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Risky Environments, Hidden Knowledge, and Preferences for Contract Flexibility: An Artefactual Field Experiment

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Abstract.—Contract flexibility can be expedient for economic exchange in environments with high ambiguity and risk, but may also encourage opportunistic behavior. We run a modified investment game, including the choice between two different contract designs and asymmetric information about the realized surplus (i.e., hidden knowledge). We examine if Nairobi slum dwellers choose flexible over rigid contracts when interacting in risky environments and whether preferences for contract flexibility are sensitive to the exogenous probability of experiencing a negative shock. We find that most interaction is realized through flexible agreements. Principals offer a higher level of flexibility if the likelihood of a shock is high, relative to the low-risk environment. Agents are somewhat more reluctant to sign rigid agreements when facing the threat of a bad state. While agents and the overall efficiency benefit from higher flexibility, principals always do better by opting for a rigid contract.

Keywords: contract flexibility, risk sharing, hidden knowledge, artefactual field experiment, investment game, Nairobi slums, Kenya

JEL classification: C72, D82, L14, O12

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1. Introduction

Renegotiations and contract flexibility do not always have a good record in contract theory—for at least two reasons. First, when contracts are incomplete or public enforcement is inefficient, the possibility for renegotiating contract terms may lead to commitment problems, to hold-ups and underinvestment (see, e.g., Klein, Crawford, and Alchian, 1978; Williamson, 1985; Hart and Holmström, 1987; Milgrom and Roberts, 1992; Hart, 1995). Similarly, if the agreement leaves space for discretion and unilateral changes due to information asymmetries, strong incentives for strategic behavior and false statements arise.

A second argument against contract flexibility is offered by a more recent strand of literature, suggesting that contracts serve as reference points (Hart and Moore, 2008). Involved parties feel entitled to the best outcome an *ex ante* agreement allows for, even if they know that the eventual outcome may be less favorable. Accordingly, flexibility and renegotiations might result in aggrieved agents, conflicts and even welfare losses.

In spite of all these arguments, the empirical literature on market institutions in developing countries has a different view on renegotiations and stresses that without *ex post* flexibility exchange in highly uncertain environments could often not occur at all. The reason is that after signing an agreement some agents may find it hard or even impossible to comply with rigid contract terms—albeit willing to do so—due to external shocks and they fear harsh retaliation. Moreover, a first-moving principal is usually better off receiving part of the promised surplus or a reimbursement of her investment than receiving nothing at all upon contract breakdown.

The prominent problem is one of asymmetric information and post-contractual opportunism. Regularly, a principal cannot observe if breach of contract is due to an external shock or strategic behavior by the agent. It is therefore impossible to make sanctioning (say, terminating the relationship or harming the offender's reputation) contingent on the reason of breach.[1] Hence, principals are faced with a trade-off: Harsh sanctioning can help to daunt fraudulent agents and opportunistic behavior, but may also prevent *bona fide* trade from taking place as agents are generally assumed to be risk averse. No sanctioning, in turn, can support exchange, but also opportunistic behavior and adverse selection.

Contract flexibility may help in situations of uncertainty and induces an implicit sharing of risk between the contracting parties. Some literature suggests that it is regularly used in business relations in Kenya (Fafchamps et al., 1994), Ghana (Fafchamps, 1996), Zimbabwe (Fafchamps, 1997), and other economies in sub-Saharan Africa (Bigsten et al., 2000; Fafchamps, 2004). Vietnamese firms appear to be reluctant to retaliate against breaching trading partners, because it is not possible to perfectly distinguish between strategic default and "acts of nature" that are beyond an individual's or firm's control (McMillan and Woodruff, 1999).

Bigsten et al. (2000: 5) understand contract flexibility as a voluntary adjustment to particular environments or circumstances:

> "Flexibility arises when contractual performance is made explicitly or implicitly contingent upon external events affecting one of the parties. The idea is that a supplier who cannot deliver or client who cannot pay is allowed to renegotiate the contract and default from his or her original obligations. Flexibility is thus a form of insurance, of risk sharing."

To the best of our knowledge, there is so far no experimental research with subjects from low-income countries that investigates preferences for contract flexibility in a controlled environment, and additionally examines if the risk of a (production) shock directly and positively correlates with the use of flexible agreements. Identification issues, critical differences in political and market institutions or the impossibility to objectively evaluate risk make the use of

[1] Here we assume that courts cannot be used for various reasons, yet the problem is also likely to occur with the existence of a functioning legal system as many circumstances are unobservable to a third party.

observational data for studying contractual relations highly problematic (see, e.g., Just and Wu, 2009). Experimentation, by contrast, enables us to exogenously alter the trade environment while holding other influencing factors constant.

With this paper we contribute to both the experimental literature on behavior in contractual (principal–agent) relationships and the empirical literature on informal market institutions in the developing world. We address the question of whether poor individuals from sub-Saharan Africa, who are regularly affected by and vulnerable to external shocks, choose flexible over rigid contracts when trading in environments of high risk and asymmetric information. Moreover, we raise the question if flexible contracts are more often accepted relative to rigid ones and if agents exploit this discretion and act increasingly opportunistically. Finally, we explore whether both parties benefit from contract flexibility, especially in high-risk environments.

Following the taxonomy by Harrison and List (2004), we run an "artefactual field experiment"[2] with urban slum dwellers from Nairobi, Kenya. All subjects live in Kibera, the city's largest informal settlement and a playground for vivid informal economic activity. Residents' regular exposure to shocks and the many economic and social interactions beyond the reach of formal institutions make them a very relevant population for our study.

Using a modified investment game (based on Berg, Dickhaut, and McCabe, 1995), we intend to create a very simplistic and easily understandable setting of sequential exchange. Unlike the standard game, our version involves agreements and asymmetric information on the state of nature and, thus, realized surplus. We are only aware of very few other papers studying investment games with information asymmetries of this or similar kind (Coricelli, Morales, and Mahlstedt, 2006; Castillo and Leo, 2010; Clots-Figueras, Hernán Gonazáles, and Kujal, 2012), which are very different from our contribution in terms of design, research question

[2] The distinction between artefactual and framed field experiment is somewhat blurred. We believe that our study rather belongs to the former category as the use of field context and framing is still limited (see Harrison and List, 2004).

and study population, however. Technically speaking, we examine a problem of moral hazard with hidden knowledge or “post-contractual adverse selection” (Rasmusen, 2007, ch. 10). Arrow (1985) understands hidden knowledge—in distinction from hidden action problems—as the agent’s private information on a state (e.g., productivity). Others emphasize the timing of a particular information asymmetry and define hidden knowledge as one that occurs after a contract is signed (Holmström and Milgrom, 1987; Tirole, 1999). As argued above, this information and incentive issue is undisputedly common in many principal–agent relations in risky environments, but rather neglected in the behavioral and experimental economics literature.[3] We aim to fill this gap by applying the problem to a developing country context and investigate whether contractual flexibility provides a solution.

In our game, a first-moving principal can decide to transfer points to a second-moving agent, using a flexible or a rigid contract. With a certain probability the transferred amount is productive or subject to an external production shock. Yet this state is private information of the agent who can then return points to the principal. In case a rigid contract is used, repayment is considered a fixed amount, and if the agent cannot—or is not willing to—transfer the agreed points, she returns zero and the principal can harshly retaliate. If a flexible contract is used, the agent is free to also return any different amount, contingent on the observed state (which is unknown to the principal). This design enables us to compare preferences for contract flexibility and their allocative consequences in environments with different degrees of risk.[4]

[3] One reason for this is perhaps the experimental literature’s emphasis on problems of hidden action, where the state of nature (e.g., the quality outcome) is a random variable with a distribution contingent on the agent’s action choice. Another might be the oftentimes missing distinction against problems of adverse selection that appear before the contract is concluded. The situation examined in this paper is indeed similar, but not identical.

[4] It is, however, not suitable to investigate the aforementioned reference-points hypothesis (for experimental evidence see Fehr, Zehnder, and Hart, 2009; Erlei and Reinhold, 2010; Fehr, Hart, and Zehnder, 2011a; ibid., 2011b; Bartling and Schmidt, 2015). This is because in our design no response to outcomes of flexible agreements is possible and, moreover, the incomplete contracts literature throughout assumes symmetric information on the state of the world. Yet, the assumption that this state is public information is not realistic for many economic interactions. This is why we consider the distinction between an incomplete contract and a contract under asymmetric information as essential (as argued in Hart and Moore, 1988).

We find that the majority of observed interaction is realized through flexible agreements. In high-risk environments the probability of a flexible contract offer is significantly higher relative to the low-risk environment. Agents accept more flexible than rigid agreements when facing the threat of a negative shock. The high degree of flexibility is particularly surprising given that principals do not benefit from it and are in general better off when opting for rigid agreements. At the same time, rigid contracts lead to considerable welfare losses owing to extensive retaliation and the higher rejection rate in the conditions that exhibit risk.

The rest of our paper is organized as follows. In Section 2 we explain the experimental game, procedures and protocols. Section 3 reveals our theoretical predictions and hypotheses. Section 4 summarizes our main results. The last section concludes.

2. Experimental design

2.1 A modified investment game with contracts and hidden knowledge

In our sequential game, a principal and an agent player can conclude a contract on the transfer and repayment of points. The game is played for a finite number of $T = 8$ repetitions, following two practice periods in which no points can be earned. To largely avoid reputation effects, we use a stranger matching protocol and a principal player is not matched with the same agent in each period.[5] We conduct three different conditions with varying probabilities of an external shock in order to study subjects' behavior contingent on the degree of risk in the environment of trade. Both players receive the same initial endowment of $M = 10$ (points) at the beginning of a period.

[5] In sessions with 16 or more subjects we used a perfect stranger matching protocol. Yet, this was not possible in smaller sessions since not enough matching partners for eight periods were available (owed to no-shows). We believe, however, that subjects were practically unable to assess if there is a sufficient number of matching partners in the room and they are matched with one or two participants twice. We are thus optimistic that there is no systematic difference between smaller and larger sessions and the one-shot nature of the experiment is retained. When running regressions, we control for small sessions by including a dummy variable.

Our modified investment game consists of the following five stages:

STAGE 1 (Contract offer and choice)—The principal decides whether to offer the agent an agreement that can be flexible or rigid in nature, $c \in \{0, f, r\}$. As the terms "flexible" and "rigid" might be loaded and rather complicated, subjects chose between a blue (*mkataba wa bluu*) and a yellow agreement (*mkataba wa njano*). An agreement $c \neq 0$ states that the principal transfers her entire endowment $M = 10$ to the agent who returns R eventually. If $c = 0$, both players keep their initial endowments M. Note that unlike in the standard investment game the principal can only send all points or none (for a summary of the different contract terms see Table 1).

STAGE 2 (Contract acceptance)—The agent observes the potential contract offer and type. If $c \neq 0$, she decides whether to sign this contract and thereby accept its terms, $s \in \{0,1\}$. If $s = 0$, both keep their initial endowments; if $s = 1$ the principal's points are sent and we proceed to the next stage.

STAGE 3 (State of nature)—The agent (and only the agent) observes the state of nature ε which may be good (*hali nzuri*) or bad (*hali mbaya*), $\varepsilon \in \{g, b\}$ with $prob(\varepsilon = b) = p$ and $prob(\varepsilon = g) = 1 - p$. If $\varepsilon = g$, the amount sent by the principal will be tripled ($k = 3$) and the agent now owns 40. If $\varepsilon = b$, the transferred points remain unchanged ($k = 1$) and the agent now owns 20. The outcome of ε is and remains the agent's private information.

STAGE 4 (Contract performance)—The agent decides on the amount R she returns to the principal. If the agreement is flexible, then $R \in \{0,1, \ldots, 10 + 10k\}$. That is, the agent can send back any amount between zero and the maximum she owns (with k depending on ε). If a rigid agreement was chosen, then $R \in \{0,20\}$ and repayment can thus only be the amount of 20 fixed in the contract or nothing, respectively. That means, a rigid agreement stipulates an even division of surplus *in case the state turns out to be good*. In a bad state (where no surplus is produced), compliance would still be possible but leaves the agent with zero and therefore the loss of her endowment. The principal will not observe if a repayment of less than 20 points is due to an unfortunate situation beyond the agent's control or to opportunistic behavior (that, in reality, could be masked as an external shock).

STAGE 5 (Retaliation)—If a rigid agreement was chosen and $R = 0$, the principal can retaliate with reducing the agent's profit by $\delta \in \{0,15\}$ (δ can be interpreted, e.g., as damage to the agent's reputation). However, there is no contract enforcement possible. That is, δ does not influence the principal's payoff (π), only reduces the agent's (u) by 15 points. Table 1 summarizes the contract terms.

[Table 1 about here]

Both players' payoffs are summarized below.

(1) Payoff principal:
$$\pi = \begin{cases} 10 & \text{if } c = 0 \text{ or } s = 0 \\ R & \text{if } c \neq 0 \text{ and } s = 1 \end{cases}$$

(2) Payoff agent:
$$u = \begin{cases} 10 & \text{if } c = 0 \text{ or } s = 0 \\ 10 + 10k - R - \delta & \text{if } c \neq 0 \text{ and } s = 1 \end{cases}$$

If no contract is offered or signed, both players keep their initial 10 points. If they interact, the principal will earn whatever the agent returns. The agent's payoff consists of her own endowment and the principal's points sent (either tripled or unchanged), reduced by the amount she returns and the potential sanction in case of breaching a rigid agreement.

We first implement a so-called "LOW" condition, in which a bad state occurs with a probability of $p = 0.1$. Second, in the "HIGH" condition, probability of a bad state is $p = 0.5$. To have a comparison of how individuals behave without the general possibility of a shock, we run a few sessions of a third "NO SHOCK" condition ($p = 0$) in which a principal player, like in the standard investment game, has complete information on the realized surplus.

2.2 Discussion of design features

Before we turn to the experimental procedures and protocols, we discuss some of the choices we made with regard to our game. Note that in all conditions we use an extreme form of flexibility and mere "implicit" renegotiation, where the agent has full discretion on the repayment. This extreme form as well as the fact that an agent is aware of her discretion before accepting an agreement may seem little realistic. Similarly, one might argue that in reality a later (*ex post*) relaxation of rigid contract terms and an actual renegotiation are likely if the agent can credibly communicate the occurrence of a shock. With our design, however, we follow previous experimental studies examining flexible and rigid contracts, e.g., Fehr, Hart, and Zehnder (2011a) and Brandts, Charness, and Ellman (2012), and introduce a clear distinction between the two contract designs. The exclusion of "hybrid forms" allows us to make the difference between the two contract designs more salient and thus better capture individuals' preferences for flexibility or rigidity in exchange.

Moreover, one may claim that the rigid agreement differs from the flexible with respect to two elements: The reduced action space (agent has fewer return options) and the potential retaliation. However, we reckon that fixed repayment and punishment directly belong together and characterize a rigid contract design ("Either you send me what we agreed on, or I will retaliate"). With a flexible agreement the same reference value for repayment (20 points) is given by the contract. As a deviation from this reference value is allowed to facilitate risk sharing, though, no sanctioning can be possible by definition.

Further note that the potential retaliation amount of 15 points lies between M and $2M$. It is thus more than the unproductive transfer received by the agent in a bad state, but less than the “compliance amount” fixed in the rigid contract. As we do not intend to measure negative reciprocity (or the extent of altruistic punishment) and only the general threat of sanctioning is important to our design, we try to avoid overload and confusion by omitting punishment costs for the principal (as, e.g., de Quervain et al., 2004 do in one treatment).

In addition, one needs to bear in mind that in the LOW and HIGH condition the principal faces two different kinds of risk: the shock risk and what can be labeled the “strategic risk” of opportunistic behavior by the agent. Our design does not allow disentangling these different sources of risk. Even so, as subjects are randomly assigned to a condition we can assume that “strategic risk” and the perception thereof is distributed equally between conditions—and all differences in behavior and preferences trace back to a variation in shock risk.

Finally, we should briefly discuss why we decided against a compulsory contract offer by the principal (and a mere choice of contract type). We intend to examine a situation of *voluntary* contracting, in which both principal and agent have the chance to also refuse interaction. This is not only more realistic and generates more information; we additionally believe that a “forced” contract offer would be likely to influence the principal’s decision on the contract type, which, in turn, results in a biased statement of preferences.[6]

2.3 Subject pool, lab environment, and procedures

We ran our experiment with subjects from the Kibera slum in Nairobi, Kenya, the city’s largest informal settlement with an estimated 170,000–270,000 residents.[7] A closer look at the life in the slum reveals that, in particular, two instances make Kibera residents a very relevant population for our study.

[6] For example, a player who is reluctant to send her points in our game might be biased towards a rigid contract design if forced to offer an agreement. As a consequence, the flexible–rigid contract ratio would alter compared to a situation with voluntary exchange.

[7] For long time, Kibera was considered the biggest African slum with an estimated population of up to 1.5 million. An official census in 2009 and investigations by the *Map Kibera Project* drastically refuted and scaled down these figures, however (see, e.g., Karanja, 2010).

First, there is a widespread engagement in economic activity outside the reach of formal institutions and regulations (for a portrayal of the slum's business practices see The Economist, 2012). In Kenya, about 11.2 million people (more than 80 percent of workforce) are estimated to have a job in the informal sector, and the rate is increasing (KNBS, 2014). According to the country's statistical service, "[t]he informal sector is characterized by small scale-activities that are semi-organized [and] unregulated […]. The sector plays a vital role in the economic development by increasing competition, fostering innovation, besides generating employment" (ibid.: 78). Compared to the country's average, the scope of informal economic activity is likely to be even higher in Kibera, a place without any formal legal basis (Amis, 1984). In fact, legal institutions are hardly ever used for settling conflicts about property rights or contractual issues. Instead, besides bilateral negotiations, enforcement in Kibera relies on ethnic gangs or community based NGOs (Joireman and Vanderpoel, 2010). Both lack proper legal status and come with considerable social cost (gangs) or are only semi-effective (NGOs).

Second, interviews with business owners during field trips suggest that dwellers are regularly affected by unpredictable events and shocks (health, production, weather, etc.). Usually, informal insurance mechanisms, such as borrowing from friends and neighbors, are used to cope with these risks.

All of the above indicates a need for private ordering and flexibility when engaging in exchange with others. At the same time, potential preferences for flexibility are unlikely to be overestimated, since trust levels in the slum have been reported to be particularly low. While Kenya in general is regarded as a country with abundant corruption and a very low level of mutual trust among people (Camerer, 2003, ch. 2.7), Kibera gained reputation as "a place considered among those in the world where cooperation and trust/trustworthiness are scarcest" (Becchetti, Conzo, and Romeo, 2014: 284).

Our experimental sessions were run between July and August 2014 in the Busara Center for Behavioral Economics close to the slum. The Busara Center is affiliated to the NGO Innovations for Poverty Action Kenya (IPA-K) and offers a state-of-the-art infrastructure for behavioral research, including a laboratory with twenty touchscreen computers (for details see Haushofer et al., 2014).

Participants were randomly invited from the Busara subject pool of roughly 2,500 Kibera residents via SMS. As a sufficient understanding of probabilities is crucial to our study, subjects were required to have a minimum level of education, namely completed primary school. Upon arrival, facilitators confirmed participants' identity via fingerprint and randomly assigned them to a computer booth. After signing a consent form, everyone completed a short test to prove sufficient ability to handle the touchscreen. Experimental instructions were read aloud and explained in Swahili while subjects received an English handout with figures and important concepts of the game, such as an overview of the different agreements, the decisions and the probabilities.[8] After individual queries were answered, participants went through a number of comprehension questions. Like all on-screen elements, these questions were programmed by the software package z-Tree (Fischbacher, 2007) and did not allow subjects to merely guess answers in a trial-and-error manner. If a participant got an answer wrong, a facilitator was required to "unlock" the screen and explain the respective part of the experiment again. Only after everyone successfully completed all questions, the game started with two practice rounds and proceeded with eight "real" periods, in which points could be earned.[9] Following this game, another short experimental test was conducted (not reported here) and subjects filled a post-experimental survey.

[8] See Appendix for an English version of the instructions, the handout and comprehension questions.

[9] In the post-experimental survey, subjects assessed their own understanding of the game with 4.08 on a scale reaching from 1 ("very poorly") to 5 ("very well"). We thus believe that the general comprehension level was sufficiently high.

At the end of a session, participants were informed about their earnings from the game they will obtain in addition to a show-up fee of KES 200.[10] While they received this show-up fee in cash (for transport), additional earnings were transferred to the participants' MPesa accounts (again, see Haushofer et al., 2014 for details). One point earned in the game was exchanged to KES 2 resulting in an average payment of KES 420 (in total; excluding earnings from the second experiment not reported here). A typical session lasted approximately two hours.

We ran a total of 15 sessions; six of the LOW, six of the HIGH, and three of the NO SHOCK condition. A session was attended by at least 12 and at the most 20 subjects, which yields a total number of 240 participants. The differences in turnout between the sessions are owed to no-shows.

3. Behavioral predictions and hypotheses

Under the assumption of full rationality and exclusively selfish preferences, the theoretical solution of the standard investment game also holds here. Anticipating that the agent will not return anything, the principal decides not to send her points and both leave the game with their initial endowments. As our game explicitly contains two different types of contract and the chance for a negative shock, we still need to determine the agent's best response if an agreement is being offered. It is straightforward to see that there is no reason *not* to sign a flexible agreement, as the agent (like in the standard investment game) can freely decide how much she returns and sanctioning is ruled out. With a rigid contract, though, a rational response is not so obvious. If a bad state occurs and the agent returns the fixed amount of 20,

[10] At the time of the study USD 1 was worth about KES 88. Earnings were well above participants' average opportunity costs of time. Average monthly income in our sample is KES 4.800 as stated by the participants.

she is left with 0. If she returns 0 and is being punished, she earns 5 which, again, is lower than her payoff without interaction. In general, the agent accepts a rigid contract if

(3) $$E[u(c = r)] \geq M,$$

that is, her expected payoff from interaction is at least as high as her reservation payoff. Analogous to (2), the agent's expected payoff in case of a rigid contract is

(4) $$E[u(c = r)] = 10 + 10p + 30(1 - p) - R - \delta$$

with $0 \leq p \leq 1$, $R \in \{0,20\}$ and $\delta \in \{0,15\}$.

As a return of $R = 20$ is higher than the potential sanction $\delta = 15$, we can assume that the agent knows she will always breach the contract. Hence, her expected payoff becomes

(5) $$E[u(c = r)] = 40 - 20p - \delta.$$

Thus, even if the agent conservatively expects the principal to always retaliate, (3) is satisfied with a shock probability of $p \leq \frac{3}{4}$. Consequently, a risk-neutral agent accepts every contract, even in the HIGH condition.

Contrary to the backward induction solution, the experimental literature on investment games suggests that there is a non-negligible number of individuals who do trust and reciprocate (for a meta-analysis see Johnson and Mislin, 2011; for a developing country survey see Cardenas and Carpenter, 2008). Some papers even report investment/trust game results from the Nairobi slums in particular (Greig and Bohnet, 2008; Becchetti, Conzo, and Romeo, 2014). Following these studies, we expect a proportion of subjects to show willingness to interact and examine the following four hypotheses.

HYPOTHESIS 1: *The higher the risk of a bad state in the environment of exchange, the more likely principals are to offer a flexible contract.*

Hypothesis 1 predicts that subjects have preferences for flexibility and risk sharing in environments with high risk, based on their experience with informal money lending or insurances and their own business activities. As argued above, one reason is that agents are expected to dislike rigidity when risk is high and shocks are private knowledge (cf. hypothesis 2); thus principals may choose flexible contracts to increase the likelihood that their offer will be accepted. Second, in a bad state the principal might expect the agent to reciprocate and to return at least the investment M, which is possible under flexibility.

HYPOTHESIS 2: *Agents are more likely to sign flexible than rigid contracts. They are particularly reluctant to sign rigid contracts in the high-risk environment.*

Hypothesis 2 is closely related to hypothesis 1, but considers the agent's perspective. Agents fear retaliation if they experience a bad state and do not return the agreed amount (they are left with zero if they do). Hence, they always prefer flexible agreements—and more so if the probability of experiencing a shock is high.

While our focus is on the preferences for different contract designs and thus on hypotheses 1 and 2, we also formulate expectations about the agent's *ex post* behavior and both players' benefits under the different contractual arrangements.

HYPOTHESIS 3: *With flexible agreements agents more often fail to return 20 points and show more opportunistic behavior relative to rigid contracts.*

There are two reasons why we expect this. First, a flexible contract allows agents to adapt to bad states without having to return nothing at all to the principal. This is the potential advantage and risk-sharing function flexibility provides. Second, even in a good state agents do not fear consequences when returning less than 20. This is what can be interpreted as opportunistic behavior.

HYPOTHESIS 4: *In the high-risk condition, both players benefit from using flexible agreements. Yet, this does not hold in the other conditions.*

This hypothesis is based on the premise that *ex post* flexibility can potentially lead to better outcomes than rigidity in environments where external shocks are likely (Fafchamps, 2004; Bigsten et al., 2000). Therefore, even if agents in general return fewer points with flexible agreements as posed by hypothesis 3, these contracts still lead to more interaction and higher returns in the HIGH condition where zero returns otherwise would occur frequently.

4. Results

In this section we report and discuss our experimental findings. Our focus is on the players' *ex ante* behavior, namely, their preferences for a certain contract design (Sections 4.1 and 4.2). Findings on repayment and allocative outcomes will be reported in Section 4.3. Besides showing descriptive results, we mainly rely on regression analysis.[11] Table 2 summarizes descriptive statistics for our major findings and selected socio-demographic variables.

[Table 2 about here]

4.1 Preferences for contract flexibility I: contract offers

We start by analyzing the principal's behavior. As the descriptive results in Table 2 reveal, contract offers by the principal—and thus the willingness to send all points to the agent—are with 58–77 percent well above the theoretical prediction of zero offers. This is especially remarkable as players have to send their entire endowment and survey results indicate a *very*

[11] In experimental research, commonly non-parametric tests (e.g., Mann-Whitney U test) are used for comparing the outcomes between treatments. These tests, however, are run based on entirely independent observations. Due to our stranger-matching protocol, conservatively speaking, we only obtain six (HIGH and LOW), respectively three (NO SHOCK), independent observations per condition. Even though other studies with a comparable number of sessions do not refrain from using non-parametric tests, we believe that the number of observations is insufficient to reliably test hypotheses using this method. Therefore, we run regressions at the participant level controlling for cluster-correlated standard errors at the session (i.e., independent observation) level.

low level of general trust in others.[12] In the LOW condition the rate of contract offers is significantly higher than in the other two conditions.

However, unlike examinations of the standard investment game we are not primarily interested in the general level of trust and interaction, but rather in the endogenous choice of contract design. Generally speaking, two out of three agreements offered by a principal are flexible. The share of flexible agreements in the HIGH condition is 73 percent and thus, as predicted by our first hypothesis, higher than the share in the other conditions (around 64 percent).

[Table 3 about here]

The results of different probit regressions reported in Table 3 largely confirm these descriptive findings. In all specifications, *Flexible contract* is the dependent variable, taking the value of 1 if an offered agreement is flexible and 0 if it is rigid. The estimates suggest that the offer of a flexible contract is significantly more likely in the HIGH relative to the LOW condition (LOW is the omitted category in all regressions). Yet, the magnitude of the average marginal effect of HIGH ranges between 8 and 11 percentage points, when considering all eight periods (models (1) to (4)), and is thus not very large.

One potential explanation for the relatively small effect size is that we use a between-subject design, implying that individuals are not able to compare risk levels. Vice versa, if the same subject witnessed a gradual increase in risk, the treatment effect would likely be larger due to the existence of reference values.[13] Another potential reason is alignment. It takes time for a subject to learn the optimal (or presumably optimal) behavior within the course of a session. Since for a principal the risk of a bad state and the strategic risk of an agent acting opportunis-

[12] As a matter of fact, 98 percent of respondents answered the question "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" with "Need to be very careful".

[13] We decided to vary the level of risk only between conditions, because the inclusion of different probabilities within conditions would have increased the complexity of the experiment.

tically co-exist (cf. Section 2.2), she certainly requires some periods to shape expectations, in particular, about the latter form of risk. In the second half of periods, when principals are more experienced with the game and have formed specific expectations about agents' behavior, the HIGH–LOW difference becomes larger and more significant. Models (5) and (6) in Table 3 consider only periods 5–8, where a principal, who is willing to send points, is (on the average) up to 24 percentage points more likely to offer a flexible contract in the HIGH compared to a principal in the LOW condition. Yet, we find no difference between the LOW and NO SHOCK conditions.

Models (1) to (5) additionally reveal a slight general decrease of offered contract flexibility over time. In model (3) we add interaction terms of the condition dummies and *Period*.[14] The coefficient of *HIGH* × *Period* suggests that the decrease over time is smaller for the HIGH condition, but this result is not significant.

Moreover, model (4) contains an explanatory variable on stated risk preference. The variable takes a value between 1 and 5, depending on how much the subject agreed with the statement "I would invest part of my income if there is a chance that this amount doubles, but also that I lose everything" on a 5-point Likert scale. The coefficient is significant at the 5-percent level, suggesting that the likelihood of an offered contract being flexible increases with decreasing risk aversion. We also find that, controlling for risk preference, the coefficients and marginal effects of *HIGH*, *NO SHOCK* and *Period* do not change considerably compared to model (2).

RESULT 1: *The majority of offered agreements are flexible. Principals are significantly more likely to offer flexible contracts in the high-risk environment compared to the condition with low probability of a shock. The effect becomes particularly strong in the second half of a session when principals have formed expectations about the agents' behavior. This confirms part of hypothesis 1. However, there is no difference between the LOW and NO SHOCK condition.*

[14] We refrain from reporting marginal effects for probit regressions with interaction terms, as they do not correspond with the true interaction effects in nonlinear models (Ai and Norton, 2003).

4.2 Preferences for contract flexibility II: contract acceptance

We now turn to the agent's behavior and, to begin with, her decision about signing or rejecting a contract offer. Our descriptive results in Table 2 indicate that 82–86 percent of all offers are being accepted, without significant differences between conditions. This is somewhat below the theoretical agent's best response of signing every contract irrespective of the condition. Figure 1 suggests that agents have a higher propensity to sign flexible compared to rigid agreements in the conditions with a potential bad state (HIGH and LOW). There is no such discrimination between contract types in the NO SHOCK condition.

[Figure 1 about here]

The regression results in Table 4 confirm the descriptive findings. Estimated models are probit regressions with contract acceptance as dependent variable, taking a value of 1 if an agreement is signed by an agent and 0 otherwise. We do not find a difference in contract acceptance between the conditions. Acceptance in general (independent of contract type) increases over time at a very marginal rate and flexible agreements are more likely to be signed by an agent relative to rigid ones. The latter finding is significantly smaller and even seems to vanish for the NO SHOCK treatment (model (2)), as also apparent in Figure 1. The preference for flexible contracts in the LOW and HIGH conditions is plausible, if agents fear rigid terms of repayment and harsh sanctioning in the event of a shock (even though based on the expected payoff they should accept rigid contracts as well). When no shock can occur by design, there is also no risk for the agent to lose anything, which is reflected in the lack of discrimination between contract types in the NO SHOCK condition.

[Table 4 about here]

In addition, hypothesis 2 predicts an agent's particular reluctance to sign a rigid agreement when the probability of a bad state is high. Based on our data, we cannot confirm this part of hypothesis 2. The coefficient of the interaction term *HIGH* × *Flexible contract* is not statistically significant, suggesting that preferences for flexible agreements of agent players in the high-risk environment are not different from those in the low-risk condition.

RESULT 2: *Agents are more likely to sign a flexible contract relative to a rigid one in environments that exhibit a general risk of shock. They fear principals' retaliation if a bad state prevents them from complying with the contract terms, given that knowledge of the shock is hidden. This confirms part of hypothesis 2. However, we cannot find evidence for the conjecture that agents are particularly reluctant to sign rigid agreements when risk is high.*

4.3 Contractual flexibility, opportunistic behavior, and benefits from interaction

In this section we analyze the agents' post-contractual behavior as well as the contractual outcome for both players. Since repayment options for the agent differ between the contract designs (that is, they are very restricted with a rigid and very numerous with a flexible agreement) a direct comparison of repayment averages is, strictly speaking, not possible.

Therefore, Figure 2 depicts agents' repayment of more than zero (panel (a)) and of 20 points or more (panel (b)) for the various states and contract types. For the rigid contract, of course, both panels are congruent. It confirms our intuition that agents more often return "at least something" with flexible agreements (panel (a)). This holds true for both states, even though the difference between contract designs is larger when the state is bad. At the same time, however, full compliance with the contract terms is much more frequent with rigid agreements (panel (b)). Interestingly, in the case of flexible contracts the difference in full compliance between the states is not large at all.

[Figure 2 about here]

The first part of Table 5 shows results of a linear regression with the amount of points sent back by the agent as dependent variable. As we are now in the *ex post* "contract performance stage" and the state-of-nature outcome is known to the agent, we omit variables for the different conditions in the regressions. We find a slight decrease in repayment over time as well as a significantly higher return rate in a good state. Points sent back by the agent do not differ significantly between flexible and rigid contracts. When interpreting this result, however, it should be kept in mind that repayment amounts are hardly comparable between the contract types, as pointed out above.

[Table 5 about here]

The finding that agents return more in a good state may be due to various factors. In the traditional investment game, the second mover's choice has typically been interpreted as reciprocity. However, given that the state in our game is a result of chance, pure reciprocity can only partly explain why agents return more when the state is good; even though one could argue that the principal's decision to offer a contract was a necessary precondition for the agent to gain this surplus. In addition, inequity aversion (as according to the famous model by Fehr and Schmidt, 1999) as well as a positive income effect on giving, confirmed by several studies (e.g., Yen, 2002; Chowdhury and Jeon, 2014), can serve as explanations for the positive effect of a good state on repayment (see, e.g., discussion in Johnson and Mislin, 2011). We believe that a combination of agents' other-regarding preferences and the high "income" when observing a good state leads to the higher repayment rate—which, in fact, is only higher in absolute terms but not relative to productivity.

The probit models in the second part of Table 5 treat negative deviations from a repayment of 20 points (as agreed in the rigid and benchmark in the flexible contract) as a binary dependent variable, taking a value of 1 if an agent returned less than 20, and 0 otherwise. We find that a return of less than 20 is, on the average, about 30 percentage points more likely with a flexible contract. The *State of nature* coefficient is also significant and negative, indicating that a good state decreases the likelihood of less-than-20 returns.

Yet, these regression models do not provide definite information about the occurrence and severity of opportunistic behavior, as they do not allow for differentiating between risk sharing and opportunism. We define opportunistic behavior by the agent as a repayment of less than 20 points *in case of a good state*.[15] This way, we clearly distinguish between use and abuse of contract flexibility.

Consequently, the regressions in the third part of Table 5 use the dummy *Opportunistic behavior* as dependent variable, taking a value of 1 if an agent acted opportunistically according to the aforementioned definition and 0 if repayment was at least 20 or less than 20 in a bad state. We find that an agent is about 23 percentage points more likely to act opportunistically if a flexible agreement is being used.[16]

RESULT 3: *We confirm hypothesis 3 that agents fail significantly more often to return 20 points with flexible agreements. Similarly, opportunistic behavior (defined as a return of less than 20 in a good state) is more likely if interaction is facilitated by flexible contracts—although agents more often return at least some positive amount irrespective of the state. Evidently, the repayment amount is positively associated with a good state of nature and agents, to some extent, share a surplus.*

Before we turn to the contractual outcomes and payoffs, we should stress that this study is not about optimal contracts. In Section 2.2 we argue that we deliberately choose an extreme form of flexibility and an easy setting of sequential exchange. Evidently, both contract designs are rather unfavorable for the principal and therefore not very likely to be selected for real-world exchange.[17] The absolute performance of the two agreements is thus not of primary interest to

[15] We could extend this definition by including returns of less than 10 points in a bad state. This would only marginally change our regression results in Table 5 (models (6) and (7)).

[16] All estimated models in Table 5 remain robust if we include dummies for the six main ethnic groups—Luo, Luhya, Nubian, Kisii, Kikuyu and Kamba—represented in our experiment. In total, 230 of our 240 participants (96 percent) belong to one of these six ethnicities. We do not find any significant differences between subjects from different ethnicities regarding repayment amounts, return of less than 20, or opportunistic behavior.

[17] See the introduction in Hart (1995) for a nice illustration of why it is important that contracts allow for a reasonable sharing of *ex post* control.

us. Instead, we pay more attention to the comparison of the two contract types in the given situation.

Figure 3 plots the players' average payoffs *in case a contract was concluded*. While panel (a) reveals that sending points barely pays for the principal—a fact often observed in investment games (see, e.g., Camerer, 2003; Cardenas and Carpenter, 2008)—panel (b) suggests that agents derive substantial benefits from interaction. Moreover, we find that agents' mean pay-off from exchange decreases with increasing risk level and that across all conditions they are better off with flexible agreements. This latter observation is partly due to the fact that princi-pals retaliate in 83–97 percent of the cases when agents breach a rigid contract (cf. Table 2).

Panel (c) illustrates the total surplus both players could realize through interaction in the vari-ous conditions. Besides the negative welfare effect of production shocks, indicated by the changes in total payoff between conditions, an efficiency loss with contractual rigidity be-comes evident. This loss originates from the frequent retaliation and is also very likely in real-world exchange if an *ex post* adjustment of contract terms is completely ruled out. More often than not, subjects retaliate at the expense of total welfare—and other studies on cooperation show that this result holds even if retaliation is costly to the punisher (Fehr and Gächter, 2002).

[Figure 3 about here]

RESULT 4: *We have to reject hypothesis 4 that both players benefit from contract flexibility in the high-risk environment. The agent indeed does, but so she does in the other conditions. For the princi-pal, if sending points at all, rigid agreements are always superior. At the same time, rigid agreements lead to substantial welfare losses as principals extensively retaliate against reneging agents.*

5. Conclusion

Contract flexibility can support exchange in risky environments, but also encourage post-contractual opportunism. In an artefactual field experiment with slum dwellers in Nairobi, Kenya, we investigate preferences for contract flexibility, when subjects face different levels of risk and the common problem of hidden knowledge. Moreover, we examine the occurrence of opportunistic behavior and the contractual outcomes for both parties.

Our main contribution is to show that strong preferences for flexibility exist among slum dwellers and they become even stronger in a high-risk environment (compared to a low-risk). This is no surprise in the agent's case. Yet, considering that the principal is doing worse with a flexible agreement *in all conditions* and opportunistic behavior by the agent is encouraged, the question remains why offering flexibility is this prevalent after all.

One explanation could be the existence of corresponding social norms. Offering rigid exchange without flexibility but with the threat of punishment may be considered rude. This argument becomes flimsy against the backdrop of the heavy actual retaliation we observe. A second potential explanation is that principals, analogously to the wage premium in a gift-exchange game, hope to trigger positive reciprocity by offering a flexible contract. Similarly, anticipated "hidden costs of control", as reported by Falk and Kosfeld (2006), could have restrained subjects from using rigid contracts. Yet, the high amount of points being controlled in our study and the possible retaliation imply that these control costs are small if not negligible. Note, though, that none of these arguments can explain the differences between conditions.

Our findings do not only shed light on real behavior and actual preferences in developing countries' informal markets, but also suggest some implications for the design of contracts (or implicit agreements) in environments where hazards and information problems are ubiquitous. Accordingly, contracts should take account of the strong preferences and need for flexibility we observe in our controlled experiment. Without flexibility economic exchange is less likely to occur, which, in turn, can result in welfare losses. Nonetheless, to mitigate post-contractual opportunism and make contract flexibility beneficial for both parties, these agreements must allow for a more elaborated sharing of *ex post* control.

Also from a policy perspective it is a noteworthy fact that flexibility may be desirable to facilitate exchange, but is easily exploited. Solutions thus need to target a stronger symmetry of information in markets (e.g., through monitoring or networks). When shocks are likely, flexibility is preferable to institutions that rigidly enforce all contracts and, that way, ignore the risk-sharing capability and welfare potential of contract flexibility.[18] In environments where third-party enforcement is ruled out, private institutions—designed or spontaneously arising—may take over the task of information provision. We found that hidden knowledge does not prevent exchange and interaction altogether, but mere flexibility seems not sufficient to achieve a fair division of a surplus.

There are at least three aspects of contract flexibility that we ignore in our study but ought to briefly mention at this point. First, the literature often associates flexibility with long-term relationships. Indeed, relational contracts, in the sense of a repeated game, would be likely to discourage opportunism to a certain degree (see, e.g., Kunte, Wollni, and Keser, 2014) and thus highlight the risk-sharing function of flexible agreements. As we intended to examine the pure link between risk and contract flexibility, we tried to avoid reputational effects. Second, the opportunity for communication may alter the efficiency of flexible agreements. Brandts, Charness, and Ellman (2012) show that contract flexibility coincides with less grievance and better outcomes if unrestricted communication between contracting parties is possible. Third, and related, a proper renegotiation that is *ad hoc* and different from our unconditional flexibil-

[18] In fact, this positive effect on efficiency is twofold: First, we find that flexible contracts encourage interaction and thus the possible creation of gains. Second, no resources are being wasted by means of retaliation.

ity is indeed more promising for solving hidden knowledge problems of the kind introduced in this study. We must leave it to future research to take these aspects into account.

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TABLE 1.—Rigid and flexible contract terms

		Rigid contract $(c = r)$	**Flexible contract** $(c = f)$
Contract specifications	**“quid”**	Principal’s endowment M	Principal’s endowment M
	“quo”	Fixed amount of $2M$	Also more or less than $2M$ contingent on ε (unobservable to the principal)
	Consequences of $\boldsymbol{R < 2M}$	Agent returns 0, principal can retaliate by δ	Agent returns “what she can”, no retaliation possible

TABLE 2.—Summary statistics and descriptive results

	(1) LOW	(2) HIGH	(3) NO SHOCK	Difference (1)–(2)	(1)–(3)	(2)–(3)
Demographic and economic variables						
Age (in years)	32.81 (10.97)	30.78 (9.40)	29.90 (9.32)	2.03	2.91	.88
Gender (1 = female)	.500 (.503)	.612 (.490)	.510 (.505)	–.112	–.010	.102
Number of children	1.91 (1.99)	1.61 (1.66)	1.30 (1.40)	.30	.61*	.31
Marital status						
Single	.467 (.502)	.531 (.502)	.480 (.505)	–.064	–.013	.051
Married, cohabitating	.435 (.498)	.418 (.496)	.440 (.501)	.017	–.005	–.022
Divorced, separated, widowed	.098 (.299)	.051 (.221)	.080 (.274)	.047	.018	–.029
Education, attended§ (1 = primary, 2 = secondary, 3 = tertiary)	2.10 (.367)	2.19 (.397)	2.16 (.370)	–.09*	–.06	.03
Job (1 = has currently a job)	.293 (.458)	.265 (.444)	.220 (.418)	.028	.073	.045
Descriptive results						
Contract offer (1 = contract offered)	.774 (.419)	.579 (.494)	.580 (.495)	.195***	.194***	–.001
	N = 368	*N = 392*	*N = 200*			
Flexible contract offered (1 = flexible; 0 = rigid)	.642 (.480)	.727 (.447)	.647 (.480)	–.085**	–.005	.080
	N = 285	*N = 227*	*N = 116*			
Contract acceptance (1 = contract signed)	.821 (.384)	.863 (.344)	.828 (.379)	–.042	–.007	.035
	N = 285	*N = 227*	*N = 116*			
Points returned (by agent if interaction)	9.71 (8.72)	7.79 (8.64)	9.63 (9.41)	1.92**	.08	–1.84*
	N = 234	*N = 196*	*N = 96*			
Payoff principal (including non-interaction)	9.82 (6.95)	8.90 (6.20)	9.82 (6.50)	.92*	.00	–.92*
	N = 368	*N = 392*	*N = 200*			
Payoff agent (including non-interaction)	20.25 (10.98)	15.24 (10.10)	18.81 (10.98)	5.01***	1.44	–3.57***
	N = 368	*N = 392*	*N = 200*			
Retaliation (1 = retaliated)	.971 (.171)	.833 (.381)	.867 (.352)	.138*	.104	–.034
	N = 34	*N = 24*	*N = 15*			

Notes: Data are reported as means with standard deviations in parentheses; significance levels of 1% (***), 5% (**), and 10% (*) refer to two-sample *t* tests; §variable is ordinary, means are thus for information only

TABLE 3.—Probability of flexible contract offers

	Dep. Variable: Flexible contract										
	(1)	ME	(2)	ME	(3)[1]	(4)	ME	(5)	ME	(6)	ME
HIGH	.238** (.116)	.083**	.307*** (.112)	.099***	–.067 (.286)	.341*** (.113)	.109***	.591*** (.123)	.212***	.733*** (.145)	.236***
NO SHOCK	.017 (.117)	.006	.274 (.198)	.089	.199 (.305)	.230 (.204)	.075	.075 (.175)	.029	.323 (.255)	.111
Period	–.061** (.026)	–.022**	–.064** (.026)	–.020**	–.097** (.045)	–.062** (.026)	–.020**	–.086* (.052)	–.031*	–.072 (.055)	–.023
HIGH × Period					.084 (.053)						
NO SHOCK × Period					.018 (.057)						
Risk preference						.114** (.056)	.036**				
Constant	.640*** (.144)		1.088*** (.382)		1.237*** (.396)	.534 (.377)		.614** (.310)		.763 (.652)	
Socio-demographic controls	No		Yes		Yes	Yes		No		Yes	
Control for small session	Yes		Yes		Yes	Yes		Yes		Yes	
Periods considered	All		All		All	All		Only 5–8		Only 5–8	
N	628		599		599	599		296		280	
Pseudo R^2	.015		.107		.110	.114		.034		.131	

Notes: Table shows results for probit regressions; LOW is the omitted treatment; robust standard errors (in parentheses) are adjusted for clustering at the session level; ME columns report the average marginal effects (dy/dx); socio-demographic controls include variables on age, gender, education, employment, marital status and number of children; small session dummy is 1 if number of subjects attending the session < 16, and 0 if number of subjects ≥ 16 (i.e., perfect stranger matching is possible); *** indicates significance at 1%, ** significance at 5%, and * significance at the 10% level

[1] We are not estimating marginal effects for this model as it contains interaction terms. Since the regression is nonlinear, MEs do not correspond with interaction effects (Ai and Norton, 2003).

TABLE 4.—Probability of contract acceptance by agents

	Dep. Variable: Contract acceptance				
	(1)	ME	(2)[1]	(3)	ME
HIGH	.119 (.197)	.027	.081 (.253)	.101 (.229)	.022
NO SHOCK	–.016 (.384)	–.004	.464 (.299)	–.036 (.368)	–.008
Period	.044** (.017)	.010**	.044** (.019)	.048** (.019)	.011**
Flexible contract	.676*** (.181)	.176***	.815*** (.180)	.691*** (.184)	.168***
HIGH × Flexible contract			.056 (.470)		
NO SHOCK × Flexible contract			–.799*** (.235)		
Constant	.357** (.165)		.276** (.135)	1.544** (.746)	
Socio-demographic controls	No		No	Yes	
Control for small session	Yes		Yes	Yes	
N	628		628	628	
Pseudo R^2	.057		.069	.110	

Notes: Table shows results for probit regressions; LOW is the omitted treatment; robust standard errors (in parentheses) are adjusted for clustering at the session level; ME columns report the average marginal effects (dy/dx); socio-demographic controls include variables on age, gender, education, employment, marital status and number of children; small session dummy is 1 if number of subjects attending the session < 16, and 0 if number of subjects ≥ 16 (i.e., perfect stranger matching is possible); *** indicates significance at 1%, and ** significance at the 5% level

[1] We are not estimating marginal effects for this model as it contains interaction terms. Since the regression is nonlinear, MEs do not correspond with interaction effects (Ai and Norton, 2003).

TABLE 5.—Regression analyses of repayment, less-than-20 returns, and opportunistic behavior

	OLS Dep. Variable: Repayment			*Probit* Dep. Variable: Return < 20				*Probit* Dep. Variable: Opportunistic behavior			
	(1)	(2)	(3)	(4)	ME	(5)	ME	(6)	ME	(7)	ME
Flexible contract	–1.605 (1.025)	–.827 (.938)	–1.542 (1.158)	.842*** (.172)	.297***	.838*** (.186)	.293***	.591*** (.183)	.226***	.598*** (.192)	.227***
State of nature	3.469*** (.740)	4.210** (1.590)	3.623*** (.744)	–.383*** (.139)	–.113***	–.387*** (.142)	–.114***				
Flexible contract × State of nature		–1.002 (1.720)									
Period	–.337* (.162)	–.339* (.160)	–.319* (.161)	.035 (.025)	.011	.035 (.026)	.011	.023 (.029)	.009	.023 (.030)	.008
Constant	10.066*** (1.208)	9.501*** (1.447)	11.447 (6.625)	.012 (.146)		–.414 (.744)		–.641*** (.189)		–.699 (.628)	
Socio-demographic controls	No	No	Yes	No		Yes		No		Yes	
Control for small sessions	Yes	Yes	Yes	Yes		Yes		Yes		Yes	
N	526	526	526	526		526		526		526	
(Pseudo) R^2	.058	.058	.082	.087		.095		.051		.061	

Notes: Table shows results for OLS and probit regressions; LOW is the omitted treatment; robust standard errors (in parentheses) are adjusted for clustering at the session level; ME columns report the average marginal effects (dy/dx); socio-demographic controls include variables on age, gender, education, employment and number of children; small session dummy is 1 if number of subjects attending the session < 16, and 0 if number of subjects ≥ 16 (i.e., perfect stranger matching is possible); *** indicates significance at 1%, ** significance at 5%, and * significance at the 10% level

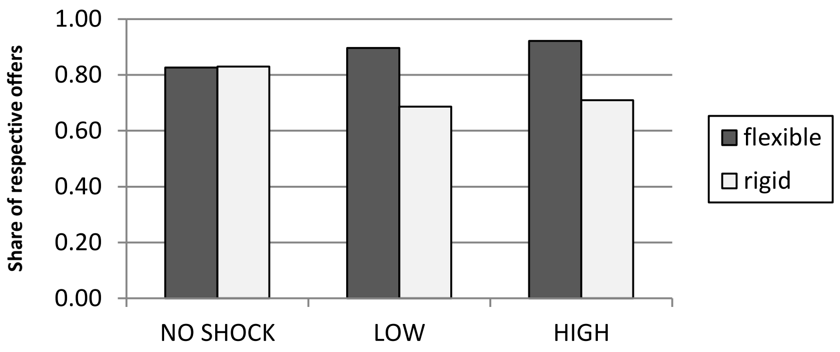


FIGURE 1.—Signed flexible and rigid agreements by agents (as share of respective offers of this contract type in a treatment)

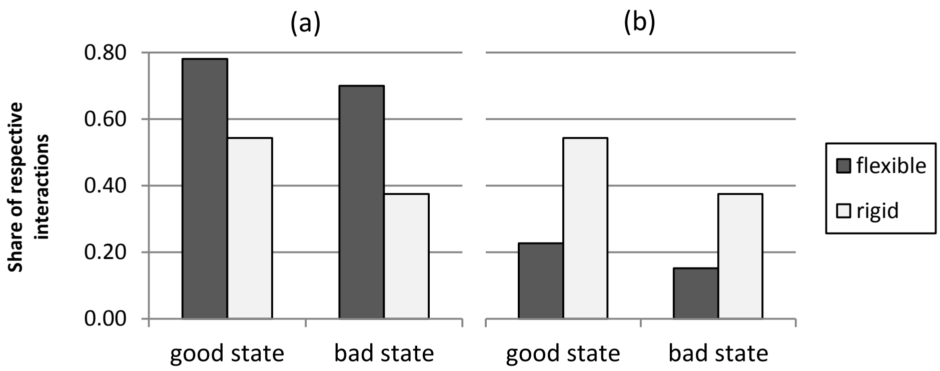


FIGURE 2.—Agents' return of (a) more than zero and (b) 20 points or more (as share of respective interactions with this contract type in a certain state)

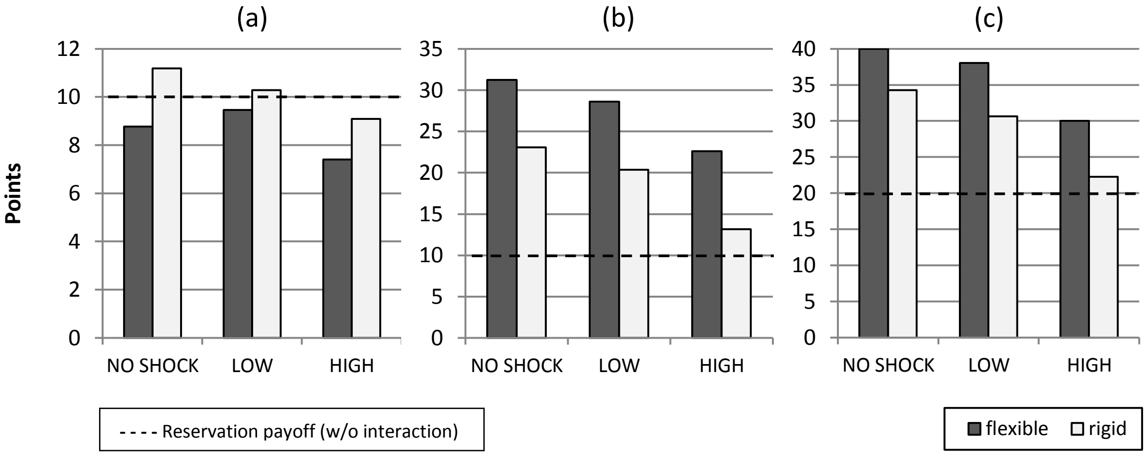


FIGURE 3.—Mean payoffs of (a) principal, (b) agent and (c) mean total payoffs of both players (in case of interaction)

Appendix: Experimental instructions and handout[*]

Thank you very much for joining this study!

You will participate in an economic experiment that studies behavior for scientific purposes. Please carefully follow the instructions below.

We play a game in which you will earn money. How much you earn depends on your own decisions and on the decisions by other players. Henceforth, please do not talk to other participants, keep your phone switched off and do not read any magazines or books you might have brought.

In this game, two players have the opportunity to interact, called Player 1 (**P1**) and Player 2 (**P2**). Both players will receive 10 points at the beginning of each round. Points are worth real money and both players may increase their points when they interact. P1 can send his points to P2. The points sent will triple (in a **good** state) or remain unchanged (in a **bad** state). Only P2 can observe this state. Then, P2 can return points to P1. For a transaction, both players will conclude a **blue** or **yellow** agreement (described below).

The decisions:

The two players can face the following (5) decisions in each round of the game [→ handout].

(1) P1 decides if he wants to interact with P2 in this round and send him all 10 points. If not, both players keep their 10 points and this round is finished. If so, P1 chooses a **blue agreement** or a **yellow agreement** for this transaction (described in the boxes below).

(2) If an agreement is offered, P2 decides if he accepts it. If not, both players keep their 10 points and this round is finished. If so, the transaction takes place.

(3) If an agreement was offered and accepted, P2 observes if the state is good or bad. If he observes a **good** state, the points sent by P1 are tripled and P2 now owns 40 points (his own 10 points + the tripled points sent by P1). If he observes a **bad** state, the points sent by P1 remain unchanged and P2 now owns 20 points (his own 10 points + the 10 points sent by P1). P1 cannot observe how many points P2 now owns.

(4) P2 decides how many points he sends back to P1. In case a **yellow agreement** was concluded, he can only choose between sending back a fixed amount of 20 points or nothing (0 points). In case a **blue agreement** was concluded, he can send back also any different amount (more or less than 20 points).

[*] This material refers to the HIGH condition. For the other conditions only relevant elements changed (e.g., shock probability), everything else remained the same. Translated to Swahili, the instructions were read aloud to the participants while they received an English handout (see below) with important elements of the game. Comprehension questions had to be answered using the computer, giving participants an immediate feedback; as the screen was locked following a wrong answer, pure guesswork was impossible. The Swahili instructions and the material of the other conditions will be provided upon request.

(5) P1 observes how many points P2 returned to him. If a **yellow agreement** was chosen and the repayment is zero, P1 can now delete 15 of P2's points. However, this does not alter P1's points. If a **blue agreement** was chosen, P1 accepts the points sent by P2.

The agreements:

The interaction and transfer of points is realized through a **blue** or a **yellow agreement**. P1 decides which type of agreement he offers P2. Both agreements include different terms of repayment [→ handout]. Before we start with the study, please make sure that you have understood the differences between the two agreements.

With a **blue agreement**, repayment is considered a flexible amount and P2 is allowed to send back also more or less than 20 points depending on the state (Remember: P1 cannot observe this state).

With a **yellow agreement**, repayment is considered a fixed amount and P2 can only send back 20 points or nothing. If he does not send points, P1 can decide to delete 15 of P2's points (Remember: if a **bad** state occurs, P2 only owns 20 points in total and must send everything he owns to comply with the agreement).

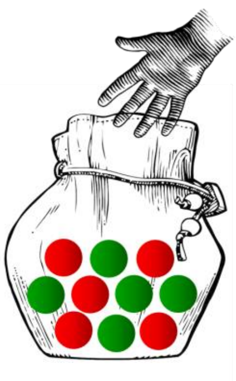
Good or bad state:

If P2 observes a **good** state, the 10 points sent by P1 are tripled. If P2 observes a **bad** state, the points remain unchanged. Only P2 can observe this state, P1 is not informed about it. That means, after P1 sent his points, P2 owns either 20 points or 40 points, but P1 does not know this amount.

The computer determines if the state is good or bad.

- There is a chance of **50 %** that the state is **good**.
- There is a chance of **50 %** that the state is **bad**.

To get a better idea of the chances, consider the following picture of a bag containing 10 balls [→ handout]. 5 of these balls are **green** and 5 are **red**. Imagine now, you draw one ball without looking into the bag. The chances of getting a **green** or **red** ball are the same as for a **good** or **bad** state (**50 %** and **50 %**).



Your profit:

In each round, you will keep the points you earned. That means

- if no interaction took place, both players keep their 10 points.
- if an interaction took place, P1 earns the points sent back to him; P2 earns the points not sent back.
- in case a **yellow agreement** was concluded and P2 does not return points, P1 can delete 15 of P2's points.

In the end of the study, the points from all rounds (excluding the two practice rounds) are summed up and exchanged to Kenyan Shilling according to the following rate:

1 point = 2 KSh

This amount will be added to the payment of **200 KSh** for participation and transferred to your cell-phone via mPESA after this session.

You will first play the game for two practice rounds. These rounds are only meant to support your understanding of the different decisions, the outcome will not affect your payment. After the two practice rounds, the game is played for eight "real" rounds in which you can earn money. You will keep your role (P1 or P2) throughout the whole game.

In the eight "real" rounds, you will interact with different players. No one will learn the identity of the other players during or after the study. Thus, decisions and earnings cannot be attributed to a specific participant.

All interactions are facilitated by computers. In the course of the game, you will face different screens that either ask you to take a decision yourself or inform you about other decisions. For taking own decisions, you need to push labeled buttons on the touch screen in front of you. For numerical entries a number pad will appear. If information is provided, you may push the "OK" button to proceed.

Before we start with the actual study, you are now asked to answer a few questions to prove full comprehension of the instructions.

Thanks again for your participation!

Participants' handout

Exp1_high_handout

The decisions:

(1) Player 1 decides if he wants to send his 10 points to Player 2. If not, both keep their 10 points and this round is finished. If so, Player 1 chooses for this transaction a

- **blue agreement** or
- **yellow agreement**.

(2) Player 2 decides if he accepts the agreement. If not, both keep their 10 points and this round is finished. If so, the transaction takes place.

(3) Player 2 observes the state. If the state is **good**, the points sent by Player 1 are tripled and Player 2 now owns 40 points (his 10 points + the tripled points sent by Player 1). If the state is **bad**, the points sent by Player 1 remain unchanged and Player 2 now owns 20 points (his 10 points + the 10 points sent by Player 1). Player 1 cannot observe the state.

(4) Player 2 decides how many points he sends back to Player 1. With a **yellow agreement**, he can only send back a fixed amount of 20 points or nothing (0 points). With a **blue agreement**, he can send back also any different amount (more or less than 20 points).

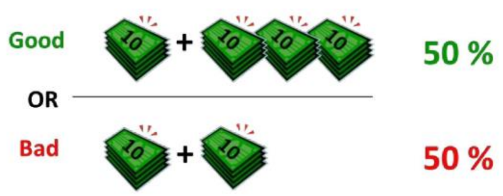
(5) Player 1 observes how many points Player 2 returned. If a **yellow agreement** was chosen and the repayment is zero, Player 1 can now delete 15 of Player 2's points. However, this does not change Player 1's points.

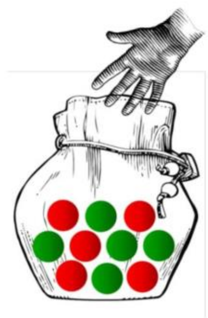
The agreements:

With a **blue agreement**, repayment is considered a flexible amount and Player 2 is allowed to send back also more or less than 20 points depending on the state (Remember: Player 1 cannot observe this state).

With a **yellow agreement**, repayment is considered a fixed amount. Player 2 can only send back 20 points or nothing. If he does not send points, Player 1 can delete 15 of Player 2's points (Remember: in a **bad** state Player 2 only owns 20 points in total and must send everything he owns to comply with the agreement).

Chances for good and bad state:





Comprehension questions

Please answer the following questions. They are only meant to support your understanding of the game and will not directly influence your payment.

1. How many points does each player own at the beginning of a round?	0	40	20	30	10

2. If Player 1 sends all points and a GOOD state occurs, how many points does Player 2 now own?	20	40	10	0	30

3. If Player 1 sends all points and a BAD state occurs, how many points does Player 2 now own?	20	40	10	0	30

4. With a yellow agreement, what can Player 1 do if Player 2 sent back nothing?	Delete points	Tell other players

5. Is it true that Player 1 cannot observe if the state is good or bad?	Yes	No

6. Player 2 can send back also more or less than 20 points with a ...	blue agreement	yellow agreement

7. Player 2 can send back only 20 points or nothing with a ...	blue agreement	yellow agreement

8. What are the chances that a BAD state occurs?	10 %	50 %

9. What are the chances that a GOOD state occurs?	10 %	50 %

10. Who is setting this state?	Player 2	The computer

11. Do you interact with the same person in each round?	Yes	No

12. How many KSh will you receive for 1 point?	2	1