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Transformation of Global Agri-Food Systems:
Trends, Driving Forces, and Implications for Developing Countries

Georg-August-University of Göttingen

GlobalFood Discussion Papers

No. 70

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June 2015

RTG 1666 GlobalFood · Heinrich Düker Weg 12 · 37073 Göttingen · Germany
www.uni-goettingen.de/globalfood

ISSN (2192-3248)

The effect of opportunistic behavior on trust: An experimental approach

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ABSTRACT

Linking small farmers to global markets through contract farming has become an important policy recommendation aiming to increase farmers' income and foster rural development. Nevertheless, some of the arrangements involving small farmers have been reported to loose participants or collapse over time. Trust is an informal institution that can discourage opportunism and facilitate the compliance of contracts in a setting with an expensive and weak legal system. Nevertheless, the study of trust has been addressed mostly in lab experiments, but in the agribusiness context it has been addressed only by a few authors in a rather descriptive way

We use a framed field experiment with prior signaling on a sample of 180 small broccoli farmers in the highlands of Ecuador to explore the effect of opportunistic behavior on small farmers´ trust. The results reveal that this group of farmers has lower than average trust towards unknown people. Furthermore, we use a signal that mimics the payment of a loan by the B partner as treatment in the predesigned trust game. Results show that a positive signal increases trust, but a negative signal has no effect on it. Reacting slowly to external negative signs can threaten individuals who will not protect themselves towards opportunism. If farmers do not react quickly enough, they might face larger losses and will not be able to stay in business. In addition, if informal norms include weak sanctions, contract farming will be less likely and individuals will prefer the spot market were only one-time exchanges take place.

Keywords: small farmers, trust, experiments, signaling, delay on payment

JEL classification: D02, Q13

Acknowledgement: The financial support of the German Research Foundation (DFG) is gratefully acknowledged.

1. Introduction

Farmers´ inclusion in global markets as food suppliers is perceived as a way not only to increase farm income but also to foster rural development (Barrett et al., 2012; Braun et al., 1989; Hernández et al., 2007). Based on the idea that participation in high value markets can alleviate poverty, linking small farmers to such markets has become an important focus of donors and nongovernmental organizations (NGOs) in recent years (Altenburg, 2006). Simultaneously, contract farming through formal or informal agreements has made this linkage possible by solving the market failures that confront disadvantaged producers[1]. In practice, access to international high-value markets can be beneficial and sustainable only if existing agreements are honored by both buyers and suppliers. Even when governmental and non-governmental organizations facilitate smallholders´ inclusion, *contract breaches* and *weak institutions* may hold them back and threaten existing relationships among participants and in the communities where they live (Carletto et al., 2010; Chemnitz, 2007). The consequences of opportunistic behavior under weak contract enforcement in developing countries have been addressed by only a few authors. For example, Cungu et al., (2008) find empirical evidence using survey data of a decrease in farmers´ monetary investment as a response to delayed payments in Hungary´s agricultural sector. Nevertheless, the effect on farmers´ trust has not been quantified so far.

Adequate *institutions* and enforcement mechanisms that deter contract breach are essential for stable business relationships. North, (1990) describes institutions as constraints that decrease uncertainties by providing rules of behavior that shape human interaction and facilitate cooperation. Institutions can be either *formal*, such as a country´s political and economic rule or *informal* such as a country´s culture, codes of conduct and norms of behavior. Informal rules govern most of our daily interactions, whereas formal rules influence only a small proportion of our choices; thus, even when formal rules change quickly, it remains difficult to modify informal rules. When the legal system becomes either unreliable or too expensive, these informal mechanisms can become complements that both discourage opportunism and facilitate market transactions (Klein, 1996; North, 1990; Fafchamps and Minten, 2001). This situation is particularly common in rural areas in developing countries, which are often characterized by weak legal systems associated with high transaction costs. In such a context, both trust and informal codes of conduct can provide structures that promote exchange (Cardenas and Carpenter, 2008; Fafchamps and Minten, 2001; North, 1990). Analyzing how these informal codes of conduct are shaped can help us to understand interactions in supply chains involving smallholder farmers.

Trust refers to the expectation of good behavior by others and is seen as a lubricant that both decreases the fear of opportunism and facilitates trade (Arrow, 1974; Höhmann et al., 2002; Höhmann and Welter, 2002). According to Höhmann and Malieva (2002), the "degree of trust between people and

[1] For an overview on contract farming refer to Key and Runsten (1999).

towards existing institutions determines the structure, quality and efficiency of interactions and transactions." The conditions under which trust is built, sustained or destroyed are important for understanding the existence of institutions and organizations (Torero and Viceisza, 2011). Informal codes of conduct and opportunism affect the level of trust and the governance structures that guide trade in rural areas, such as contract farming. Thus, trustworthiness and reciprocity either reward or punish others' behavior (Greig and Bohnet, 2008) and in the absence of efficient external enforcement mechanisms, they make contracting possible (Morduch, 1999).

The correlation between trust and market development has been extensively studied. Prior studies show that trust has a positive influence on the development of trade; such studies include those of Lyon (2000) for the case of rural Ghana, Höhmann et al. (2002) for Eastern Europe and Fafchamps and Minten (2001) for Madagascar. The effect of market participation on trust has also been analyzed more recently. Siziba and Bulte (2012) conclude that a rapid entrance into markets decreases the level of trust in a society, and Fischer (2008) and Berggren and Jordahl (2006) find that frequent trade experiences under good economic institutions generate trust. In the same field, but using an experimental approach, behavioral economics attempts to quantify the level of individual trust by measuring the actual behavior of people under controlled game settings. In such games, individuals are offered real money as payoffs for the decisions that they make. The trust or investment game designed by Berg et al. (1995) has been used extensively to measure trust and reciprocity based on an investment simulation. The results show that individuals can both trust and reciprocate in anonymous relationships to achieve mutual gains and enhance cooperation (Berg et al., 1995). Using the same game, other studies have found that trust is higher in more homogeneous groups (Bouma et al., 2008), that men trust more than women (Buchan et al., 2008) and that women are more reciprocal than men (Croson and Buchan, 1999).

Experimental games are usually run with students in a lab, but studies have shown that their behavior varies significantly when compared to that of individuals operating under different social constraints (Anderson et al., 2012; Henrich et al., 2001). This indicates that such data should be collected directly from the specific populations whose behavior is being investigated. To our knowledge, only a few framed trust experiments have been conducted with farmers in developing countries to study their behavior when facing specific problems,[2] leaving room for further research to determine possible explanations for their observed decrease in cooperation in the long term. Given the characteristics of small farmers and the high costs of using the legal system in rural areas, informal institutions are extremely important for compliance with and the sustainability of payment agreements. In developing countries in which the rural economy is dominated by such small producers, studying the determinants

[2] Torero and Viceisza (2011) conduct framed trust experiments to analyze the effect of third-party enforcement and possible collusion in Vietnamese dairy farmers' investment decisions.

of trust is important for the design of new programs and interventions that aim to create social capital (of which trust is an important component) and sustainable relationships.

Our main objective in this paper is to explore the effect of opportunistic behavior in the form of delayed payment on small farmers' trust and investment decisions. Farmers exposed to payment delays should decrease their level of trust as a measure of protection. Conversely, a positive signal in the form of on-time payment should increase trust and encourage exchange. We use a field-framed trust experiment with prior signaling conducted with a sample of small broccoli farmers linked to different markets in the highlands of Ecuador. The game measures changes in trust by the change in the amount of money sent by the trustor after receiving a signal in the treatment group. Given that some of the invited farmers did not show up to the experiment, we correct for possible selection bias in the analysis that may be introduced if the farmers who participate in our game significantly differ from the rest of the sample.

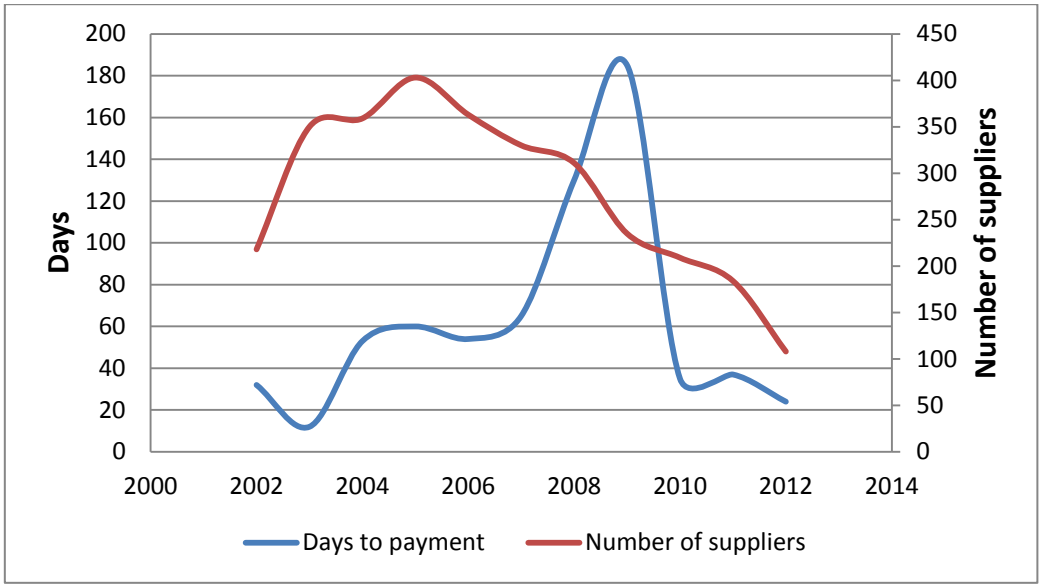
The article is organized as follows. The next section provides background information on the broccoli supply chain in Ecuador and on the farmers invited to participate in our game. Section three provides a conceptual framework discussing the definition and measurement of trust. Information on the experimental approach and the implementation of the trust game is given in section four. Finally, section five presents and discusses the results, and section six concludes.

2. The broccoli export chain and small farmers in Ecuador

Broccoli became important as an export crop in the Ecuadorian highlands at the end of the 90s and was considered a promising source of income for small farmers. The inclusion of small farmers in the export chain was promoted by a local NGO, which organized a farmers´ group and established a collection center to gather the produce and sell it to an exporting firm. The farmers´ group acted as intermediary between the exporter and the small farmers and an agreement specifying the volume, price, quality and payment conditions was made between the farmers´ group, the exporter and the suppliers. The business relationship was not free of problems and during the past decade producers and buyers have been exposed to different transaction risks during the marketing process. Suppliers for example have experienced hold ups when the buyer decided to reduce the price, delay the payment or increase the grading criteria. According to the contract, the payment for the delivered produce had to be made within a two-week period but in practice suppliers faced regular delays on their payment. When a payment is not made on time, the buyer is effectively extracting rent from its suppliers by getting access to interest-free loans (Gow and Swinnen, 1998). This problem worsened in 2009 when an exporting firm supplied by the collection center went bankrupt and left the area without paying for the received product. Consequently, the farmers' group endured a liquidity crisis, and payments were delayed even longer than usual. Meanwhile, a large percentage of suppliers have abandoned the scheme, and the farmers' collection center faces a broccoli shortage. Figure 1 shows the average

number of days that farmer had to wait for the payment and the number of suppliers working with the collection center during the past 11 years.

Fig. 1: Payment delays experienced by broccoli farmers and number of farmers supplying the export chain in the past 11 years



Source: Farmers 'group collection center records.

Several studies mention the importance of trust to facilitate exchange and to construct a flexible and good relation (Cardenas and Carpenter, 2008; Fafchamps and Minten, 2001; Lyon, 2000). However, perceiving the buyer as opportunistic could negatively affect the suppliers´ trust. Table 1 describes the level of perceived trust for two marketing channels (i.e. export market and local market) for a sample of broccoli farmers who are currently supplying the export sector (*Current suppliers of export market*), who dropped out from the export sector (*Former suppliers of export market*) or who sold their produce only in the local market (*Never participated in export market*). The level of trust for the local market is higher than the level of trust for the export market for the whole sample of surveyed farmers. The construct for trust depicted in Table 1 is based on 4 different statements rated by farmers on a five-point Likert scale during a household survey. Based on these statements trust was identified using principal component analysis[3]. All the surveyed farmers show similar levels of trust for buyers in the local market, but trust for the export market differs between the two groups involved in the export market. Farmers who withdrew from the export market show lower levels of trust when compared to farmers who are still participating in the scheme. However, different hold ups experienced (e.g: delay in payment and high rejection) could have had different effects on the way farmers´ perceive their buyers. This can also be determined by personal characteristics. Furthermore,

[3] For details on the statements used to build the construct as well as its validity (variance explained, loadings of the components and KMO) refer to the Appendix.

the group of former suppliers could have had a lower trust even before joining the export chain. Thus, the measuring of trust and how trust is affected by possible hold ups can be further improved. For this we conducted an artefactual field experiment with a subsample of the same group of farmers in order to quantify general trust and their response to a payment delay.

Table 1. Trust towards different marketing channels

	Whole sample	**Current suppliers of export market**	**Former suppliers of export market**	**Never participated in export market**	
(No. Obs)		*(86[1)]*	*(174)*	*(113)*	
Trust in the export market	0.573	0.683	0.543		*** a
Trust in the local market	0.650	0.633	0.669	0.631	
	*** b		*** c		

*Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. **a**: Significant difference in trust expressed for export market by current and former suppliers. **b**: Significant difference in trust expressed for the export market and for the local market for the whole sample. **c**: Significant difference in trust expressed for the export market and for the local market by the group of former suppliers.
[1] The number of observations is 74 when measuring trust in the local market for current suppliers

3. Conceptual framework

3.1 Trust and enforcement mechanisms

Berggren and Jordahl (2006) classify trust into two categories: particularized and generalized trust. Particularized trust is based on reputation and refers to trusting concrete actors who are known from past interactions, which leads to a decrease in transaction costs and the creation of sustainable relationships. In contrast, generalized trust is linked to social capital and refers to putting trust in unknown people. Different beliefs about others' trustworthiness and the ability to elicit trustworthy behavior are some of the factors that influence a person's willingness to trust (Glaeser et al., 2000). Yamagishi (2001) discusses high and low trustors in society. In the absence of any prior evidence, high trustors have high expectations that people are trustworthy, whereas low trustors expect the opposite. General distrust provides protection to individuals but simultaneously leads them into isolation. By not interacting with others, low trustors miss opportunities to develop their social intelligence, which could make them more vulnerable to opportunistic situations over the long term (Yamagishi 2001). Yamagishi (2001) finds evidence that because of this lack of social interaction, low trustors take more time to decipher signals from others and therefore their response is slower than that of high trustors.

An individual's trustworthiness, which is directly linked to reciprocity, makes a contract possible in the absence of external enforcement mechanisms (Bohnet et al., 2001). Greig and Bohnet (2008) distinguish between balanced and conditional reciprocity. *Balanced reciprocity* exists when the

receiver repays an investment as if it were an interest-free loan. This approach characterizes populations with harsh economic conditions under which individuals must insure themselves against income shocks. *Conditional reciprocity*, in contrast, occurs when a relationship is seen as a partnership, with both actors profiting. In this case, higher trust is rewarded with higher trustworthiness, thus increasing the efficiency of the transaction.

Rational choice theory assumes that trust is a product of some system of rewards and penalties that act as incentives for the trustee to fulfill his duties in repeated interactions (Bacharach and Gambetta 2001). Coleman and Coleman (1994) and Calvert (1995) refer to mistrust or the withdrawal of trust as a social sanction imposed on a person who has violated some norm. Nevertheless, it can be the case that a relationship with a partner may be too strong (family or friendship), such that maintaining it becomes more important than sanctioning opportunism. An absence of strong sanctioning can also occur if the affected person wants to avoid the reputation of being difficult to do business with, which could harm his future business relationships (McMillan and Woodruff, 2000).

3.2. Measuring trust

The trust game designed by Berg et al. (1995) has been used extensively to study trust and trustworthiness in an investment setting. In the two-player game, player A is given the choice to send part of his initial endowment to an anonymous partner, B. The amount sent is tripled by the experimenter and delivered to player B, who then must decide how much of the received money he wants to return to player A. Anonymity is preserved during the game and in the original version, no repetitions are played to eliminate potential punishment and long-term strategies such as reputation building. Generalized trust is observed if player A sends part of his endowment to his unknown partner, who may not reciprocate. The ratio of B's response to A's initial decision is referred to as trustworthiness. Player B reciprocates if the amount that he returns is equal to or larger than the original quantity sent by A (Greig and Bohnet, 2008).

Signaling can be introduced to the game to reveal the players' intentions. These signals can be used to establish if a partner possesses or lacks trustworthiness qualities (Bacharach and Gambetta, 2001). Weele (2012) notes that when introducing signaling to a game, people can behave in a more calculated manner when giving their trust. Using a repeated trust game, McCabe et al. (2003) find evidence that certain players do consider their partners' intentions when making a decision. Therefore, sending a credible signal is expected to guide trustors to make a more rational decision regarding how much to trust someone. We use prior signaling in our experiment to frame possible opportunism when paying back a loan. Thus, a private signal is sent by the B players to their A partners before the trust game is played. The B players are asked to decide whether they want to pay back a loan made by A on time or if they prefer to delay the payment and obtain an additional profit.

4. Experimental approach

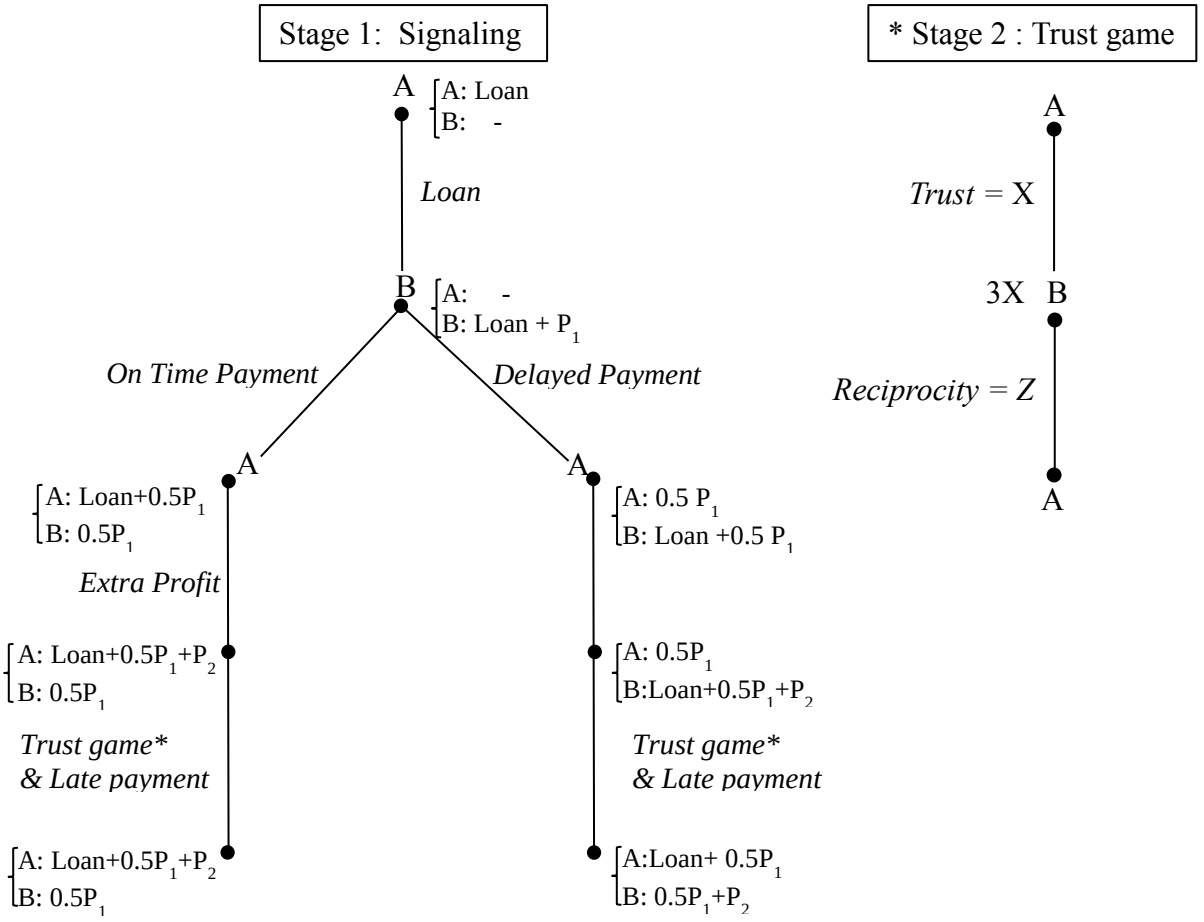
4.1 Instructions for the game and predictions

The first stage of the game is framed as a loan in which player A must send a fixed portion of his endowment to player B, and B must decide to either repay the loan on time or delay repayment. In the second stage, the normal trust game is played after A has learned of his partner's decision with respect to the loan. Neither player is informed that the trust game will be played in the second stage to ensure enough variation in B's decision with respect to the loan. If B was aware of the second stage, he would be more likely to choose to pay the loan on time as a reputation-building strategy. To mimic the opportunity cost of money, a profit is awarded to the player holding the money from the loan. Because providing the loan is mandatory for players A, the profit for the first stage must be shared between the players. During the second stage, the profit corresponding to the loan stays with the person who retains the capital from the loan. According to the rules as conveyed to both players, player A expects payment for the loan once the first stage is complete (if A receives the payment on time, she will also obtain the profit corresponding to the second stage). Nevertheless, B can choose to default on the payment and keep the money to obtain the additional profit. If B chooses this option, he still must send the loan repayment at the end of the second stage.

The game took approximately one hour, and the instructions were read aloud in Spanish and Quichua. To begin, all players (A and B) were given an initial endowment of 5 US dollars (USD), which is a half-day's salary for an agricultural worker in the region. In the first stage, player A has to send a 1 USD loan out of his initial endowment to player B. Player A expects to be paid back in the following move together with some profit. B receives the loan from his partner, plus 0.50 USD profit (P_1). Player B immediately must decide whether to repay the loan on time together with half of the profit, as expected by his partner, or to delay the payment until the end of the second stage and to return only half of the profit for the time being ($0.5P_1$). If B decides to delay the payment, he obtains an additional profit of 0.25 USD (P_2) for keeping the money during the second stage. If B decides to repay the loan on time, the 0.25 USD (P_2) goes to player A. The trust game (second stage) starts once player A receives a response from B in a closed envelope that contains the $0.5P_1$ (0.25 USD) and additionally either contains or does not contain the 1 USD loan. Now, the trust game starts. Player A must decide how much of the remaining 4 USD[4] he wants to send to player B (X). X is tripled by the experimenter, so player B receives $3X$. Finally, player B sends back whatever amount he wants (Z) in return for his partner's trust. Additionally, if player B delayed the repayment of the loan in the first stage, he must pay the 1 USD loan at the end of the second stage. Figure 2 shows a graphic representation of both stages of the game. Monetary payoffs for the control and treatment groups and the English translation of the instructions of the game are shown in the Appendix.

[4] Regardless of whether Player A received the 1 USD back, all of the A players in the second stage can only decide to send part of the remaining 4 USD. The control group also received a 5 USD initial endowment, but similarly, they were able to send only up to 4 USD out of the endowment to match the conditions of the A players in the extended version of the game.

Fig. 2: Graphic representation of the trust game with signaling.



From our game, we make three predictions based on the existing literature. First, if individuals have a strictly increasing utility function for wealth, it is expected that the B players will behave opportunistically in the first move by delaying the payment and keeping the loan during both stages of the game ($R_A = 0$ for all players). Alternatively, if at least one B player complies with the rule and repays the loan on time, then we can test how the A players react to this positive signal. Second, as in the original game described by Berg et al. (1995), if the A players infer their partners' dominant strategy of keeping all of the money, they will not cooperate. Therefore, player A will not trust player B because B is expected to send nothing in return. Finally, our third prediction is that social norms acting as private ordering mechanisms that sustain cooperation should modify A's trust according to the signal received from his partner. Thus, Player A should increase his trust when **receiving** the payment on time ($X_T > X_C$ if R_A=1) and should decrease his trust to protect himself against a possible negative outcome when **not receiving** the payment on time ($X_T < X_C$ if R_A=0).

4.3. Data collection

A household survey was conducted with a random sample of 401 small broccoli farmers in the highlands of Ecuador between December 2012 and February 2013. Former and active export chain suppliers were selected from a list of producers provided by the farmers' association and were interviewed in 8 different villages. In addition, households in the same eight villages and in a ninth village located in the same province (with the same infrastructure and weather characteristics) that had never participated in the export market were selected through a random walk. A questionnaire was answered by a family member involved in broccoli production and marketing decisions.

A member of one of the 383 interviewed households was invited to participate in the game (there were too few observations on three of the visited villages so as to organize an experimental session). Invitations were made immediately after the survey took place and repeated in the days after through phone calls. The participants were required to be involved in production and marketing decisions for broccoli but were not limited to heads of household. The game was played with the people who voluntarily attended each session after receiving the invitation. Fourteen sessions were played in six villages with 180 small farmers, of whom 51% participated as export chain suppliers. The trust game with signaling was played in 12 of the sessions, and in the remaining 2 sessions, the trust game alone was played as a control. The final sample comprised 90 observations,[5] of which 49 observations received a delayed payment, 23 observations received the payment on time and 18 observations played the trust game alone.

4.4. Determinants of trust

Our primary interest is to analyze the effects of positive and negative signaling on small farmers´ trust. To this end, we specified the following outcome or main equation:

$$(2)\ Y_i = \gamma' \boldsymbol{Z_i} + \varepsilon_{i2},$$

where Y_i is the amount of USD sent by player A, Z_i is a vector of variables influencing trust that include the dummies *On time payment*$_i$ and *Delayed payment*$_i$ accounting for the signal received from the B partner, and ε_{i2} is the unobserved error term for equation 2. In addition to controlling for the initial signal received at the beginning of the game, ***Zi*** includes other covariates related to the personal characteristics of each trustor such as *female*, *asset index*[6] (as a proxy for household wealth), *organization membership* and *completed primary education* (as a proxy for game understanding). We also include the variable *dropout* as a control for whether the household had previously participated in the export chain which could influence a farmer's response when confronted with similar situations.

[5] Because of the paired structure of the game.
[6] The asset index was calculated using principal component analysis. For details on the assets used to build the index as well as its validity (variance explained, loadings of the components and KMO) refer to the Appendix.

Recent studies (e.g. Frijters et al., 2015; Harrison et al., 2009) suggest that individuals might be more willing to participate in artificial field experiments due to some specific characteristics that differentiate them from the original sample, introducing a sample selection problem. In our experiment, invited farmers´ had to decide whether to participate and once they arrived, they were further randomly assigned to two groups: A and B[7]. Our interest lies in the A players' decision about how much to trust their partners. A Heckman model corrects for this selection process, in which the level of trust of the non-participants could be different than zero but is unknown. In such an approach, a probit model is used to explain the selection mechanism. The model assumes that both decisions (e.g. the decisions to participate and the decision on how much to trust during the game) have a bivariate distribution that allows both error terms to be correlated. If the errors of both equations are correlated (*rho* is significant), then unobservables in the first stage also affect the outcome variable in the second stage or outcome equation. In such cases, the Heckman model is appropriate to produce unbiased estimates. The probability of a farmer participating in the game can be estimated using a probit model if the error term is assumed to have a standard normal distribution. Our selection equation is defined as follows:

(1) $P_i^* = \beta' \boldsymbol{X}_i + \varepsilon_{\boldsymbol{i1}}$ **,**

$P_i = 1 \; if \; P_i^* > 0, 0 \; otherwise$

where the binary choice variable P_i takes the value of 1 if the farmer decided to participate and 0 otherwise, X_i is a vector of exogenous variables influencing participation and ε_{i1} is the unobserved error term to be minimized. Studies advise using an exclusion restriction in the selection equation to generate credible estimates. This exclusion restriction consists of at least one variable that appears with a non-zero coefficient in the selection equation but not in the equation of interest. Thus, we use *number of household* (*HH) members* and *Distance to game*, which should not have an effect on trust and could affect participation. We expect a positive effect of the number of HH members because the bigger the family, the lower the opportunity costs for one of its members to engage in activities outside the household. Distance to the game is a proxy for a farmer's costs to travel to the location, which should affect participation negatively but should not have any effect on trust.

The correlation between the error terms of both equations ε_{i1} and ε_{i2} is measured by ρ (Rho) which determines whether there is a sample selection problem. If ρ = 0, then ε_{i1} and ε_{i2} are not correlated, and there is no necessity to correct for sample selection (Wooldridge, 2012).

7 A table showing the Characteristics of players A and B is presented in the Appendix. There is no significant difference between both groups

5. Results and discussion

5.1. Results from the experimental game

Rational choice theory predicts that player B will behave opportunistically in the first move to maximize his monetary profits. Nevertheless, 23 of the 72 B players who were required to send a signal chose to repay the loan on time and thus to comply with the rules of the game. We can therefore reject our first prediction on the opportunistic behavior expected from *all* B. Some individuals behaved according to the rules, even though this meant giving up the extra profit they would have earned had they kept the loan for one more period.

The decisions made by Players A and B sorted per group are summarized in Table 1. Three different groups are specified according to the treatment: 1) payment on time, 2) payment delayed and 3) control. The results confirm the existence of norms of trust and trustworthiness among smallholders even when no previous interaction has taken place. Generalized trust is quantified by the amount sent by the A players in the control group (1.16 USD, or 30% of their endowment), which shows the farmers' tendency to trust their unknown partners. The level of general trust in our sample is much lower compared with that found in Berg et al. (1995) for American students (50% of their endowment) and the values compiled by Cardenas and Carpenter (2008) from different studies (40% of the initial endowment or higher). However, our trust result is similar to that found by Greig and Bohnet (2008) in the slums of Nairobi (30% of the initial endowment). According to these authors, this low level of trust is influenced by severe poverty and harsh conditions that create the need for participants to insure themselves against income shocks by keeping as much money as possible.

The percentage returned by B (30% of the possible amount, or 1.25 USD) in the control group closely matches the results reported by Berg et al. (1995) and by Cardenas and Carpenter (2008) for non-students. Regarding trustworthiness, on average, player A is better off when the game is over. Players in the control group receive a slightly higher amount than what was initially sent on average ($Z - X =$ 0.083 USD). Only 14% of the A players[8] received less money than what they sent, and the rest received at least the same amount or higher. However, the average ratio of return observed ($Z/X =$ 1,185) is not significantly different than 1.[9] This result is characteristic of balanced reciprocity, whereby the B players perceive that the money sent by A is an interest-free loan, and the profits should not be shared (Greig and Bohnet 2008). Similar to low trust, balanced reciprocity is present because the players keep as much money as possible for themselves to protect themselves from external shocks. From a negative perspective, this approach can discourage long-term business relationships.

[8] Two A players of the 14 who sent something in the first move.
[9] T-test applied. P value = 0.2947.

Table 2. Trust and trustworthiness according to the signal received

	1. Payment on time (Obs: 23)[b]	2. Payment delayed (Obs: 49)[b]	3. Control (Obs: 18)[b]	Sig. Differences (p values)[c] 12	13	23
Trust						
USD sent by A (*X*)	1.565 *(0.895)*	1.122 *(0.881)*	1.167 *(1.043)*	0.043**	0.092*	0.920
% sent by A	0.391 *(0.224)*	0.281 *(0.220)*	0.291 *(0.261)*	0.043**	0.092*	0.920
Amount returned by B						
USD sent by B (*Z*)	2.413 *(1.819)*	0.776 *(1.071)*	1.250 *(1.128)*	0.000***	0.024**	0.047**
% sent by B (K_b)	0.479 *(0.238)*	0.190 *(0.245)*	0.307 (0.250)	0.000***	0.009***	0.0509*
Trustworthiness						
Ratio of return (*Z/X*) [a]	1.50 *(0.6548)*	0.735 *(0.7592)*	1.185 *(0.6322)*	0.000***	0.0453**	0.0235**

Standard errors in parenthesis *** p<0.01, ** p<0.05, * p<0.1.
a: 16 A players choose not to send anything –no trust-: 1 from group **1** (4%), 11 from group **2** (22%), and 4 from group **3** (22%). These observations were dropped out when calculating the ratio of return.
b: Data reported as means
c: The Wilcoxon rank-sum test to find the level of significance between pairs.

Receiving the payment on time is interpreted as a positive signal that increases the level of trust and enhances cooperation. Individuals who were paid on time sent on average a significantly higher amount of their endowment (1.56 USD) compared to the average amount sent by players whose payment was delayed (1.12 USD). When comparing these figures to the control group, players who received a positive signal also trust more than players who received no signal at all (p value = 0.092). However, when comparing trust after a negative signal with that of the control group, there is no significant difference (p value = 0.920). In summary, a positive signal sent at the beginning of the relationship has the power to trigger a positive response and to enhance the trust of small farmers, but a negative signal has no effect. We find three possible explanations for this behavior. First, individuals do not have much room to react strongly toward their partner's opportunism by significantly decreasing their trust because their level of general trust is already quite low. Our second explanation follows Yamagishi's theory that generalized distrust provides protection to individuals but also leads them to social isolation and lower levels of social intelligence (Yamagishi 2001). The author finds evidence that low trustors respond more slowly to external information, especially when stimuli are negative. Finally, farmers might not decrease their already-low trust because they do not want to completely sever the relationship. It could be that maintaining a relationship is more important than severely sanctioning opportunism because of other social aspects (kinship or friendship within the members of the community with whom they are playing).

The average amount returned by B also differs among the three groups. The group of farmers who paid the loan back on time returned an average of 2.41 USD (50% of what they received) compared to the farmers who behaved opportunistically, and in the second stage they returned on average only 0.77 USD (19% of what they received). The trustworthiness shown by the B players is clearly linked to

their first decision about when to pay their counterpart. Players who behaved according to the rules also showed a higher degree of trustworthiness and reciprocity later on by sharing part of their profits with their counterparts. B players who kept the money for themselves also behaved selfishly later, and most of the time they made their counterparts worse off: on average, their partners received 26.5% less than what they had sent.

5.2. Determinants of trust considering sample selection

To determine the factors influencing trust we use a Heckman selection model to control for possible self-selection of participants. In Table 2 we present the results for both stages: participation and trust.

Table 3. Heckman model for trust

VARIABLES	**1. Participation** Coef.	**2. Trust** USD sent by A
Treatment[a]		
Received payment on time (R_A=1)		0.574**
		(0.247)
Received delayed payment (R_A=0)		0.057
		(0.219)
Control variables		
Female		-0.435***
		(0.151)
Completed primary education		0.061
		(0.167)
Distance to main market	0.024	0.068
	(0.025)	(0.041)
Asset index	-0.071	-0.051
	(0.047)	(0.074)
Organization membership	0.269*	0.832***
	(0.147)	(0.238)
Dropout from export chain	-0.0273	-0.158
	(0.142)	(0.227)
HH members	0.0568*	
	(0.0334)	
Distance to game location	-0.172	
	(0.112)	
Constant	-0.988***	-1.724**
	(0.195)	(0.585)
Rho		0.968***
		(0.025)[b]
Observations	383	88

Robust standard errors in parenthesis *** p<0.01, ** p<0.05, * p<0.1.

[a]: Base group is the control group

[b]: LR test of indep. eqns. (rho = 0): chi2 =14.69 Prob > chi2 = 0.0001

The rho estimate indicates a positive correlation between the error terms of both equations, and the Wald test indicates that this correlation is highly significant. Therefore, some unobserved factors

positively influence participation and trust. This result confirms a selection problem and the adequacy of the Heckman model to analyze our data and correct for the positive bias that our estimates would otherwise have.

The results of the *Participation* equation show that farmers who decided to participate in our sessions have specific characteristics that differentiate them from the entire sample of invited farmers. Farmers who are members of an organization and those with more household members were more likely to participate. Although wealth negatively affects participation, as expected, it is not statistically significant. Members of an organization hold regular meetings in which it is common for outsiders to organize different activities such as technical training or the diffusion of information. Therefore, these farmers could be more willing to participate in a meeting organized by scholars. Moreover, we had the support of the farmers' group in conducting the survey, and the group might have encouraged its members to participate in the game. It is also not surprising that wealthier farmers were less likely to participate. One of the variables in our exclusion restriction is also significant. Having an additional member of the household increases the likelihood that one of the household's members has time to participate in our game. When this variable is divided into household members over 15 and household members under 15, the results (see the Appendix) show that having one household member older than 15 significantly increases the probability of participating in the game, which supports the idea that an additional household member alleviates the burden of household work, thus allowing another member to participate in external activities.

After controlling for selection bias and other characteristics, we still find that a positive signal modifies the trust of an individual toward one's partner, thus allowing us to accept H_4. However, a negative signal does not have an effect on trust; therefore, we cannot reject our last null hypothesis. Holding all other variables constant, a small farmer who receives a loan repayment on time sends on average 0.57 USD more than one who has not received any signal from his partner. Conversely, a person whose payment was delayed sends on average the same amount of money as in the control group (p value: 0.785). Low trustors can take longer to react to external stimuli because of their reluctance to engage in social interactions, a situation that represents a problem when eliciting the trustworthiness of others. Additionally, females in our sample send an average of 0.43 USD less than males. This result confirms previous findings by Buchan et al. (2008) that females trust less than males. Additionally, the amount sent by members of an organization is an average of 0.83 USD higher than the amount sent by non-members. Our players do not know their partners' identities, but because members of the same village often belong to the same organization, increased trust may be encouraged. Finally, it is interesting that even though former participants in the export value chain showed a negative coefficient for trust, this result is not statistically significant.

6. Conclusions

Care must be taken when drawing conclusions from experimental data because the individuals who participate in experimental games could systematically differ from the originally invited population. Recruiting participants is easier with the support of a local organization, but their members might have specific characteristics that differentiate them from the general population. Therefore, selection bias should be accounted for when using game data derived from a subsample of the population for whom we wish to draw our conclusions.

Our findings show a low level of generalized trust towards unknown people. This result could be the effect of the business conditions to which the farmers had been exposed, which include extremely volatile prices in the local market and high uncertainties due to quality (rejections) and price (payment delay) in the export market. This paper's primary contribution is the study of farmers' behavior when exposed to previous signaling from a partner. In such cases, the level of trust partly varied according to the type of signal. Behaving according to the rules and sending an on-time payment increased the amount of trust received in the game. Thus, we can conclude that positive signaling enhances trust and promotes norms of cooperation. However, farmers whose partners behaved opportunistically showed similar levels of trust as those who had no information at all. We should keep in mind that the reason for this lack of response could be a low capacity for eliciting others' trustworthiness. Farmers already protect themselves at the beginning of any business relationship by showing mistrust toward an unknown partner and if they receive a negative signal, they may be unable to react promptly, so they choose to maintain the relationship at a low level. Nevertheless, if not reacting in the face of opportunism is an informal norm in the region, agreements would be considered flexible because not fulfilling them would have no visible consequences. Reacting slowly to external signs, particularly when such signs are negative can threaten livelihoods of farmers. If small farmers cannot react quickly enough, they might face large losses by the time they decide to sanction such behavior. In addition, according to Williamson (1993), if informal rules include weak sanctions, then an action depending on a reciprocal sense of responsibility will be less likely. Therefore, individuals may prefer the spot market, in which immediate exchanges take place, rather than some signed or verbal agreement in which both actors must act reciprocally and responsible during a prolonged period and in which they are exposed to hold ups.

The low levels of trust toward unknowns and the existing norms that reward good behavior also suggest the need to send a strong positive signal at the beginning of any relationship to achieve cooperation. Now that technology facilitates the exchange of information on reputation, a database containing information about the reputation of possible partners can be established and distributed by the authorities to increase the initial level of trust. Additionally, adequate safeguards to ensure contract compliance should be demanded from larger players as a sign of their willingness to engage in long-term relationships.

This study represents an initial approach that attempts to disentangle the internal norms that govern smallholder behavior. There is extensive room to expand the topic of signaling and trust using farmers as the subjects of study. We analyzed the response to a single signal, but it remains unknown whether repeated positive signals produce an added effect on trust or whether farmers' responses cease to change at some point. Similarly, it would be interesting to see whether farmers change their behavior when faced with repeated negative signals. Finally, the signaling used was a delayed payment, which the farmers might not find very serious. There is a chance that farmers may react differently to other possible problems, such as high rejection rates.

7. References

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APPENDIX

Table A1.1: Statements used for construct Trust.

Construct	Cronbach's Alpha	Item
Trust in Export market	0.832	I think that I can trust on my buyer in the export market to fulfill his promises
		In general, I think that my buyer in the export market has been honest with me
		I would recommend my buyer in the export market to my friends and family who grow broccoli
		I think that my buyer in the export market has been trustful during the time I have dealt with him
Trust in Local market	0.779	I think that I can trust on my buyer in the local market to

	fulfill his promises
	In general, I think that my buyer in the local market has been honest with me
	I would recommend my buyer in the local market to my friends and family who grow broccoli
	I think that my buyer in the local market has been trustful during the time I have dealt with him

Table A1.2: Principal components for Trust

Component	Eigenvalue	Difference	Proportion	Comulative
Trust in Export market				
Comp1	2.68677	2.06259	0.6717	0.6717
Comp2	.624182	.272973	0.1560	0.8277
Comp3	.351209	.0133747	0.0878	0.9155
Comp4	.337835	.	0.0845	1.0000
Trust in Local market				
Comp1	2.44337	1.71933	0.6108	0.6108
Comp2	.72404	.210389	0.1810	0.7919
Comp3	.51365	.19471	0.1284	0.9203
Comp4	.31894	.	0.0797	1.0000

Table A1.3: Factor Loadings for Component 1 (rotation = varimax).

Variable	Trust in export market	Trust in local market
Statement 1	0.5085	0.4954
Statement 2	0.5244	0.5618
Statement 3	0.4341	0.4178
Statement 4	0.5272	0.5143

Table A1.4: Kaiser-Meyer-Ohlin measure of sampling adequacy.

Variable	KMO for trust in export market	KMO for trust in local market
Statement 1	0.7844	0.7459
Statement 2	0.7894	0.6857
Statement 3	0.8588	0.8355
Statement 4	0.7822	0.7798
Overall	**0.7971**	**0.7448**

A2. Monetary payoffs for the control and treatment groups

Control Group (Berg et al., 1995)

Player A: $\pi_A = 1USD + [4USD - Xc + Z_C]$

Player B: $\pi_B = 5USD + 3Xc - Z_C$

Treatment Group[10]

Player A: $\pi_A = \frac{P_1}{2} + R_A P_2 + [1USD + 4USD - X_T + Z_C]$

Player B: $\pi_B = \frac{P_1}{2} + (1 - R_A)P_2 + [5USD + 3X_T - Z_C]$

Where:

π_A, π_B = Profit for player A and player B, respectively

$Xc, X_T \in \{0,1,2,3,4\}$: Amount sent by player A = "trust"

k_b; k_{bC}: Percentage returned by player B of the total quantity received

$Z \in \{0,1,\dots,12\}$: Total amount sent by player B.

Z/X = Trustworthiness (ratio of return to A)

P_1, P_2: Profits from loan during the first and second stage, respectively.

R_A: Dummy for player A receiving payment on time (1= Yes; 0=No)

A3. Instructions of the game translated to English

PLAYER A

For this game you have a partner in the room next door with whom you will play following the instructions we will read out loud. Your partner does not know your name and you will not get to know his/her name either. All decisions will be anonymous. Please do not make any comments with the other players in this room. If you do this, you will not be able to continue playing the game.

To begin with, we will give you and your partner in the other room 5 dollars each for coming to the game.

[Distribute envelopes containing 5 bills of 1 dollar]

1

To start, you have to give a loan of 1 dollar of the 5 dollars you got to your partner. This dollar will produce a profit of 0,50 cents that will be split between you and your partner. So for the 1 dollar loan you will get a 0,25 cent profit and your partner will also get a 0,25 cent profit. At the end of this stage, your partner MUST pay you the 1 dollar back plus the 0,25 cents of the profit. It is important that you get this payment on time. Now, please put 1 of the 5 dollars you got inside the blue envelope.

[Collect blue envelopes]

[Wait for response of player B]

2

Your partner MUST pay you the dollar you sent him/her as a loan plus the 0,25 cents that are your share of the profit. This means that you MUST receive 1 dollar with 0,25 cents inside the yellow envelope that was sent to you by your partner.

[Distribute yellow envelopes coming from player B]

Please open the yellow envelope and look inside. You will find 1 dollar if your partner PAID YOU ON TIME for the loan, plus the 0,25 cents of profit. If your partner decided to NOT SEND THE PAYMENT ON TIME and keep YOUR 1 dollar for longer, then your envelope will have only 0,25 cents, which is your part of the profit.

Now, If your partner PAID YOU ON TIME, that means if you got your 1 euro back already, you will get an additional profit for having your money with you. But if you did not find a dollar in the envelope then your partner DID NOT PAY YOU YET, and the additional profit will go to your partner and not to you.

The people who received the PAYMENT for the 1 dollar ON TIME, will get 0,25 cents as additional profit. However, if your partner DID NOT GIVE YOU THE DOLLAR BACK YET, you will get NO additional profit.

[Distribute white envelopes which contain 0,25 cents if the player got the payment on time or which are empty if the player did not get the payment on time]

3

START SECOND STAGE OF THE GAME

Now we will start the second stage of the game. During this second part, you are still playing with the same partner you have been playing so far. You all must have at least 4 dollars left. Now, you have to decide how much of this 4 DOLLARS you want to send to your partner. The amount you send to your partner will be multiplied by three by us and then the total amount will be delivered to your partner. Your partner will receive this money and afterwards should decide how much he wants to send back to you.

For example, if you send your partner 1 dollar of the 4 dollars you have left, we will multiply this by 3 and give your partner 3 dollars. Then, he/she HAS TO decide how much of these 3 dollars he/she wants to send back or share with you. IF you decide to send your partner 2 dollars, we will give your partner 6 dollars and he/she will have to decide how much of these 6 dollars he/she wants to send back to you.

There are no wrong decisions. You can send to your partner 0, 1, 2, 3 or 4 dollars. Depending on how far you trust that your partner will send you a fair amount back. Please take your decision and put the money on the white envelope in front of you.

[Collect white envelopes]

4

[Distribute the envelopes coming from B players]

Please open the envelopes your partners have sent you. The white envelop has the money that your partner sent you back. The yellow envelope MUST have 1 dollar of the initial loan if you were not paid before. If you were already paid, this envelope is going to be empty.

END OF THE GAME

PLAYER B

For this game you have a partner in the room next door with whom you will play following the instructions we will read out loud. Your partner does not know your name and you will not get to know his/her name either. All decisions will be anonymous. Please do not make any comments with the other players in this room. If you do this, you will not be able to continue playing the game.

To begin with, we will give you and your partner in the other room 5 dollars each for coming to the game.

[Distribute envelopes containing 5 bills of 1 dollar]

1

Your partner sent you 1 dollar as a loan out of the 5 dollars he got. This dollar generates a profit of 0,50 cents. You must share this profit with your partner and additionally PAY HIM/HER the 1 dollar back.

[Distribute blue envelopes containing 1 dollar and white envelopes containing two coins of 0,25 cents]

Inside the blue envelope you will find 1 dollar sent by your partner which you MUST immediately pay back. Inside the white envelope you will find the 0,50 cents profit coming from this loan which you must share with your partner. Please take this money out of the envelopes.

Now, please take the yellow envelope placed in front of you and put inside the 0,25 cents that are your partners´ share of the profit.

Now you must decide if you want to pay the 1 dollar loan made by your partner ON TIME as HE/SHE IS EXPECTING IT. IF you decide to send the 1 dollar back ON TIME to his/her OWNER, your partner will get an additional profit of 0,25 cents but you will not receive any additional profit. BUT, if you decide to KEEP the 1 dollar for longer, I will give you an additional 0,25 cents profit to you, but your partner (the owner of the DOLLAR) will not receive anything. Please make your decision and close the yellow envelope.

[collect yellow envelope]

Now we will distribute the additional profit if you decided to keep the 1 dollar for longer.

[Distribute white envelopes which contain 0,25 additional cents for the players who kept the loan or which is empty for the ones who paid the loan on time]

2

[Wait for white envelopes coming from A players]

START SECOND STAGE OF THE GAME

Do you remember that at the beginning of this game you and your partners received 5 dollars each. Now, your partner has ***decided*** to send you part of his 4 dollars as an investment. What they decided to send you I have multiplied by three and is the amount that you will receive now. Once you get this additional money, you have to decide how much you want to send back and share with your partner. For example, if your partner sent you 1 dollar of his 4 remaining dollars I multiplied this by 3 and you will receive 3 dollars now. In a following move you have to decide how much of the 3 additional dollars you just received you want to share with your partner. Another example: if your partner sent

you 2 dollars, you will get 6 dollars inside the new envelope and you have to decide how much of this money you want to share with your partner. If your partner sent you 3 dollars, you will receive 9 dollars and you have to decide how much of these you want to send back to your partner. Finally, if your partner sent you 4 dollars, you will receive 12 dollars and you have to decide how much of these 12 dollars you want to send back to your partner. The money that you do not send back to your partner will be yours.

[Distribute white envelopes that comes from A partners]

Please take the money out of the envelope and count it, but do not talk to your neighbor.

Now you have to decide how much of what you just got you want to share with your partner. Put this amount of money again inside the white envelope. There are no wrong decisions. This means that you can send back any amount you think is better, from 0 to everything you got. Close the envelope.

Now, please put inside the yellow envelope in front of you the 1 dollar that your partner sent you as a loan at the very beginning of the game if you did not paid on time. If you already paid this dollar before, let the envelope empty and close it.

END OF THE GAME

A3: Principal component analysis for construction of the Asset Index

Table A3.1: Principal components for Asset Index

Number of Obs: 401 (Original survey participants).

Component	Eigenvalue	Difference	Proportion	Comulative
Comp1	2.78363	1.55347	0.232	0.232
Comp2	1.23016	0.154495	0.1025	0.3345
Comp3	1.07566	0.057864	0.0896	0.4241
Comp4	1.0178	0.124076	0.0848	0.5089
Comp5	0.893723	0.0220651	0.0745	0.5834
Comp6	0.871658	0.00361226	0.0726	0.6561
Comp7	0.868045	0.10822	0.0723	0.7284
Comp8	0.759826	0.0338496	0.0633	0.7917
Comp9	0.725976	0.0246856	0.0605	0.8522
Comp10	0.701291	0.146155	0.0584	0.9106
Comp11	0.555136	0.0380417	0.0463	0.9569
Comp12	0.517094	.	0.0431	1

Table A3.2: Factor Loadings for Component 1 (rotation = varimax).

Variable	Component 1
Pickup	0.311
Truck	0.0038
Car	0.0764
Tractor	0.032
Pc	0.3948
refrigerator	0.3925
HH floor	0.4186
HH roof	0.2541
HH aspect	0.2708
HH bathroom	0.3697
USD clothes	0.2852
Extra house	0.2355

Table A3.3: Kaiser-Meyer-Ohlin measure of sampling adequacy.

Variable	KMO
Pickup	0.8211
Truck	0.7008
Car	0.7324
Tractor	0.7567
Pc	0.7722
refrigerator	0.8265
HH floor	0.7941
HH roof	0.6595
HH aspect	0.7842
HH bathroom	0.8042
USD clothes	0.8382
Extra house	0.716
Overall	**0.7851**

A4. Characteristics of players A and B

Table A4. Descriptive statistics for player A and B

	Players A	Players B	p value
Female	0.523	0.494	0.708
Asset Index	-0.235	-0.423	0.441
Organization membership	0.455	0.494	0.601
Complete primary education	0.705	0.632	0.312
Dropout from export chain	0.477	0.540	0.408
Distance to main market	12.192	12.167	0.952
HH members	4.375	4.080	0.228

Distance to game location	0.578	0.645	0.418

A5: Other models explaining Trust

Table A5.1 Heckman model with two different variables showing the composition of the household in the selection equation.

VARIABLES	**1. Participation** Coef.	**2. Trust** USD sent by A
Treatment[a]		
Received payment on time (R_A=1)		0.496**
		0.244
Received payment delayed (R_A=0)		-0.021
		0.220
Control variables		
Female		-0.408***
		0.151
Complete primary education		0.096
		0.174
Distance to main market	0.022	0.061
	0.025	0.041
Asset Index	-0.079*	-0.039
	0.046	0.071
Organization membership	0.264*	0.793***
	0.147	0.230
Dropout from export chain	-0.018	-0.182
	0.143	0.222
HH members over 15	0.076**	
	0.036	
HH members under 15	-0.1892628	
	0.138	
Distance to game location	-0.182967	
	0.113	
Constant	-1.301***	-1.501***
	0.355	0.699
Rho		0.961***
		(0.025)[b]
Observations	383	88