of sesame) was for 35% of collectors a means to assess the quality. Most (76%) say that their buyers offer a price that is in line with the quality of sesame. However, some (6) say that buyers hide price information, five say that buyers value the sesame at a lower quality. Only two said that buyer collude and fix prices amongst each other.

Factors leading to trust

The measure of trust we use is subjective trust, which means that trust levels (and risk perceptions) are based on prior experiences or feedback. We focus on goodwill trust, thus the perception of farmers (traders) on the intentions of traders (farmers). We do not focus on competence trust because in a cash-and-carry exchange relationship, there is not much scope for contract default (e.g. payment problems). Trust and risk propensity is an inherent trait of people and is not related to circumstances or experiences. We expect, therefore, that trust and risk propensity will "average out" and will also not differ between regions.

In general, farmers have very little subjective trust in traders (Figure 5), whether it is in weighing sesame ("honesty with the scale"), giving correct price information, honestly valuing the quality of sesame, giving information about the market conditions (supply and demand) or whether traders are colluding on price.

Figure 5: Frequency of farmers and their levels of trust in traders per categories of trust



The information is was combined by averaging the five categories to obtain a "weighted trust" measure. The values indicate the level of trust: 1 is very low trust while 5 is very high trust. The weighted value is depicted in Figure 6, which shows that overall trust is very low, with the majority of farmers having very little to little trust in traders.

Figure 6: Frequency of farmers and their mean level of trust in traders

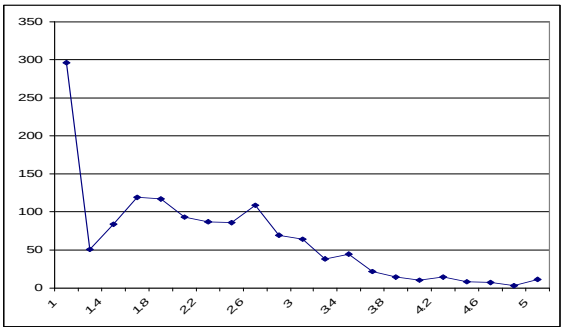
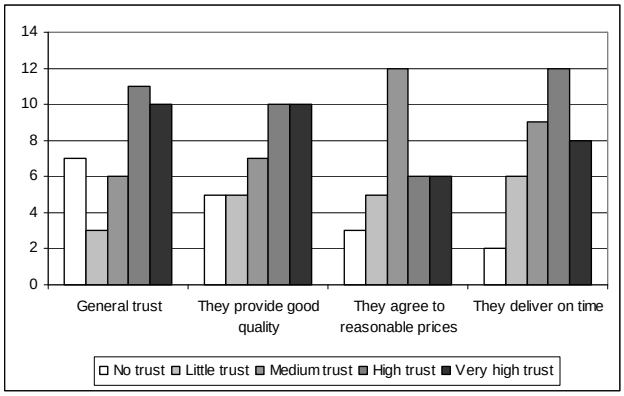


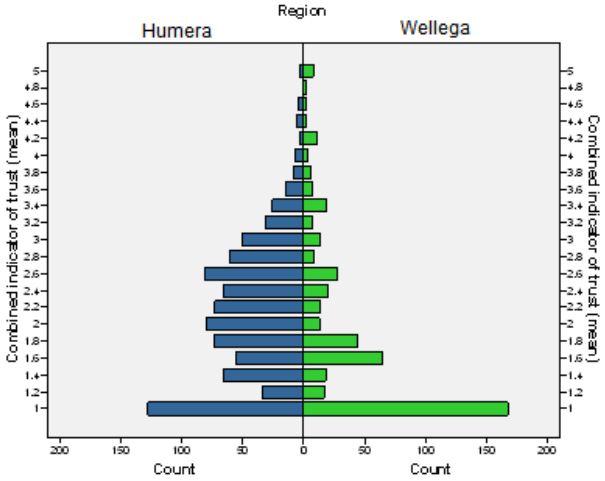
Figure 7 shows the levels of trust of collectors. Although their numbers are small, they do give some indication that their levels of trust in both farmers and buyers is relatively higher than the trust levels of farmers. The levels of trust in farmers is generally high, with a slight exception in the category on prices, where the majority of collectors think that farmers cannot be trusted to accept a reasonable price. Price is also the issue where there is most mistrust with respect to buyers: "giving price information" is skewed towards lower levels of trust. The mean trust of collectors in farmers is 3.4.

Figure 7: Frequency of collectors and their levels of trust in farmers per categories of trust



There is, an interesting difference between Wellega and Humera with respect to levels of trust. In Humera, farmers trust traders more than farmers in Wellega, although the overall levels of trust are still very low. Figure 8 shows the distribution trust between Humera and Wellega. Although the highest frequencies are very low levels of trust in both regions, Humera shows higher frequencies for medium trust levels.

Figure 8: Distribution of level of trust for Humera and Wellega



To test whether this difference is significant we tested whether the means are significantly different, using ANOVA. The results are depicted in Table 1 (Appendix). This confirms that there is, indeed a significant difference in trust levels between Humera and Wellega, although the difference is small. To test whether this is not due to another factor, such as culture, we have used data from the World Values database for 2005 which includes Ethiopia (World Values Survey, 2009[10]). This database includes measures for trusting people in general (such as neighbours, people you do or do not know etc). Table 2 (Appendix) presents the results for the means of Humera and Wellega on the different types of trust. A t-test reveals that the differences between Humera and Wellega are not significant (95% confidence level) except for trusting people of another religion

[10] Available at http://www.worldvaluessurvey.org/

(Table 3 in Appendix). The interviewed people in Wellega trust people of another religion less than those in Humera. Because collectors in both regions are from that region and predominantly of the same religion, this cannot explain the difference in trust.

3.3 Hypotheses

Farmers sell their sesame on the basis of cash-and-carry, thus minimizing transaction risks. However, farmers are not able to minimize transaction risks related to opportunistic behaviour from traders with respect to offering (low) prices. Farmers have little to no accurate price information and have therefore a disadvantaged bargaining position. Because farmers are aware of this, they distrust the traders. If there is a trader who offers a higher price than other traders, or than the estimated price of farmers, the farmers will probably perceive this trader to be more honest and trustworthy than other traders. Thus, we assume that prices are an important determinant of trust. Transaction costs can be seen as an outcome of trust or as *behavioural* trust: the behavioural manifestation of trust (Figure 3). The same applies to number of traders contacted. If farmers contact more traders, this may indicate that they do not trust traders and contact more traders to negotiate a better deal (usually confined to a higher price). This may also be seen as farmers trying to lower perceived risk. This is linked with transaction costs of course, but can be taken as a refinement. If farmers receive a higher price with the last trader (i.e. the one they sell their sesame to), they may trust this particular trader more than the other traders they contacted. Their trust perception on traders will be mixed. We assume, however, that more traders who offered too low prices will increasingly influence trust levels negatively.

We propose three hypotheses:

Hypothesis 1
We hypothesise that price and trust are positively correlated. If farmers received a good price for their sesame, they are more inclined to have a more favourable, trusting perception of traders.

Hypothesis 2
We hypothesize that the relationship between trust and transaction costs is a negative one. The lower the trust, the higher transaction costs will be (searching for trading partners, negotiations, inspection, payment etc).

Hypothesis 3
Finally, we hypothesise that the number of traders contacted and trust are negatively correlated.

We therefore first want to test that:
1. Farmers in Humera receive on average a higher price for sesame than farmers in Wellega
2. Farmers in Humera spend on average less time with traders that farmers in Wellega

3. Farmers in Humera visit on average fewer traders than farmers in Wellega.

However, we also want to test that in general there is a positive relationship between trust and price and a negative relationship between trust and transaction costs and number of traders visited.

4. Results

4.1 Comparison between two regions

Prices in Humera and Wellega
Table 4 (Appendix) shows that in Humera, farmers were indeed offered on average a higher price (1259 Ethiopian Birr/quintal[11]) than in Wellega (992 Ethiopian Birr/quintal). The ANOVA shows that there is, indeed, a significant difference between Humera and Wellega: farmers in Humera obtain higher prices for their sesame. However, we have to take into account that in Wellega a different variety (*wellega*) is produced than in Humera (*humera*), and that this may explain the price difference. The *humera* type usually is values higher than the *wellega* type. In 2007 price paid for *humera* seed (950 birr/quintal) is higher than for *wellega* seed (870 birr/quintal)[12]. *Wellega* seed is 91.6% of *humera* seed. However, our survey results show that farmers in Wellega only receive 71.7% of the price farmers in Humera receive.

We used a t-test to test whether the difference between 91.6% and 71.7% (share of price that Wellega farmers receive) is significant. If it is, it would mean that the farmers in our sample receive less for sesame than can be explained by the difference in price for different types. We took as the testing value 1152.063, which is 91.6% of the average price Humera farmers receive for sesame (1258.9). The result are in Table 5 (Appendix). The t-test shows that the mean price that farmers in Wellega receive is significantly lower than 91.6%. It also shows that the farmers in Humera receive significantly higher mean prices. This substantiates the fact that there is a significant difference between prices that farmers in Humera and Wellega receive, more than can be explained by sesame types only.

Transaction costs
Farmers in Wellega spend on average more time with traders (119 minutes per transaction) than farmers in Humera (102 minutes), as predicted. We tested whether this difference is significant using ANOVA. The results are in Table 6 (Appendix). The ANOVA shows that there is, indeed, a significant difference (< 5%) between Humera and Wellega: farmers in Wellega spend on average more time with traders.

Number of traders visited

[11] A quintal is a commonly used term in Ethiopia to denote 100 kg.
[12] EPOSPEA cited in Evolve Consulting, and terra fusca. 2007

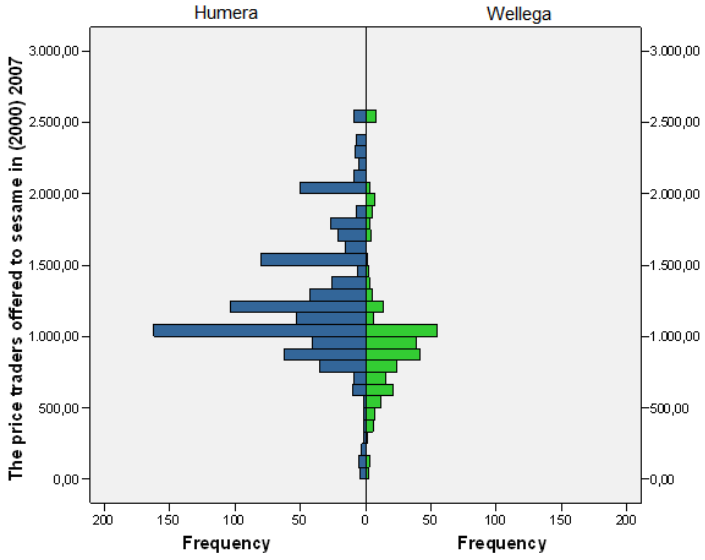
Farmers in Wellega visit on average more traders (2.7) than farmers in Humera (2.05). We tested whether this difference is significant using ANOVA. The results are in Table 7 (Appendix). The ANOVA table shows that there is, indeed, a significant difference (< 5%) between Humera and Wellega: farmers in Wellega visit more traders than those in Humera.

Discussion
The results do not reject the hypotheses we put forward above. In Humera, where trust of farmers in collectors is generally low but significantly higher than Wellega (although not much), prices are also significantly higher, as predicted, and transaction costs as well as number of traders visited are significantly lower, as predicted.

4.2 Overall relationship between trust, prices, transaction costs and traders visited

We now explore whether there is an overall relationship between price, trust, transaction costs and number of traders. This analysis is complicated by the fact that the price data is highly dispersed (Figure 9).

Figure 9: Price dispersion



The prices farmers received for their sesame in 2007 is a function of quality (intermixing of sesame with twigs, leaves, sand etc) and timing of sales. Very low prices reflect low quality and the period just after harvest, when prices are relatively low (as a result of high supply). It is assumed that these two factors are the same for both regions and that the difference in price cannot be explained by different quality or timing of sales between the two regions.

Standard OLS regression to analyse the relationship between trust, prices, transaction costs and number of traders offered by traders is less useful in this case. This is why we have used quantile regression. In OLS, the primary goal is to determine the conditional mean of random variable Y, given some explanatory variable xi, reaching the expected value E[Y | xi]. Quantile Regression goes beyond this and enables one to pose such a question at any quantile of the conditional distribution function.

The explanatory variables are:

- Price
- Transaction costs (total) = TC
- Number of Traders
- Region (Wellega is base case)

A number of variants of this basic model are presented here, each varying according to the method used to calculate the standard errors. This means that for all the figures, the point estimates of the conditional quantile regression function (represented by the line of black dots) is the same. In each case, the grey zone will vary. Note that the OLS coefficient estimate for each variable is represented by the horizontal red line, and its standard errors by the dashed lines. So these should also be identical across the various groups of figures.

It is probably best to focus attention on Figure 12 and 13 (in Appendix), which use more robust methods to calculate standard errors (hence the grey zones are generally broader). The higher prices for **Humera** region are immediately apparent in the last panel. It is not clear whether the relationship here across quantiles is of much interest.

It appears as though **trust** has a slightly positive effect on the price only at the lowest observed prices, which is not unreasonable, and perhaps around the 40% quantile. It seems to have a negative effect at higher price ranges, although the standard errors (grey zone) is so broad that it is in most cases not significant.

The **transaction costs** are also only showing a significant effect at lower quantiles, although we need to check the units to see how large an effect this is (it appears to be very small).

And the pattern is repeated for the number of **traders**. There we can see that an extra trader raises the price between 10 and 30 birr for transactions in quantiles 0.1 to 0.4. Note that this is similar to the OLS estimate. But while the OLS estimate is significantly different from zero, this is not the case for some of the higher quantile estimates. We could translate these price differences into percentage terms.

- *NB econometric work is still in progress* -

5. Conclusions

Summarize the results and integrating these into the framework, we find the following.

Factors influencing transaction risks
Sesame production is not linked to asset specificity (no major investment are made for a particular customer). Uncertainty with respect to market conditions are high, as prices fluctuate and market conditions are difficult to predict. Linked with an overall lack of information about market conditions and prices (due to a lacking institutional environment) this increases the probability of transaction risks. Sesame has only one harvesting season, after which it is sold, usually immediately after harvest because farmers need the cash income. There is thus no regular, repeated contact with traders, thus contributing to transaction risk. Although the quality of sesame is fairly visible (although sometimes bags need to be emptied to see the level of admixture), because standards are lacking (again due to a lacking institutional environment) linking a share of admixture with a percentage of price decrease, we argue that there is a difficulty of performance measurement, contributing to transaction risk. Finally, because of incomplete financial markets, farmers are compelled to sell their sesame immediately after harvest, contributing to transaction risk.

Opportunistic behaviour manifests itself mainly in price negotiations, where traders make used of the asymmetric information that exists, whereby traders has fairly good knowledge of prices, while farmers do not.

Probability of transaction risks
The probability of transaction risks for farmers is fairly high, and mostly emanating from being misinformed about prices, potentially resulting in low prices. For the collectors, however, the probability of transaction risks is fairly low, as they are the better informed party.

Institutional arrangements, transaction risks and costs
Farmers and collectors have minimized transaction risks by cash-and-carry exchange with the collector who offers the best price at the right time. This means they expend transaction costs in searching for traders who will offer them this, and spend time negotiating a good price. They also spend time while the collector inspects their sesame to determine the quality (which is an important determinant of price).

Farmers cannot reduce transaction risks of information asymmetry whereby they are the uninformed party, as this can only be solved by the institutional environment (formal price information system), or by building a (trust) relationship with collectors that will reduce their opportunistic behaviour. However, there are no price information systems in place as yet, although Ethiopia is in the process of implementing such a system as part of the newly established Commodity Exchange which will start trading sesame in July.

Feedback loop: building trust relationships
In general, farmers' trust in collectors is very low. The fact that they lack accurate price information makes it difficult for them to determine whether the collector is behaving opportunistically or not. Much of the NIE literature discussing the role of trust focuses on breach of contract in repeated interactions. When, in repeated exchanges none of the two

parties breach the contract, then trust is built up, enabling extended forms of trade (e.g. where the quid and the quo have a time lapse). In Ethiopia, this model does not apply: there is no breach of contract (because of cash-and-carry exchange), and trust relationships are asymmetric (farmers do not trust collectors, but collectors do trust farmers), reflecting the asymmetric bargaining positions. Prices play a crucial role in building up trust. The first step in building trust is when farmers feel that they are receiving reasonable prices from collectors. Only then can they start extended the nature of exchange from cash-and-carry to forms in which the quid and quo are separated by time (e.g. credit). For this, better price information is necessary. If farmers have a reliable (objective) source of prices, they can more quickly determine which trader is behaving opportunistic and which is to be trusted. Prices offered by collectors thus functions as a signal of whether they can be trusted.

Interestingly, farmers in Humera seem to be have more trust in collectors than those in Wellega. This may be an indication that farmers in Humera are gradually developing a trust relationship. At least more trust seems to be related to minimizing transaction costs as well as minimizing the transaction risk of a low price. Offering a "good" price may function as the "experimental" level of cooperation in the terminology of Ghosh & Ray (1996). This "gradual trust-building"– may increases to a higher level when the initial phase is successfully passed without termination of the relationship and may develop into extended institutional arrangements (e.g. with credit).

The question is why this is apparently happening in Humera and not in Wellega. We have looked at characteristics of farmers that could be correlated with having more trust (e.g. age, wealth), but these were all unrelated with trust. The only real difference between Humera and Wellega is the degree of specialisation: farmers in Humera have specialised in sesame while farmers in Wellega have not. This has an agro-ecological reason. The agro-climatic conditions in Wellega are much better facilitating the diversification of crops (and thus spreading the risk of crop failure). In Humera, conditions are much harsher and is unsuitable for many crops. Sesame, however, does grow in these conditions, and is an important cash crop. Farmers in Humera do diversify risk also, by growing drought-resistant cereal crops for food, but are not able to diversify into different cash-crops. Because farmers in Wellega grow different cash-crops, they also deal with different collectors, as most collectors are specialised in only one or few cash-crops (e.g. oil-seeds). Farmers in Humera, in contrast, will deal with fewer collectors – mostly those buying sesame. And this is where the conceptual framework helps to understand the effect of this. The community of collectors and farmers is much smaller in Humera than in Wellega (where there many more and different collectors). This facilitates the repeated exchange with personalised relationships necessary to establish trust. Although farmers in Wellega may meet as many sesame collectors as farmers in Humera, they also have to deal with the collectors of other cash-crops, which may result in less personalised relationships.

A second interesting result is that trust, transaction costs and number of traders visited seem to matter more at the low-price end than at the high price-end. We offer the following explanation. The lower end of prices consists of sesame of a lower quality.

Price fluctuations do play a role, but only a minor one. Farmers selling very low quality sesame do not have a strong bargaining position: they are selling the least wanted produce. The collectors have the upper hand. It is in this situation where (goodwill) trust becomes important: the belief that the action of another individual (collector) will serve the actor's (farmer's) interest (high price). At the high price end, the reverse happens. Here price and trust are negatively correlated (although the effect is not very strong). This may be explained by a reversal in bargaining power. At the high price end, sesame is supposedly of a high quality and the farmer is selling a produce that is much in demand. The farmer will probably feel that (s)he is entitled to a good price and will drive a harder bargain (and maybe overshoot).

At the low price end, transaction costs and number of traders are also significant. At low prices, transaction costs are lower, although the effect is not very bug. This is in line with our line of reasoning that trust is positively correlated with higher prices and negatively correlated with lower transaction costs. Number of traders is positively correlated, however, something that we did not expect. But it may be that farmers selling low quality sesame need to search for traders who are willing to buy such low quality sesame. More trust will thus lead to more efficient trade (in terms of transaction costs expended).

These result show also the usefulness of quantile regression instead of OLS. With OLS (red solid line in Figure 13), there is no significant relationship between trust and price.

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Appendices

Table 1: ANOVA Combined indicator of trust (mean)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Humera	873	2.1487	.83244	.02817	2.0934	2.2040	1.00	5.00
Wellega	474	1.8882	1.01368	.04656	1.7967	1.9797	1.00	5.00
Total	1347	2.0570	.90858	.02476	2.0085	2.1056	1.00	5.00

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	20.846	1	20.846	25.716	.000
Within Groups	1090.295	1345	.811		
Total	1111.141	1346			

Table 2: Trust values from the World Values database (2005)

	Ethnic group	N	Mean	Std. Deviation	Std. Error Mean
Trust: Your neighborhood	Ethiopian - Tigre	178	1.80	.732	.055
	Ethiopian - Oromiya	314	1.80	.791	.045
Trust: People you know personally	Ethiopian - Tigre	179	2.19	.755	.056
	Ethiopian - Oromiya	314	2.10	.831	.047
Trust: People you meet for the first time	Ethiopian - Tigre	176	2.86	.736	.055
	Ethiopian - Oromiya	307	2.95	.833	.048
Trust: People of another religion	Ethiopian - Tigre	172	2.55	.797	.061
	Ethiopian - Oromiya	291	2.75	.977	.057
Trust: People of another nationality	Ethiopian - Tigre	166	2.87	.756	.059
	Ethiopian - Oromiya	282	2.99	.889	.053

NB in this survey, a higher number conveys a lower level of trust.
Tigre is the same as Tigray (Humera) and Oromiya is the same as Oromia (Wellega)

Table 3: Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Upper	Lower
Trust: Your neighborhood	.739	.391	-.066	490	.947	-.005	.072	-.147	.137
			-.068	391.939	.946	-.005	.071	-.144	.134
Trust: People you know personally	.313	.576	1.211	491	.226	.091	.075	-.057	.239
			1.243	399.936	.215	.091	.073	-.053	.235
Trust: People you meet for the first time	2.254	.134	-1.158	481	.247	-.088	.076	-.236	.061
			-1.198	402.386	.232	-.088	.073	-.231	.056
Trust: People of another religion	7.706	.006	-2.239	461	.026*	-.197	.088	-.370	-.024
			-2.358	416.152	.019*	-.197	.083	-.361	-.033
Trust: People of another nationality	3.707	.055	-1.449	446	.148	-.119	.082	-.281	.043
			-1.511	390.759	.132	-.119	.079	-.275	.036

NB first line is equal variances assumed, second line is equal variances not assumed.
* Significant at the 95% level.

Table 4: The price traders offered to sesame in 2007 in Humera and Wellega

Region	Mean	N	Std. Deviation
Humera	1258.9078	803	431.33480
Wellega	992.0608	576	443.67935
Total	1147.4474	1379	455.80034

We tested whether this difference is significant using ANOVA.

ANOVA Table

		Sum of Squares	df	Mean Square	F	Sig.
The price traders offered to sesame in (2000) 2007 * Region	Between Groups (Combined)	23883538.885	1	23883538.885	125.333	.000

	Within Groups	262401402.554	1377	190560.205		
	Total	286284941.439	1378			

Table 5: t-test price differences

Region		N	Mean	Std. Deviation	Std. Error Mean
Humera	The price traders offered to sesame in (2000) 2007	803	1258.9078	431.33480	15.22147
Wellega	The price traders offered to sesame in (2000) 2007	576	992.0608	443.67935	18.48664

Region		Test Value = 1152					
		t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper
Humera	The price traders offered to sesame in (2000) 2007	7.023	802	.000	106.90785	77.0292	136.7865
Wellega	The price traders offered to sesame in (2000) 2007	-8.652	575	.000	-159.93924	-196.2488	-123.6297

Table 6: ANOVA for total time spent with buyer per region

		Sum of Squares	df	Mean Square	F	Sig.
Total time spent with buyer * Region	Between Groups (Combined)	31342.168	1	31342.168	4.164	.042
	Within Groups	3823536.107	508	7526.646		
	Total	3854878.275	509			

Table 7: ANOVA for number of traders contacted per region

		Sum of Squares	df	Mean Square	F	Sig.
# of traders contacted to sell sesame in (2000) 2007 * Region	Between Groups (Combined)	146.518	1	146.518	31.151	.000
	Within Groups	6514.265	1385	4.703		
	Total	6660.783	1386			

Figure 10: Basic IID confidence intervals

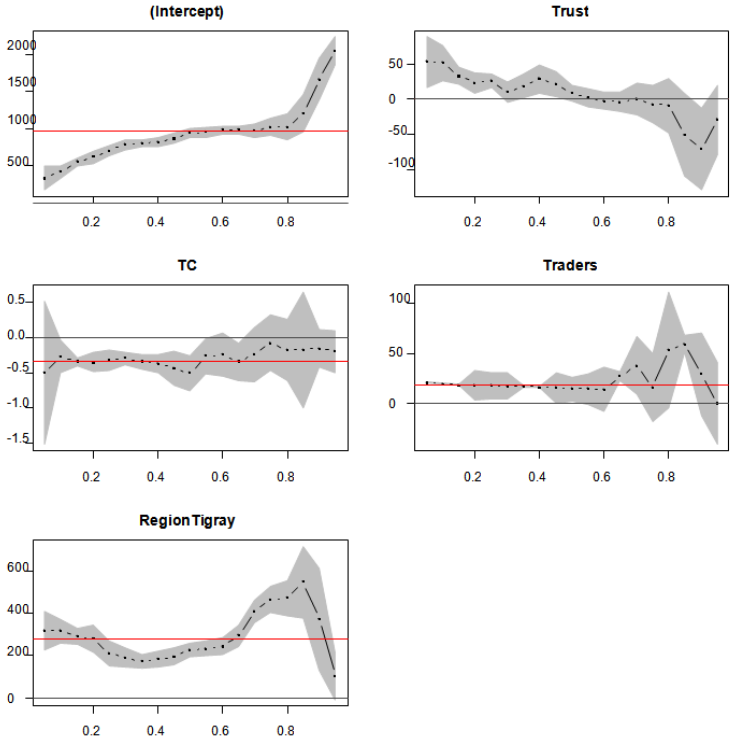

Figure 11: Basic confidence intervals without IID assumption

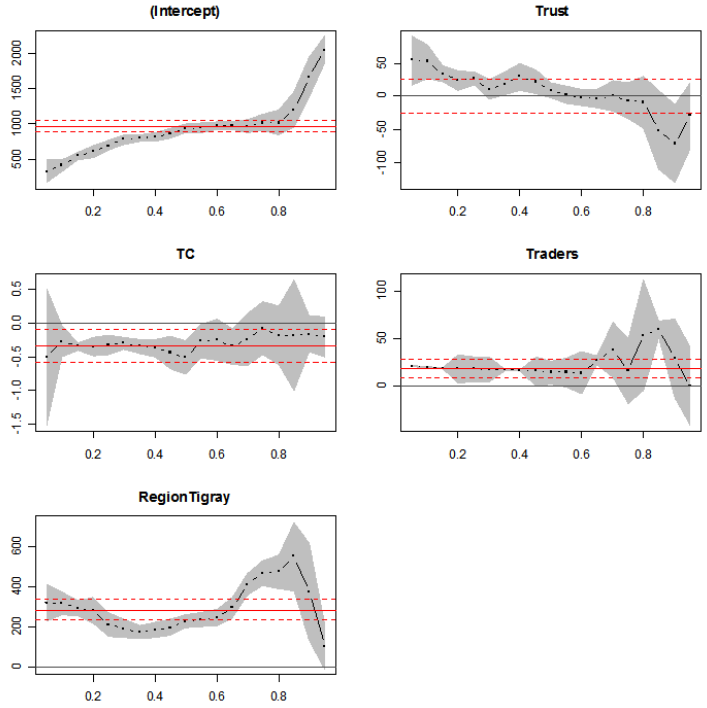

Figure 12: Powell's kernel estimate of the sandwich

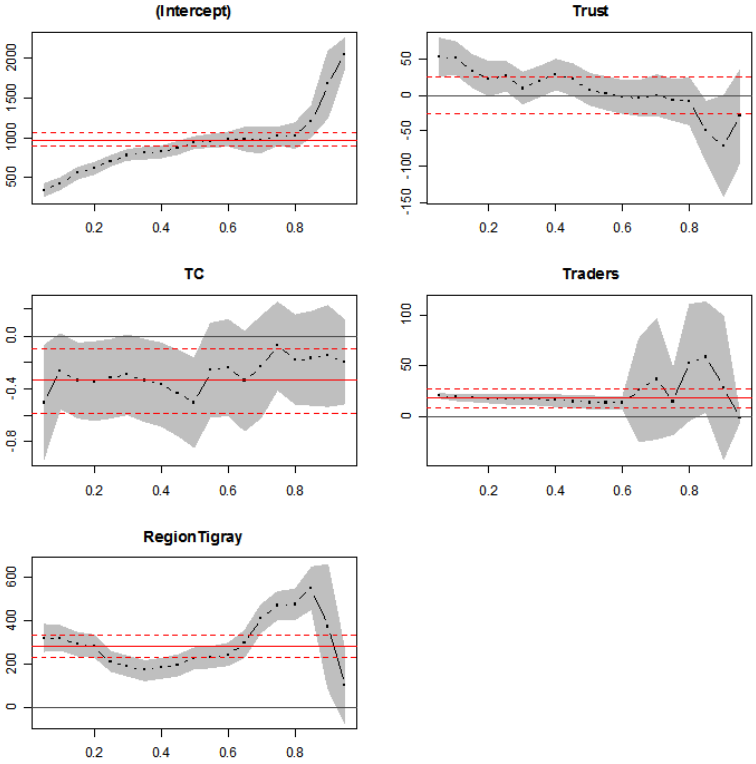

Figure 13: Bootstrapped errors (xy bootstrap; 200 replications)