Imperfect Monitoring and Informal Risk Sharing: The Role of Social Ties

Prachi Jain *†

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Abstract

This paper examines whether social ties impact informal risk sharing in the presence of asymmetric information. Using a laboratory experiment with residents of informal settlements in Kenya, I vary the observability of effort. While individuals are overall 7% less likely to risk share as a result of imperfect monitoring, there is no effect for socially close individuals. As a result, socially close individuals are 31% more likely to risk share when effort cannot be observed. I disentangle the effect of social proximity to find evidence that they correspond to an increased motive to work only when effort cannot be observed.

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* prachi.jain@lmu.edu, Loyola Marymount University, 1 LMU Drive, Los Angeles, CA 90045 USA

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1 Introduction

Poor households in developing countries are vulnerable to income shocks such as weather, illness, and unemployment. Despite this, there is considerable evidence that poor households are relatively well insured against idiosyncratic risk (Townsend, 1994; Townsend, 1995; Fafchamps and Lund, 2003; De Weerdt and Dercon, 2006). Households accomplish this using transfers and gifts in informal risk sharing arrangements between households (Platteau and Abraham, 1987; Udry, 1994), even though the inter-household arrangements are characterized by imperfect monitoring, imperfect information and lack of contract enforcement that should limit risk sharing. In these environments, social connections may sustain the high levels of risk sharing; however, less is known about how this is affected by the informational environment.

This paper examines whether social ties can sustain risk sharing in presence of asymmetric information, specifically effort cannot be observed (imperfect monitoring). To address this question, I use a laboratory experiment designed to estimate the effects of imperfect monitoring on risk sharing. Implementing the experiment in Kenya, I find effects on whether participants risk share with their partner (the extensive margin) rather than the level of risk sharing (the intensive margin). Although imperfect monitoring limits risk sharing by 7% overall, it has no impact for socially connected individuals. As a result, socially connected individuals are 31% more likely to risk share than socially distant individuals when effort cannot be observed. Further bolstering these results, I find that the effects are increasing in the strength of the social ties. Finally, I disentangle whether social connections have an effect by increasing cooperation overall, by corresponding to better information about the partner, or by generating an incentive for participants to work when effort cannot be observed. Although evidence has been found for each of these channels in isolation, this is the first paper to disentangle the various channels through which social connections have an effect. I find suggestive evidence for the third, as stronger social ties correspond to 25% higher effort on a real-effort task only when effort cannot be observed.

The experiment is conducted with residents of Kibera, a large informal settlement in Nairobi; this population faces low and variable income, and is familiar with informal transfers, which provides an appropriate context for the experiment. In the experiment, I vary whether effort can be observed in risk sharing games to causally identify how imperfect monitoring affects risk sharing. In the games, participants receive either a high or low income; completion of a real-effort task increases the likelihood that a participant receives high income. In the one-shot game, participants first negotiate a binding agreement of transfers with their partner, which may include no transfers, and then attempt the task.[1][2] Transfers can depend on income and, when effort can be observed, task completion. The design is within-subject; therefore participants play each game in a series of risk sharing games. Partners are also randomized between games, and so I can examine the effect of social proximity on risk sharing while controlling for individual characteristics that do not affect behavior differentially across games (as in Leider et al., 2009; Ligon and Schechter, 2012; Chandrasekhar et al., 2017).[3]

To test risk sharing, I first formulate a model of effort choice and risk sharing. In the model, effort increases the likelihood of high income, yet risk sharing may create an incentive for participants to shirk when effort cannot be observed (moral hazard). Bargaining costs determine whether participants risk share. Social connections strengthen participants' incentive to exert effort and may decrease bargaining costs, which determines whether participants risk share.

The experiment generated several results. First, I examine whether im-

[1]Although the experiment omits real world features such as lack of contract enforcement and the repeated nature of interactions, this are necessary to isolate the effects of imperfect monitoring from limited commitment, which would also reduce risk sharing.

[2]Charness and Genicot (2009), Chandrasekhar et al. (2017), Barr and Genicot (2008), and Barr et al. (2012) use similar laboratory experiments to study risk sharing, typically in the context of limited commitment.

[3]In contrast, the literature on risk sharing has typically focused on endogenously formed groups (Angelucci et al., 2012; Arcand and Fafchamps, 2012; Attanasio et al., 2012; Karlan et al., 2009; Munshi and Rosenzweig, 2009; Fafchamps and Gubert, 2007; De Weerdt and Dercon, 2006; De Weerdt, 2004; Fafchamps and Lund, 2003; Grimmard, 1997) which suffers from problems of omitted variable bias.

perfect monitoring results in decreased risk sharing. Consistent with previous theoretical work (Rogerson, 1985; Phelan, 1998; Belhaj et al., 2014; Kinnan, 2017), my model predicts that imperfect monitoring should decrease risk sharing on both the extensive and intensive margin. By comparing risk sharing when effort can and cannot be observed, I find that imperfect monitoring affects the extensive margin, as participants are 7% less likely to risk share when effort cannot be observed. However, I find no effects of imperfect monitoring on the intensive margin, i.e. the level of risk sharing, among participants who share.

Second, I examine whether social ties have an overall effect on risk sharing. When effort is observable the first best level of risk sharing can be achieved, conditional on risk sharing. Thus, the model predicts that social connections should not affect the intensive margin of risk sharing when effort is observable; however, social connections may affect the extensive margin of risk sharing, i.e. socially connected participants may be more likely to risk share than socially unconnected participants. Consistent with the first prediction, I find no effect of social ties on the level of risk sharing. I also find no statistically significant effect of social ties on the likelihood of risk sharing. Thus, social connections do not increase cooperation overall in the experiment.

Third, the model predicts that social connections will conversely have a different and positive effect both on intensive and extensive margin of risk sharing when effort cannot be observed. Empirically, I find that social connections have a substantial effect on the extensive margin of risk sharing when effort cannot be observed. Specifically, I find that individuals with social ties are 31% more likely to risk share than individuals without social ties. I further find that this effect depends on the strength of the social connection, as the effect is larger (47%) for participants with a stronger connection to their partner. Ultimately, there is no effect of imperfect monitoring for socially connected individuals; in contrast, socially distant individuals are between 9 to 12% less likely to risk share as a result of imperfect monitoring, depending on the measure of social proximity.

Finally, to gain more insight into my results, I explore the channels through which social connections have an effect. Social connections may sustain risk sharing by increasing cooperation overall, for example due to altruism directed towards the partner (Foster and Rosenzweig, 2001; Leider et al., 2009; Ligon and Schechter, 2012; Fafchamps, 2011). Additionally, social connections may sustain risk sharing by generating an incentive to work when effort cannot be observed, either by serving as social collateral (Ambrus et al., 2014; Karlan et al., 2009; Attanasio et al., 2012) or by generating intrinsic motives to work (Attanasio et al., 2012; Bénabou and Tirole, 2003).[4] Finally, social connections may also have an effect when effort cannot be observed due to the provision of better information about the partner (De Weerdt et al., 2017), for example regarding their likelihood of shirking. Although each of these channels have been explored in isolation, I contribute to this literature by disentangling these explanations in the context of my experiment. Since social ties do not have an overall effect on risk sharing, I can rule out that social connections increase cooperation in the experiment. Using information on beliefs, I do not find evidence that socially connected individuals are better informed about their partner. Instead, socially connected participants are more likely to complete the task when effort cannot be observed. This is consistent with the hypothesis that social connections generate incentives to work that have an effect only when effort cannot be observed.

This paper to contributes to the literature in three ways. While a number of studies have focused on testing models of incomplete insurance against each other (Kinnan, 2017; Karaivanov and Townsend, 2014; Attanasio and Pavoni, 2011; Lim and Townsend, 1998; Ligon, 1998), this is the first, to the best of my knowledge, to estimate the effects of imperfect monitoring on risk sharing. The findings also speak to a larger literature on asymmetric information within the household (Ambler, 2015; Ashraf, 2009; Hoel, 2015) and between households in the context of remittances (Joseph et al., 2015; Seshan and Zubrickas,

[4]If socially connected participants are engaged in a repeated game outside of the experiment with their partner, this social collateral should generate an incentive to cooperate and work specifically when effort cannot be observed. The intrinsic motivation to work presents when effort cannot be observed since the contract structure when effort can be observed generates extrinsic motivations to exert effort.

2017), suggesting that asymmetric information is less relevant in the context of informal risk sharing.

Second, this paper contributes to an understanding of how social ties promote cooperation to sustain risk sharing, specifically the extent to which networks mitigate the effects of market problems such as enforcement and information asymmetries. While Chandrasekhar et al. (2017) focus on lack of contract enforcement with a stronger social connections, both papers find that that social ties substitute for market imperfections. This paper relies on natural variation within the experiment in social ties; this would affect the results if participants that are socially connected differ in unobservable characteristics that affect behavior differently across games. I mitigate this concern by providing evidence that socially connected participants are no different in observables than socially unconnected participants. Finally, this paper contributes by disentangling the channel through which social ties have an effect to find evidence that they provide an incentive to work specifically when shirking is a concern.

The remainder of the article is organized as follows. Section 2 describes the experimental design and context. Section 3 proposes a model of effort choice and risk sharing to provide testable predictions. Section 4 presents the results. Section 5 explores the mechanisms behind the effect of social ties. Section 6 concludes.

2 Experiment Design and Context

2.1 Experiment Design

The experiment is an artefactual field experiment (Harrison and List, 2004) conducted March-June 2015 at the Busara Center for Behavioral Economics in Nairobi, Kenya. The experiment consists of 25 sessions lasting approximately 3 hours with 426 participants. During each session, participants play games with partners on touch-screen computers, conducted with z-Tree (Fischbacher, 2007). Instructions are provided orally by trained full-time laboratory assistants who read from a script in both English and Swahili, as well as written in English. Computers are separated by panels, allowing for anonymity. In order to ensure comprehension, participant understanding is verified through periodic quizzes during the session.

All participants play each of 3 risk sharing games with partners. The order of the games is randomized across sessions and participants are paid for the decisions made in one of the three games. Since a single game is randomly chosen for payment and income is risky, risk averse participants should attempt to smooth consumption by using transfers to decrease the variability of a one-shot lottery payment; therefore participants should demand insurance via risk-sharing. Additionally, participants are randomly rematched with partners between games. This randomization allows me to examine the role of social connections while controlling for individual characteristics such as altruism and risk aversion that do not differentially affect behavior across games.

Next I briefly discuss each risk sharing game. Each game is a variation on an one-shot standard interpersonal insurance game (Selten and Ockenfels, 1998). The Risk Only game includes only risky income, the Observable Effort game includes risk and observable completion of a real-effort task, and the Unobservable Effort Game includes risk and unobservable completion of a real-effort task. Figure 1 depicts the structure of the games.[5] In the Risk Only game, each participant faces a 75% chance of receiving a high income shock (H) and a 25% chance of receiving a low income shock (L).[6] Income is independently distributed and observable. Before income is determined, each participant communicates face-to-face with her partner to negotiate a contract that specifies what transfers she is willing to give or receive for each possible

[5] A detailed summary of the sessions and game scripts are available in the Online Appendix.

[6] There are two payment schemes used across sessions. In payment scheme 1, 258 participants begin with an endowment of 350 Kenyan shillings (KSH, approximately \$3.49 USD). If participants receive a high income shock (H), they gain 100 KSH and if they receive a low income shock (L), they lose 100 KSH. In payment scheme 2, 168 participants begin with an endowment of 250 KSH. If they receive a high income shock, they gain 400 KSH and if they receive a low income shock then they do not receive any additional money, 0 KSH. The high income shock is greater than the average daily wage in the slum, approximately 350 KSH (Haushofer et al., 2014). A post-experiment phone survey indicates that 82% of participants are risk averse over these stakes.

combination of incomes realizations (the set of possible income realizations are $\{H,H\},\{H,L\},\{L,H\},\{L,L\}$, where the first entry denotes the income of the participant and the second entry denotes of the income of her partner).[7] Participants can agree on a contract which specifies zero transfers. Additionally, no transfers are made if participants do not agree on a contract.[8] Then income is determined and transfers are made based on the transfers promised.[9] The purpose of the Risk Only game is to provide a benchmark with existing studies (Chandrasekhar et al., 2017; Fischer, 2013; Attanasio et al., 2012) and is examined in Jain (2016).

The following games are the focus of this paper. In the games with effort, income realizations depend on chance and whether the participant completes a real-effort task. To complete the task, participants must correctly count the total number of zeros contained in at least 45 grids composed of zeros and ones. An image of the task is provided in Figure **??**. When the task is first introduced, participants have the opportunity to familiarize themselves with the task in a two-minute practice round in which they are paid 2 KSH for each correct answer. I choose this task because it minimizes the importance of education or ability, as there are never more than fifteen zeros in a single grid (Abeler et al., 2011). Since the task is implemented over the computer, effort cannot be observed by others. At any time, a participant can choose to instead watch a video with headphones provided for leisure.

Completion of the task increases the probability of receiving high income. If the participant completes the task, she then faces a 75% probability of receiving H and a 25% probability of receiving L; if she does not complete the task, she instead faces a 25% probability of receiving H and a 75% proba-

[7] Participants cannot both give and receive a transfer in the same combination of income realizations. I place no restrictions on either the direction or symmetry of the promised transfers in the contracts.

[8] Participants are given unlimited time to discuss the contracts. In the Risk Only game (Observable Effort game/Unobservable Effort Game), participants take on average 7.7 (19.4/9.4) minutes to negotiate a contract. In practice, over 95% of participants reach an agreement on a contract, including contracts in which they specify no transfers promised.

[9] Realized income and transfers are not announced until the end of the session, after all games have been played and participants have completed a survey.

bility of receiving L. Participants negotiate their contract of transfers before attempting to complete the counting task.

In the Observable Effort game, a participant observes whether her partner completed the task. Furthermore, the contract can condition transfers on task completion (E = complete the task, N = do not complete the task) in addition to the set of possible income realizations. This results in 16 choices: $(\{H, H\}, \{H, L\}, \{L, H\}, \{L, L\})$ x $(\{E, E\}, \{E, N\}, \{N, E\}, \{N, N\})$.[10]

Finally, in the Unobservable Effort Game, a participant cannot observe whether her partner completed the task. Since the contract specifying transfers cannot condition on effort, it conditions only on the income realizations, as in the Risk Only game. Thus, the difference in behavior between the Observable Effort and Unobservable Effort games captures the effects of imperfect monitoring of effort.

After the risk sharing games are played, all participants answer survey questions about themselves and their partner. Participants receive additional income for choices made in the surveys. In addition, they complete a phone survey in July-August 2015.

All participants are paid within two days of the experiment via M-PESA, a mobile-phone based money transfer service. The average payment is 490 KSH (approximately $4.90 USD, ranging from 179 KSH to 840 KSH), in addition to a show-up fee; this is more than the daily wage in Kibera (Haushofer et al., 2014).[11] Since I implement the outcome from a randomly chosen game for payment and payment is sent through M-PESA, it is unlikely that participants use transfers after the experiment to risk share.

[10]Essentially, the difference in behavior between the Risk Only and Observable Effort games is the result of a change in how income is earned. Although this is interesting, it is beyond the scope of the paper.

[11]Potential subjects are invited via SMS text message. All participants are also compensated with 200 KSH in cash (with an additional 50 KSH for arriving to the session on time) to allay transportation and opportunity costs they may incur in attending the session.

2.2 Context

Participants are from Kibera, one of the largest informal settlements (slums) in Africa. Kibera is situated 5 kilometers from the Nairobi city center and 2 kilometers from the experimental site. Households have lived 16 years on average in Kibera and 42% of households fall below the poverty line of $2 a day (Marx et al., 2016). Estimates of the population in Kibera range from 170,000 (2009 official census) to over 1 million (unofficial sources). The settlement is divided into 9 smaller villages. To examine the effects of social ties, I issue invitations for each experimental session by village and ethnic group within Kibera (data from administrative records), resulting in natural variation in social proximity in my experiment.

To participate in the experiment, participants must be at least 18 years and have access to a cell phone and M-PESA.[12] The summary statistics of participants in Table 1 show that participants are comparable to the typical resident of Kibera. Since participants must be available to attend the experiment, my participants are more likely to be female. Given that Marx et al. (2016) find that residents of Kibera are more likely to have some secondary education (42%) and are more likely to be Luo, Luhya or Kamba (35%, 27%, 15% respectively) than the rest of Kenya, my participants are comparable to residents of Kibera in both education and ethnic makeup.[13]

Households are poor and face substantial risk. The survey responses show that 65% of participants perceive their household income in the past year to be well below or below average. Furthermore, 29% of participants report that they primarily work for themselves and 32% report that cannot find work. 44% of participants report that they usually work once in a while. In addition, 86% of participants indicate they have faced a household shock in

[12]Recent data collected in the Nairobi slums suggest that over 90% of residents have access to both a cell phone and M-PESA (Marx et al., 2016). A detailed description of recruitment into the Busara subject pool is provided in Haushofer et al. (2014).

[13]The typical participant in my experiment has been involved in 1.98 other studies since 2012, when Busara was founded. All participants in payment scheme 2 were newly recruited. This should allay concerns that participants in my study are familiar with economic experiments.

the past 6 months, with 59% reporting multiple shocks.[14] Finally, participants use informal transfers. 30% (51%) of participants indicate they have received (given) on average 2428 (2371) KSH in the past month. This provides the appropriate context to study risk sharing, since this is a population that uses informal transfers and face risk in their regular lives.

We may be concerned that participants are unfamiliar with features of the games, given the binding ex ante contracts and the one shot nature of the interaction. However, participants frequently engage in institutions with well-defined rules and regulations, such as Rotating Savings and Credits Associations (59% use ROSCAs or Merry-Go-Rounds). Thus, participants are familiar with informal financial promises. Also, since 77% of participants indicate they have discussed with family and friends what they might do if a bad shock were to occur, they are used to thinking ahead financially. Finally, although the games in the experiment represent an one-shot interaction, the games are intentionally embedded in a larger repeated game for socially connected participants. Thus, I argue that participants understood these features of the experiment.

3 Model of Effort Choice and Risk Sharing

In this section I develop my static model of risk sharing and effort choice that generates testable predictions on both the extensive margin of risk sharing (whether agents risk share) and the intensive margin of risk sharing (the level of risk sharing).[15] In the model, risk sharing generates an incentive for participants to shirk when effort cannot be observed. However, individuals also face

[14]These household shocks include weather related shocks, wedding or funeral expenses, eviction, loss of job or decrease in work available, or illness that prevented a household member from working or required medical expenses.

[15]Empirical tests of theories of moral hazard in risk sharing (Kinnan, 2017; Rogerson, 1985; Phelan, 1998) rely on an inverse Euler equation implication, i.e. the way that history matters in forecasting consumption. Since the risk sharing games in my experiment are one-shot games, these tests cannot be applied. However, the broad implication that risk sharing may decrease with imperfect monitoring can be derived from previous theories and the model I present here.

an incentive to work for the higher probability of high income. Thus, the effect of imperfect monitoring of effort on risk sharing will depend on the strength of the counteracting incentives. When risk sharing is limited, social ties sustain risk sharing by providing an additional incentive for participants to work and cooperate.

Suppose that there are two risk-averse agents, $i \in \{A, B\}$. These agents are endowed with initial wealth ω and face income shocks, $\pi \in \{H, L\}$ where $H > L$. In addition, they can exert costly effort, which increases the probability of the high income shock. For simplicity, I consider only two effort levels, no effort $e = N$ or effort $e = E$, respectively yielding probabilities of a high income shock, $p_N = \frac{1}{4}$ and $p_E = \frac{3}{4}$ (these probabilities come from the experiment). No effort is costless, while the cost of providing effort, c, is positive.[16]

In this model, agents are characterized by a von Neumann-Morgenstern utility function, which is assumed to be continuous, with a continuous derivative, strictly increasing and concave in wealth. Utility is separable in income and effort and income is independently distributed. Agents bargain to reach a contract of promised transfers that depend on income and, in the Observable Effort game, effort.

I model the problem as a benevolent principal with an *ex ante* utilitarian criterion and equal weights placed on each agent (as in Belhaj et al., 2014); therefore the principal maximizes the sum of agents' utilities. Equivalently, the solution can be interpreted as a Nash bargaining outcome with equal outside option and bargaining power. Agents can choose not to promise transfers with their partner and revert to autarky, where I assume it is optimal to exert effort. In the second stage of the model, agents individually choose whether to exert effort. Since equal weights are placed on each agent, there are no transfers promised when both agents receive the same income and contracts are thus symmetric, yielding τ the transfer when an agent receives income H and her partner receives income L.

In the model, socially connected agents face an additional incentive to work. Socially connected individuals are engaged in a repeated game with their

[16] I use effort interchangeably with completion of the task for the remainder of this paper.

partner outside of the experiment. The repeated nature of the game means that a socially connected agent may fear punishment or loss of the relationship outside the experiment if her partner suspects she shirks in the experiment (Karlan et al., 2009; Ambrus et al., 2014). This incentive to work may also occur because socially connected individuals are more intrinsically motivated to work, due to increased altruism directed towards their partner (Foster and Rosenzweig, 2001; Leider et al., 2009; Ligon and Schechter, 2012) or guilt (Attanasio et al., 2012). In the model, this utility loss, $d(r_{AB}) \geq 0$, arises if an agent chooses to shirk and depends on the relationship, r_{AB}, between the agent and her partner. Agents with a social connection to their partner ($r_{AB} = 1$) suffer a greater loss in utility than those without a social connection ($r_{AB} = 0$) if they shirk, i.e. $d(r_{AB} = 1) > d(r_{AB} = 0)$.[17]

With a contract with nonzero transfers promised ($\tau > 0$), agents may incur a bargaining cost, $b_i(r_{AB})$ (similar to the association costs proposed in Murgai et al., 2002). As a result, some agents may choose autarky. The bargaining cost, which is heterogeneous across agents and known to agents, relates to exogenous factors such as whether a common dialect is spoken, the relationship between the agent and her partner, and the mental cost associated with reaching a contract. The bargaining cost is lower for agents who share a social connection, i.e. $b_i(r_{AB} = 1) < b_i(r_{AB} = 0)$ (as in Fafchamps and Gubert, 2007).Furthermore, the bargaining cost should be higher when effort cannot be observed if it incorporates mental costs such as uncertainty about partner effort (Ellsberg, 1961), betrayal aversion (Bohnet et al., 2008) or transaction costs due to moral hazard (Murgai et al., 2002). Finally, the relative benefit of a social relationship on bargaining should be higher when effort cannot be observed (similar to Foster and Rosenzweig, 2001), for example if socially connected participants face less uncertainty about their partner due to better information.

If we suppose that it is optimal for both agents to exert effort ($e_i = E, e_{-i} =$

[17] Although social connections are modeled as a binary variable in the model, i..e whether or not agents have a relationship, the implications from the theory hold if the utility loss depends on relationship strength.

E), then we can define the problem as:

$$\max_{\boldsymbol{\tau}, e_A, e_B} EU_A\left(\pi_A, \boldsymbol{\tau}, e_A, e_B, b_i(r_{AB}), d(r_{AB})\right) + EU_B\left(\pi_B, \boldsymbol{\tau}, e_A, e_B, b_i(r_{AB}), d(r_{AB})\right) \quad (1)$$

If $\boldsymbol{\tau} > 0$, then, for each agent i (and her partner $-i$), the following incentive compatibility constraint (ICC) must hold:

$$EU_i\left(\pi_i, \boldsymbol{\tau}, e_i = E, e_{-i} = E,\right) - b_i(r_{AB}) \geq EU_i\left(\pi_i, \boldsymbol{\tau}, e_i = N, e_{-i} = E\right) - b_i(r_{AB}) - d\left(r_{AB}\right) \quad (2)$$

Similarly, the following participation constraint (PC) must hold for all $e_{-i} = \{E, N\}$:

$$EU_i\left(\pi_i, \boldsymbol{\tau}, e_i = E, e_{-i} = E\right) - b_i(r_{AB}) \geq EU_i\left(\pi_i, \boldsymbol{\tau} = 0, e_i = E, e_{-i}\right) \quad (3)$$

Note that transfers promised in the Unobservable Effort game condition only on income; thus, $\boldsymbol{\tau}\left(\pi_i, \pi_{-i}\right)$. Since transfers are promised only when incomes are unequal and are symmetric, this results in a single choice, $\boldsymbol{\tau}\left(\pi_i, \pi_{-i}\right) = \tau$. In contrast, transfers in the Observable Effort game condition on both income and effort, yielding four choices, $\boldsymbol{\tau}\left(\pi_i, e_i, \pi_{-i}, e_{-i}\right) = \{\tau^{EE}, \tau^{EN}, \tau^{NE}, \tau^{NN}\}$.[18]

3.1 Model with Perfect Monitoring of Effort

In the Observable Effort game, the equilibrium specifies a vector of transfers when an agent has high income and her partner low income that depends on effort $\boldsymbol{\tau} = \{\tau^{EE}, \tau^{EN}, \tau^{NE}, \tau^{NN}\}$. In this case, I assume that if either agent reneges from the preferred effort level, then both agents receive no transfers.[19]

Agents with sufficiently high bargaining costs ($b_i(r_{AB} \geq \bar{b}$) will prefer au-

[18] τ^{EE} (τ^{NN}) is the transfer from the agent that receives a high income to the agent that receives a low income when both agents exert effort (do not exert effort). τ^{EN} (τ^{NE}) is the transfer when the agent that exerts effort receives a high (low) income and the agent that does not exert effort receives a low (high) income.

[19] I use this grim trigger strategy (autarky if the defection occurs from intended effort levels) for expositional clarity. The grim trigger strategy supports the highest level of insurance in equilibrium. The qualitative properties of the equilibrium do not depend on the grim trigger assumption (Ligon et al., 2002).

tarky ($\boldsymbol{\tau} = 0$) to risk sharing ($\boldsymbol{\tau} > 0$); therefore, bargaining costs affect the extensive margin of risk sharing, i.e. whether a contract with nonzero transfers promised is reached. When bargaining costs make risk sharing preferable to autarky, full risk sharing can be implemented for all costs of effort for which agents would have exerted effort in autarky, as seen in Figure 2 (in which full risk sharing corresponds to $\boldsymbol{\tau} = 100$). For these agents, neither the participation nor incentive compatibility constraints bind.[20]

In the model, social connections may also affect the extensive margin of risk sharing. If bargaining costs are lower for socially connected agents, these agents are more likely to engage in risk sharing. Since the incentive compatibility constraint does not bind, social connections will not affect the level of risk sharing for agents (if $b_i(r_{AB}) < \bar{b}$ for both agents).

3.2 Model with Imperfect Monitoring of Effort

In the Unobservable Effort game, the equilibrium specifies a single transfer, τ. Whether full risk sharing is implementable in equilibrium depends on the cost of effort, i.e. if the incentive compatibility constraint binds. In Figure 2, I show that for an intermediate cost of effort ($2.7 \leq c \leq 5.3$), full risk sharing cannot be implemented ($\tau < 100$) in equilibrium.[21] At this cost of effort, an agent would shirk if there was full risk sharing; knowing this, the optimal transfer is lower and agents exert effort in equilibrium. In contrast, when the cost of effort is high ($c \geq 5.3$), full risk sharing can be achieved, and agents do not exert effort in equilibrium. Finally, when the cost of effort is low ($c \leq 2.7$), there is no moral hazard and full risk sharing can be achieved with both agents

[20] Whether the participation constraint binds is a function of the bargaining cost; if $b_i(r_{AB}) = 0$, then the participation constraint would hold for all risk averse agents who would exert effort in autarky. In the Observable Effort game, the incentive compatibility constraint does not bind due to the fact that defections from the intended effort level can be punished within the contract.

[21] The figure assumes bargaining costs such that risk sharing is preferable to autarky, i.e. $b_i \leq \bar{b}$.

exerting effort in equilibrium.[22] Thus, the effects of unobservable effort on risk sharing will depend on the cost of effort, which in practice corresponds to the difficulty of the task. For the remainder of the paper, I assume that the cost of effort is in the intermediate range and thus imperfect monitoring should limit the level of risk sharing.

When imperfect monitoring limits the level of risk sharing, social connections will have an effect. Since social connections decrease the attractiveness of shirking, higher levels of risk sharing can be achieved in equilibrium for socially connected agents.

In addition, imperfect monitoring may limit risk sharing on the extensive margin. If bargaining costs are higher in the Unobservable Effort game, agents will be less likely to engage in risk sharing when effort cannot be observed than when effort can be observed. If socially connected agents face relatively lower bargaining costs in the Unobservable Effort game, social connections should have a larger effect on whether a contract with any transfers promised emerges than in the Observable Effort game.

3.3 Implications

The following summarizes the predictions from the model.

Prediction 1: The Effect of Imperfect Monitoring *Participants are less likely to reach a contract with nonzero transfers promised (extensive margin) in the Unobservable Effort game as compared to the Observable Effort game. Conditional on any risk sharing, the level of risk sharing will decrease (intensive margin) in the Unobservable Effort game as compared to the Observable Effort game.*

Prediction 2: The Overall Effect of Social Ties *Social connections will have an effect on whether participants reach a contract with nonzero transfers promised (extensive margin). Conditional on any risk sharing, there is no ef-*

[22]To ensure that the cost of effort is effectively in the intermediate range in the experiment, I pilot the counting zeroes task to determine a threshold of 45 correct answers that allows approximately 56% of participants to complete the task. Although I cannot rule out the concern that completion of the task is the result of ability in addition to effort, I address this issue in the Online Appendix.

fect of social connections on the level of risk sharing (intensive margin) in the Observable Effort game.

Prediction 3: The Effect of Social Ties When Effort Cannot Be Observed *Social connections will have a larger positive effect on whether a contract with nonzero transfers promised (extensive margin) is reached in the Unobservable Effort game. Conditional on any risk sharing, social connections will now have a positive effect on the level of risk sharing (intensive margin) in the Unobservable Effort game.*

4 Results

4.1 Benchmark: Risk Only game

Before presenting the results of my analysis, I briefly discuss the Risk Only game, as it provides a benchmark for interpreting subsequent results.

A description of the contracts is presented in the Online Appendix. Altogether I have a sample of 426 participants, with each participant playing each of the three risk sharing games yielding 1278 participant-game observations.[23] Although transfers can occur for a variety of motives (explored in Jain, 2016), it is reassuring that transfers promised in the wrong direction for risk sharing (from the participant receiving low income to the participant receiving high income) are rare, occurring only 3.3% of the time in the Risk Only.

I next discuss the Risk Only game to set the context for interpreting my main results. I rescale and pool data from the two payment schemes such that full risk sharing for a risk-averse and homogeneous participant (partner) who receives income H (L) corresponds to 100. I find that the average transfer in the Risk Only game is only 25.7% that of full risk sharing. Furthermore, only 63.1% of partnerships reach a contract with any transfers promised. These findings validate the use of a bargaining cost in the model. Without the

[23]During one session, the computers lagged during the counting zeros task in the Observable Effort game. For the 20 affected participants, all variables that relate to the task are set to missing.

bargaining cost, risk averse agents should always risk share in the Risk Only game, which is clearly not the case empirically.[24]

4.2 What Are the Effects of Imperfect Monitoring on Risk Sharing?

I use OLS regressions of the following form:

$$y_i = \alpha_0 + \alpha_1 \cdot UN + \mu_i + \epsilon_i$$

where i indexes the subject and μ_i represents individual fixed effects, which implicitly include game order and session effects as well as participant characteristics such as ability, general altruism and risk aversion that do not differentially affect behaviors across games. Furthermore, y_i denotes the outcome of interest and UN is a dummy for the Unobservable Effort Game. For all following analyses I use data from the Observable and Unobservable Effort games. α_1 measures the difference in behavior between the Unobservable and the Observable Effort games (i.e. the effect of imperfect monitoring). I present the summary statistics across participants-game observations in Table 2. Since the analysis is within-subjects, the results will differ once I control for individual fixed effects in Tables 3 and 4.

My primary outcomes of interest are the extensive margin of risk sharing and the intensive margin of risk sharing. The extensive margin of risk sharing is defined as whether the contract reached includes any non-zero amount of transfers promised ("Any Transfers Promised"). If zero transfers are promised then participants are in autarky, as their partners' choices do not affect their own choices or outcomes.[25]

The intensive margin of risk sharing is defined as the level of risk sharing conditional on any transfers, measured as the non-zero transfer promised if a

[24] Although risk sharing is low, this is not an unusual finding in experiments on risk sharing (Fischer, 2013; Attanasio et al. 2012).

[25] For ease of interpretation, I use a linear probability model rather than probit for this outcome. The probit results are similar and provided in the Online Appendix.

participant receives high income and her partner receives low income ("Transfers Promised").[26] Recall that there are four potential transfers in the Observable Effort game when a participant receives high income and her partner receives low income; for this analysis, I use the transfer corresponding to whether each participant completes the task ("Conditional on Effort" in Table 2).[27]

Given the above outcomes of interest, I now present my main results.

Result 1: Imperfect monitoring affects risk sharing on the extensive margin, but not intensive margin. Specifically, participants are 7% less likely to reach a contract with any transfers promised due to imperfect monitoring. However, transfers promised, conditional on any transfers, are unaffected by the observability of effort.

Theoretically, with bargaining costs that are higher in the Unobservable Effort game, the participants is less likely to reach a contract with transfers promised in the Unobservable Effort game than the Observable Effort game. The results in Table 3 Column (1) show that participants are 4.7 percentage points (7%) less likely to reach a contract with any transfers promised in the Unobservable Effort game (significant at the 5% level).

The model predicts that levels of risk sharing, conditional on any sharing,

[26]Recall that the model provides predictions for the level of transfers conditional on any risk sharing. Since effects of imperfect monitoring on the extensive margin has implications for the comparison of the level of the transfers in the Observable Effort game to the Unobservable Effort game, I provide the unconditional level of transfers in the Online Appendix to show results that are similar to the results presented in the paper.

[27]The effect of imperfect monitoring on transfers promised will depend on which promised transfer I use from the Observable Effort game since the contract specifies a transfer there is inequality in incomes for each possible combination of effort $(\{E,E\},\{E,N\},\{N,E\},\{N,N\})$. For the analysis, I use transfers corresponding to participants' realized completion of the task since this is the transfer that would be made if the participant had received high income and her partner received low income. However, this confounds the choice of promised transfers with effort. For example, suppose that the contract was written to incentivize high effort ({E, E}), but in the experiment the participant chose to complete the task and her partner does not complete the task ({E, N}). The analysis uses the transfer promised when the participant receives high income and her partner receives low income when {E, N}. In the Online Appendix, I consider the effects of imperfect monitoring when the analysis instead uses the highest transfer promised among all possible efforts in the Observable Effort game ("Max Transfers HL in Obs Game" in Table 2).

will decrease in the Unobservable Effort as compared to the Observable Effort game. However, the results in Table 4 Column (1) show that promised transfers are slightly (9.7%), but not significantly, higher in the Unobservable Effort game than the Observable Effort game. Thus, I do not find that imperfect monitoring affects risk sharing on the intensive margin.

4.3 What is the Role of Social Proximity?

In order to measure the effects of social proximity on effort and risk sharing, I use several measures to capture different dimensions of social proximity. The first measure of social proximity indicates whether the participant lives in the same village in Kibera (84% of participants) and belongs to the same ethnic group (56% of participants) as their partner ("Same VE Group"), taken from administrative records. By this measure, 52% of participants live in the same village and speak the same language as their partner.

The remaining measures of social proximity are taken from the survey responses, in which participants indicate which items from a menu of statements describe their relationship with each partner (adapted from Banerjee et al., 2013). [28] From this, I create "Partner Rel" which indicates whether a participant does not choose "I do not know this person" (*out* network link). This is my preferred measure of social proximity, as 25% of participants fall into this category. I also generate "Partnership Rel - Two Way" in which their partner also indicates the same; 14% fall into the two-way category (*and* network link).

Since both participants must acknowledge the relationship in "Partnership Rel - Two Way", it corresponds to a stronger social link than "Partnership Rel." I interpret "Same VE Group" to capture weaker social ties than the partnership relationship measures. Given that fewer than 3% of participants interact with their partner on more than one dimension, these measures of

[28] 1. He/she visits my home or I visit his/her home, 2. He/she is my kin or family, 3. He/she is not a relative with whom I socialize, 4. I would borrow or lend money from him/her, 5. I would borrow or lend material goods (such as food, coal, etc) from him/her, 6. I get or give advice from him/her, 7. I pray (at a temple, church or mosque) with him or her, 8. I work with him/her, 9. I know this person but do not do any of the previous activities with him/her, and 10. I do not know this person.

social proximity should be interpreted as measuring the effects of relatively weak social ties as compared to the social ties commonly found in the real-world.

Given the above measures of social proximity, my empirical strategy consists of regressions with the following form:

$$y_{ij} = \alpha_0 + \alpha_1 \cdot UN + \alpha_2 \cdot relationship_{ij} + \alpha_3 \cdot relationship_{ij} \cdot UN + \mu_i + \epsilon_{ij}$$

where i indexes the subject, j indexes the partner, μ_i represents individual fixed effects, UN is a dummy for the Unobservable Effort game, $relationship_{ij}$ is one of the three measures of social proximity, and y_i denotes the outcomes of interest. The coefficients of interest are α_1, α_2 and α_3. Here, α_1 measures the overall effect of imperfect monitoring for participants. α_2 measures whether social connections have an overall effect. α_3 measures whether social connections have a different effect in the Unobservable Effort game than in the Observable Effort game. $\alpha_2 + \alpha_3$ measures whether socially connected individuals behave differently than socially unconnected individuals when effort cannot be observed. Finally, $\alpha_1 + \alpha_3$ measures whether socially connected individuals behave differently in the Unobservable Effort game than in the Observable Effort game.

Since I rely on natural variation in social proximity in the experiment to identify the effects of social ties, I cannot rule out the concern that participants who are sometimes, always or never socially connected to their partner in the experiment differ unobservable characteristics that differentially affect behavior in the Observable and Unobservable Effort games. To mitigate this concern, I provide a balance check in the Online Appendix to test whether participants who never know their partner, always know their partner, or sometimes know their partner in the games are different in observable characteristics (elicited in the survey) that relate to their social behavior in the real world. I do not find statistically significant differences in whether these groups participate in church, participate in other community groups, lend money to friends, or lend belongings to friends. Thus, I do not find evidence that the variation in social proximity in the games is correlated with observable measures of social behavior.

4.3.1 The Overall Effects of Imperfect Monitoring

Focusing on the coefficient α_1 in Table 3, I find that participants overall are 9-12% (depending on the strength of social proximity) less likely to engage in risk sharing in the Unobservable Effort game than in the Observable Effort game. For my preferred measure of social proximity, "Partner Rel", I find that participants who do not know their partner are 7.3 percentage points (11%, statistically significant at the 5% level) less likely to risk share (extensive margin) as a result of imperfect monitoring of effort. Since the effects are larger than the overall effect of imperfect monitoring, the results suggest that the negative effect of imperfect monitoring on whether participant risk share is concentrated among socially unconnected individuals.

Looking at the intensive margin, Table 4 again shows that I cannot reject that there is no effect of imperfect monitoring on the level of transfers conditional on any transfers. Again, I find that the magnitudes are in the opposite direction than the theory would predict; they are positive for all measures of social proximity and range from 3%-22%.

4.3.2 The Overall Effect of Social Ties

I find several results of note regarding the overall effects of social proximity.

Result 2: Social connections do not have a statistically significant effect on both the extensive and intensive margin of risk sharing.

The model predicts that socially connected participants are more likely to reach a contract with transfers promised if socially connected participants face lower bargaining costs. The results regarding α_2 in Table 3 show no statistically significant effects of social ties on whether participants engage in risk sharing.

The model predicts that social connections should not have an effect on the level of risk sharing, conditional on any risk sharing, in the Observable

Effort game as the contracts should incentivize the optimal level of effort. The results in Table 4 suggest that social connections may negatively affect the level of transfers; however the results are not statistically significant. Therefore, consistent with the theory, I find no detectable effect of social connections overall on the level of risk sharing.

Therefore, I cannot reject that there are no statistically significant effects of social connections overall on both the intensive and extensive margin of risk sharing. However, the magnitudes are substantively relevant, ranging between 5-14%, on the extensive margin and 3-30% on the intensive margin; therefore I may lack the power to detect statistically significant effects.

4.3.3 The Effects of Social Ties When Effort Cannot Be Observed

Focusing on coefficients α_3, $\alpha_2 + \alpha_3$, and $\alpha_1 + \alpha_3$, I find several key results.

Result 3: Social connections have a large positive, different, and statistically significant effect on the extensive margin of risk sharing in the Unobservable Effort game relative to the Observable Effort game. Social connections have a similar pattern of effects, albeit not statistically significant, on the intensive margin of risk sharing.

The model predicts that socially connections will have a different and positive effect on both the extensive and intensive margin of risk sharing in the Unobservable Effort game as compared to the Observable Effort game. Consistent with the model, the results in Table 3 show that α_3 is positive and statistically significant at least at 10% level for the measures of social proximity in which a participant indicates she knows her partner. The magnitudes are substantively large, corresponding to an 11.6 percentage points (17%, $p = 0.065$) and 29 percentage points (42%, $p = 0.001$) effect for "Partner Rel" and "Partnership Rel - Two Way" respectively.

Similarly, the results in Table 4 provide evidence that social connections have a substantively different (26-32%), but not statistically significant (at the 10% level), effect in the Unobservable Effort game relative to the Observable Effort game when a participant indicates she knows her partner.

As predicted by the theory, the effects should increase in the strength of the social tie. If the work incentive for socially connected participants is increasing in the strength of the relationship, then this effect (α_3) should be largest when both participants indicate they know each other; it should also be larger when a participant indicates she knows her partner than when participants belong to the same village-ethnic group. For both the intensive margin and extensive margin, the coefficients increase with the strength of the social connection, thus providing further support that social connections have an effect by generating an additional incentive for participants to work when effort cannot be observed.

Result 4: Socially connected participants are substantially and significantly (18-47%) more likely to risk share (extensive margin) than socially unconnected participants when effort cannot be observed.

As a result, participants with a social connection to their partner are more likely to risk share than participants with no connection to their partner when effort cannot be observed, that is $\alpha_2+\alpha_3 > 0$. Specifically, I find that the effect is 18% ($p = 0.038$) for those belonging to the same village and ethnic group, 31% ($p = 0.001$) for participants who indicate they know their partner, and 47% ($p = 0$) when both participants indicate they know each other. $\alpha_2 + \alpha_3$ is not statistically distinguishable from zero for the intensive margin of risk sharing, i.e. I cannot reject that socially connected individuals promise similar levels of transfers, conditional on any transfers, than unconnected individuals in the Unobservable Effort game. The effects on the intensive margin vary in both sign and magnitude (-35-29% effect).

Again, the magnitude of the effects are increasing in the strength of the social tie. For both the level of transfers promised and the likelihood of risk sharing, $\alpha_2 + \alpha_3$ is largest when both participants indicate they know each other; similarly $\alpha_2 + \alpha_3$ is larger for participants who indicate they know their partner compared to those who belong to the same village-ethnic group. This qualitative pattern further supports the results, since the theory indicated that the effects should increase in the strength of the social tie.

To summarize, socially connected participants are more likely to risk share on the extensive margin than socially unconnected participants when effort cannot be observed. If we believe that effort cannot be fully observed in the real-world, these results suggest that socially connected participants are substantially better insured against risk than socially unconnected participants.

Result 5: Socially connected participants are equally likely to risk share, both on the extensive and intensive margin, in the Unobservable Effort game relative to the Observable Effort game. Therefore there is no effect of imperfect monitoring for socially connected individuals.

$\alpha_1+\alpha_3$ captures the extent to which social connections substitute for perfect information, i.e. whether socially connected participants are more likely to engage in risk sharing in the Unobservable Effort game than in the Observable Effort game. I find that $\alpha_1+\alpha_3$ is positive and statistically different from zero when both participants indicate they know each other, with an effect of 20.9 percentage points (30%, $p = 0.008$), but statistically indistinguishable from zero for the other measures of social proximity; this suggests, if anything, that socially connected participants may be more likely to risk share in the presence of asymmetric information. Regarding the intensive margin of risk sharing, $\alpha_1 + \alpha_3$ is similarly positive and substantively large for measures in which participants indicate they know their partner, corresponding to 28% ($p = .080$) when a participant indicates she knows her partner and 37% ($p = 0.145$). Reassuringly, $\alpha_1 + \alpha_3$ is again increasing in the strength of the relationship. This provides compelling evidence that social connections fully substitute for the lack of information when effort is unobservable.[29]

Therefore, I conclude that socially connected individuals are equally likely to risk share in the Unobservable Effort game and the Observable Effort game.

[29]The theory does not necessarily predict that $\alpha_1 + \alpha_3 > 0$, i.e. that social connections more than compensate for the lack of information. If socially connected individuals are motivated by intrinsic motives to cooperate in the Unobservable Effort game and extrinsic motives in the Observable Effort game (since incentives to work are written into the contract), then $\alpha_1 + \alpha_3 > 0$ suggests that the intrinsic motives are stronger than the extrinsic motives (as in Bénabou and Tirole, 2006).

Indeed, socially connected participants may be more likely to risk share when effort cannot be observed. If we believe that risk sharing in the real-world occurs among socially connected individuals, then these results suggest that imperfect monitoring does not negatively affect risk sharing outside of the laboratory.[30][31][32]

4.3.4 Welfare Implications

The effects on risk sharing have meaningful implications for individuals' welfare. Participants who know each other would receive 6% higher consumption ($p = .081$) and less volatility in consumption ($p = 0.181$) than participants who do not know each other when effort cannot be observed. If all participants exert effort and fully risk shared, participants could receive up to 15% higher income and reduce income volatility by 29%. Thus, my results indicate that socially proximate individuals are substantially closer to efficient levels of risk sharing, and thus better insured against risk, than socially unconnected individuals.[33]

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[30] To provide further confidence in my results, I remove the individual fixed effects and instead control for game order and payment scheme. I examine whether my findings are the result of within-subject design, by estimating the effects for the first game played, essentially treating the sample as a between-subject experiment. Finally, I also examine whether the results differ substantively by payment scheme. These results are presented in the Online Appendix and are broadly similar regarding the extensive margin of risk sharing.

[31] Recall that the predictions from the theory assume that the cost of effort is in the intermediate range. In the Online Appendix I discuss how the empirical results differ as predicted by the theory when the cost of effort is low and shirking is not a concern using data from a separate experiment.

[32] Finally, I also provide evidence that adverse selection is not a confounding factor in the experiment in the Online Appendix.

[33] For these estimates I simulate income given the risk sharing contracts and effort choices in the experiment for 50 periods. Depending on the income realizations of each participant and partner, I calculate transfers from the contracts in each period. Consumption is income net of transfers. For each participant, I estimate the average consumption and standard deviation of consumption across all periods. I refer to the standard deviation of consumption as consumption volatility. Further details are provided in the Online Appendix.

5 Mechanisms Driving the Effect of Social Connections

In this section, I explore three channels through which social connections may have an effect. First, social connections may have an effect by increasing cooperation overall (Foster and Rosenzweig, 2001; Leider et al., 2009; Ligon and Schechter, 2012; Fafchamps, 2011). Second, social connection may result in an incentive to work when effort cannot be observed and shirking is possible, as a result of intrinsic motives to work (Attanasio et al., 2012; Bénabou and Tirole, 2003) or social collateral that results from socially connected participants interacting outside the experiment (Ambrus et al., 2014; Karlan et al., 2009; Attanasio et al., 2012). Third, social connections may have an effect when effort cannot be observed due to the provision of better information (De Weerdt et al., 2017), for example about the partner's likelihood of shirking. Although evidence has been found for each of these explanations in isolation, this is the first paper, to the best of my knowledge, to disentangle the various channels through which social connections have an effect.

5.1 Do social connections increase cooperation overall?

If social connections correspond to increased cooperation overall, then social connections should have an effect on risk sharing in *both* the Observable and Unobservable Effort games. This could result from altruism directed towards the partner. Since I find that α_2 is not significantly different from zero in the main results, this is not the primary channel through which social connections have an effect in the experiment and therefore I disregard this first possible channel.

5.2 Do social connections correspond to an incentive to work?

If social connections correspond to an increased motive to work, then socially connected individuals should also increase effort only when shirking is a concern. Recall that the theory indicates that the desired effort level can be implemented in the Observable Effort game, since the contract can "punish" shirking. In contrast, shirking cannot be punished in the Unobservable Effort game, and therefore social connections can have an effect.

I can examine the effects of social connections on effort in the games using whether a participant completes the task ("Completed Task") as an outcome of interest and the empirical specification from before. The results in Table 5 show that there is a different effect of social proximity in the Unobservable Effort game (α_3), corresponding to 19.2 percentage points (34%, $p = 0.041$) increase in task completion for participants who both indicate they know each other. As a result, socially connected participants are 25% ($\alpha_2 + \alpha_3, p = 0.078$) more likely to exert effort in the Unobservable Effort game than participants who do not know their partner. In addition, these participants are 20.5 percentage points (36%, $\alpha_1 + \alpha_3, p = 0.016$) more likely to complete the task in the Unobservable Effort game than in the Observable Effort game. The coefficients when a participant indicates she knows her partner follow a similar pattern.

Therefore, the results on effort provide evidence that social connections correspond to increased effort in the Unobservable Effort game. Since the qualitative pattern of results for the effects of social connections on task completion follows that of the extensive margin of risk sharing, I conclude that Table 5 provides evidence supporting the hypotheses that social connections provide an increased motive to work that affects effort only in the Unobservable Effort game.

5.3 Do social connections correspond to better information?

However, better information about the partner may also affect behavior in the Unobservable game. If participants are socially connected, they may have better information about their partners' ability, risk aversion, preferences, or work ethic. As a result, the bargaining cost would be lower for socially connected participants in the Unobservable Effort game since there is increased certainty about the partners' actions compared to socially unconnected participants. As a result, socially connected participants would be more likely to risk share in the Unobservable Effort game than participants who are not socially connected due to this information.

To explore this channel, I explore partner knowledge using two measures. First, I ask participants whether they think their partner completed the task in the Unobservable Effort game (mean 0.594).[34] The first measure captures whether participants correctly guessed whether their partner completed the task in the Unobservable Effort game. The second measure is an index of participants' knowledge about their partners generated from the survey in which I ask a series of questions about one of the three partners from the session.[35] The index captures how well the participant knows the partner, ranging from 0 (does not answer a single question correctly about their partner) to 1 (answers all questions about their partner correctly), with a mean value of 0.616.

I regress each measure of social proximity on whether the participant's belief regarding whether their partner completed the task is correct, and the partner knowledge index. The questions included in the index are asked for

[34] Participants are incentivized to answer the question correctly. The question is asked after all risk sharing games are played, but before incomes are announced.

[35] The questions relate to the partner's household relative income, proportion of income from their own work, number of people in the household, marital status, employment, whether the partner has been unable to work in the past month due to illness, housing status (own, rent, live without pay), and whether the partner's household has electricity, TV, refrigerator, bicycle, and a vehicle. Participants receive 50 KSH for one randomly selected answer if their answer is the same as their partner's response for herself.

only one of the three partners in the session, which decreases the sample substantially. Therefore, I show the results with (sample of 169) and without the index (sample of 406). The results in Table 6 are correlations that provide suggestive evidence of the mechanism through which social connections have an effect.

Overall, I do not find evidence to suggest that socially connected participants have better information about their partners. Table 6 shows that participants who are socially connected are not more likely to correctly answer whether their partner completed the task and are, if anything, less likely to answer questions about their partner correctly (corresponding to a lower score in "Index Knowledge Partner"). These results are consistent with the fact that social ties in the experiment are relatively weak. Thus, I conclude that social connections do not correspond to better information in my study.

Thus, the evidence that social connections correspond to higher effort in the Unobservable Effort game taken with the lack of evidence that social connections correspond to an increased cooperation overall or better information suggests that the main channel through which social connections have an effect is by increasing the motive to work, either due to intrinsic motives or social collateral generated by the repeated game that socially connected participants are engaged in outside of the experiment.

6 Conclusion

This paper examines how real-world social connections impact informal risk sharing in the presence of asymmetric information using a novel laboratory experiment. The experimental design allows me to vary whether effort is observable, while holding other dimensions of the economic environment fixed, in order to causally identify the effects of imperfect monitoring on risk sharing. By randomizing partners across games, I can examine the role of natural variation in social proximity while controlling for individual characteristics such as altruism and risk aversion that may differentially affect behavior in the games.

I find statistically and substantively meaningful results on the extensive margin of risk sharing, whether participants promise any transfers to their partner, rather than the intensive margin; this suggests that the extensive margin of risk sharing is the relevant margin for participants in my experiment. Overall, I find that participants are 7% less likely to engage in risk sharing due to imperfect monitoring of effort. However, the effects differ substantially for socially connected and unconnected participants. Participants who know their partner are 47% more likely to risk share than participants who do not know their partner when effort cannot be observed. As a result, imperfect monitoring has no effect on risk sharing for socially connected individuals. These results are consistent with a model of effort choice and risk sharing in which social connections strengthen participants' incentive to exert effort and decrease bargaining costs. The impacts of these choices are substantively significant, as socially connected individuals would achieve a 6% higher income over time. The results imply that effects asymmetric information on risk sharing are disproportionately high for socially distant individuals. Finally, I disentangle the various channels through which social connections have an effect to find evidence that social connections provide an additional incentive to work, as stronger social ties correspond to 25% higher effort on a real-effort task only when effort cannot be observed.

Since risk sharing is an important mechanism through which poor households smooth consumption, my results indicate that the strength of social connections in a community affects the extent to which households can cope with risk. Therefore, it is important to understand how networks endogenously form to sustain risk sharing. This is especially relevant as social networks adapt and change over time, for example due to mobile technology that allows risk sharing over increased distances (Jack and Suri, 2014). In addition, it is important to understand what aspects of social connections work to sustain risk sharing. This paper provides an important first step in understand the mechanism through which social connections have an effect, and suggests that the repeated interactions among the socially connected play a major role in sustaining the high levels of risk sharing observed outside the lab.

References

[1] Abeler, Johannes, Armin Falk, Lorenz Goette and David Huffman. 2011. "Reference Points and Effort Provision," *American Economics Review*, 101(2): 470-492.

[2] Ambler, Kate. 2015. "Don't Tell On Me: Experimental evidence of asymmetric information in transnational households," *Journal of Development Economics*, 113: 52-69.

[3] Alger, Ingela, Laura Juarez, Miriam Juarez-Torres, and Josepa Miquel-Florensa. 2016. "Does informal risk sharing induce lower efforts? Evidence from lab-in-the-field experiments in rural Mexico", TSE Working Paper 16-623.

[4] Ambrus, Attila, Markus Mobius and Adam Szeidl. 2014. "Consumption Risk-Sharing in Social Networks," *American Economic Review*, 104(1): 149-182.

[5] Angelucci, Manuela, Giacomo De Giorgi, and Imran Rasul. 2017. "Consumption and Investment in Resource Pooling Family Networks," *Economic Journal*, forthcoming.

[6] Arcand, Jean-Louis, and Marcel Fafchamps. 2012. "Matching in community-based organizations," *Journal of Development Economics*, 98: 203-219.

[7] Ashraf, Nava. 2009. "Spousal Control and Intra-Household Decision Making: An Experimental Study in the Philippines, "*American Economic Review*, 99(4): 1245-1277.

[8] Attanasio, Orazio, Abigail Barr, Juan C. Cardenas, Garance Genicot and Costas Meghir. 2012. "Risk Pooling, Risk Preferences, and Social Networks," *American Economic Journal: Applied Economics*, 4(2):134-167.

[9] Banerjee, Abhijit, Arun G. Chandrasekhar, Esther Duflo, and Matthew O. Jackson. 2013. "The Diffusion of Microfinance," *Science*, 341(6144).

[10] Barr, Abigail, Marleen Dekker and Marcel Fafchamps. 2012. "Who Shares Risk with Whom under Different Enforcement Mechanisms?," *Economic Development and Cultural Change*, 60(4):677-706.

[11] Barr, Abigail and Garance Genicot. 2008. "Risk Sharing, Commitment and Information: An Experimental Analysis," *Journal of the European Economic Association*, 6(6): 1151-1185.

[12] Belhaj, Mohamed, Renaud Bourlès, and Frédéric Deroïan. 2014. "Risk-Taking and Risk-Sharing Incentives Under Moral Hazard," *American Economic Journal: Microeconomics* , 6(1):58-90.

[13] Bohnet, Iris, Fiona Greig, Benedikt Herrmann and Richard Zeckhauser. 2008. "Betrayal Aversion: Evidence from Brazil, China, Oman, Switzerland, Turkey and the United States," *American Economic Review*, 98(1):294-310.

[14] Chandrasekhar, Arun, Cynthia Kinnan and Horacio Larreguy. 2017. "Social Networks as Contract Enforcement: Evidence from a Lab Experiment in the Field," *American Economic Journal: Applied Economics*, forthcoming.

[15] Charness, Gary and Garance Genicot. 2009. "Informal Risk Sharing in an Infinite-Horizon Experiment," *The Economic Journal*, 119:796-825.

[16] De Weerdt, Joachim. 2004. "Risk-Sharing and Endogenous Network Formation," In *Insurance Against Poverty*, edited by Stefan Dercon, 197-216, Oxford: Oxford University Press.

[17] De Weerdt, Joachim and Stefan Dercon. 2006. "Risk-sharing Networks and Insurance Against Illness," *Journal of Development Economics*, 81:337-356.

[18] De Weerdt, Joachim, Garance Genicot, and Alice Mesnard. 2017. "Asymmetry of Information within Family Networks," *Journal of Human Resources*, forthcoming.

[19] Ellsberg, Daniel. 1961. "Risk, Ambiguity, and the Savage Axioms," *The Quarterly Journal of Economics*, 75(4):643-669.

[20] Fafchamps, Marcel. 2011. "Risk Sharing Between Households,"*Handbook of Social Economics,*, Volume 1B.

[21] Fafchamps, Marcel and Flore Gubert. 2007. "Risk Sharing and Network Formation,"*American Economic Review*, 97(2):75-79.

[22] Fafchamps, Marcel and Susan Lund. 2003. "Risk-sharing networks in rural Philippines,"*Journal of Development Economics*, 71:261-287.

[23] Fischbacher, Urs. 2007. "z-Tree: Zurich toolbox for ready-made economic experiments,"*Experimental Economics*, 10(2):171-178.

[24] Fischer, Greg. 2013. "Contract Structure, Risk-Sharing and Investment Choice,"*Econometrica*, 81(3):883-939.

[25] Foster, Andrew D. and Mark R. Rosenzweig. 2001. "Imperfect Commitment, Altruism, and the Family: Evidence from Transfer Behavior in Low-Income Rural Areas," *The Review of Economics and Statistics*, 83(3):389-407.

[26] Grimmard, Franque. 1997. "Household consumption smoothing through ethnic ties: evidence from Cote d'Ivoire,"*Journal of Development Economics*, 53(3):391-422.

[27] Harrison, Glenn W. and John A. List. 2004. "Field Experiments,"*Journal of Economic Literature*, 42(4):1009-1055.

[28] Haushofer, Johannes, Marie Collins, Giovanna de Giusti, Joseph Muiruri Njoroge, Amos Odero and Cynthia Onyango, James Vancel, Chaning Jang, Maneesh Varghese Kuruvilla and Conor Hughes. 2014. "A Methodology for Laboratory Experiments in Developing Countries: Examples from the Busara Center," Working Paper.

[29] Hoel, Jessica B. 2015. "Heterogeneous Households: A Within-Subject Test of Asymmetric Information Between Spouses in Kenya," *Journal of Economic Behavior & Organization*, 118:123-135.

[30] Jain, Prachi. 2016. "Motives for Sharing: Evidence from Risk Sharing Games in Kenya,"Working paper.

[31] Jack, William, and Tavneet Suri. 2014. "Risk Sharing and Transactions Costs: Evidence from Kenya's Mobile Money Revolution," *American Economic Review*, 104(1):183-223.

[32] Karaivanov, Alexander and Robert M. Townsend. 2014. "Dynamic Financial Constraints: Distinguishing Mechanism Design from Exogenously Incomplete Regimes," *Econometrica*, 82(3):887-959.

[33] Karlan, Dean, Markus Mobius, Tanya Rosenblat, and Adam Szeidl. 2009. "Trust and Social Collateral," *Quarterly Journal of Economics*, 124(3):1307-1361.

[34] Kinnan, Cynthia. 2017. "Distinguishing barriers to insurance in Thai villages," Working paper.

[35] Leider, Stephen, Markus Mobius, Tanya Rosenblat and Quoc-Anh Do. 2009. "Directed altruism and enforced reciprocity in social networks," *Quarterly Journal of Economics*, 124(4):1815-1851.

[36] Ligon, Ethan. 1998. "Risk Sharing and Information in Village Economies, ", *Review of Economic Studies*, 65:847-864.

[37] Ligon, Ethan and Laura Schechter. 2012. "Motives for sharing in social networks," *Journal of Development Economics*, 99(1):13-26.

[38] Ligon, Ethan, Jonathan P. Thomas and Tim Worrall. 2002. "Informal Insurance Arrangements with Limited Commitment: Theory and Evidence from Village Economics,"*The Review of Economic Studies*, 69(1):209-244.

[39] Lim, Youngjae and Robert M. Townsend. 1998. "General Equilibrium Models of Financial Systems: Theory and Measurement in Village Economies,"*Review of Economic Dynamics*, 1:59-118.

[40] Marx, Benjamin, Thomas Stoker and Tavneet Suri. 2016. "There Is No Free House: Ethnic Patronage and Property Rights in a Kenyan Slum," MIT Sloan Working Paper 5041-13.

[41] Munshi, Kaivan and Mark Rosenzweig. 2009. "Why is Mobility in India so Low? Social Insurance, Inequality and Growth,"NBER Working Paper No. 14850.

[42] Murgai, Rinku, Paul Winters, Elisabeth Sadoulet, and Alain de Janvry. 2002. "Localized and incomplete mutual insurance," *Journal of Development Economics*, 67:245-274.

[43] Phelan, Christopher. 1998. "On the Long Run Implications of Repeated Moral Hazard," *Journal of Economic Theory*, 79:174-191.

[44] Platteau, Jean-Philippe and Anita Abraham. 1987. "An inquiry into quasi-credit contracts: The role of reciprocal credit and interlinked deals in small-scale fishing communities," *Journal of Development Studies*, 23(4):461-490.

[45] Rogerson, William P. 1985. "Repeated Moral Hazard," *Econometrica*, 53(1):69-76.

[46] Selten, Reinhard and Axel Ockenfels. 1998. "An experimental solidarity game," *Journal of Economic Behavior and Organization*, 34(4):517-539.

[47] Seshan, Ganesh and Robertas Zubrickas. 2017. "Asymmetric information about migration earnings and remittance flows, " *World Bank Economic Review*, 31(1):24-43.

[48] Townsend, Robert M. 1994. "Risk and Insurance in Village India," *Econometrica*, 62(3):539-593.

[49] Townsend, Robert M. 1995. "Consumption Insurance: An Evaluation of Risk-Bearing Systems in Low-Income Economies," *The Journal of Economic Perspectives*, 9(3):83-102.

[50] Udry, Christopher. 1994. "Risk and Insurance in a Rural Credit Market: An Empirical Investigation in Northern Nigeria," *The Review of Economic Studies*, 61(3):495-526.

Figures and Tables

Figure 1: Structure of the Games

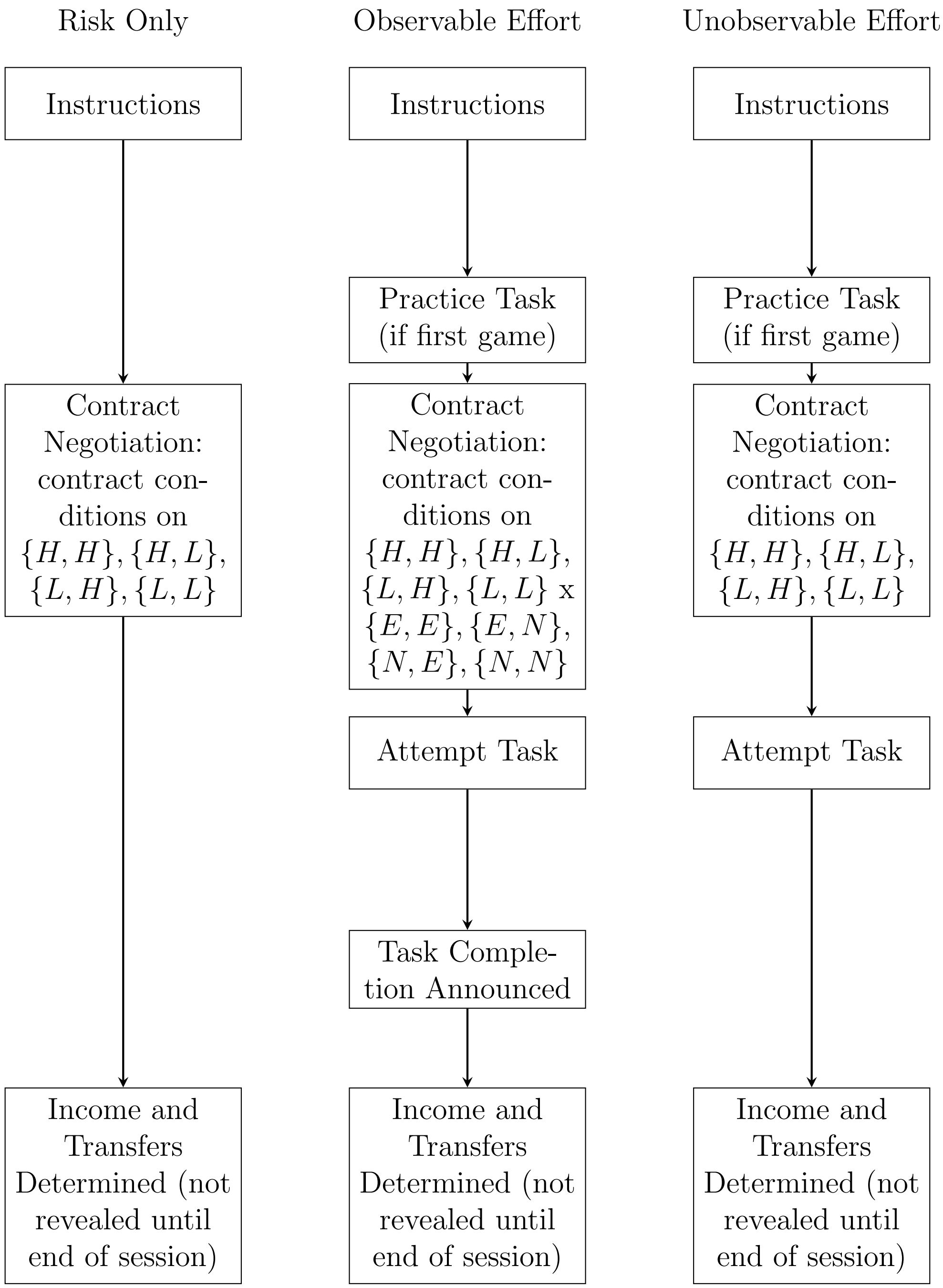
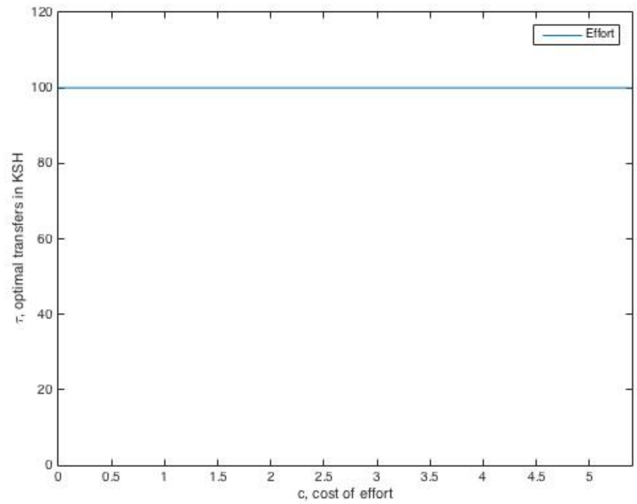
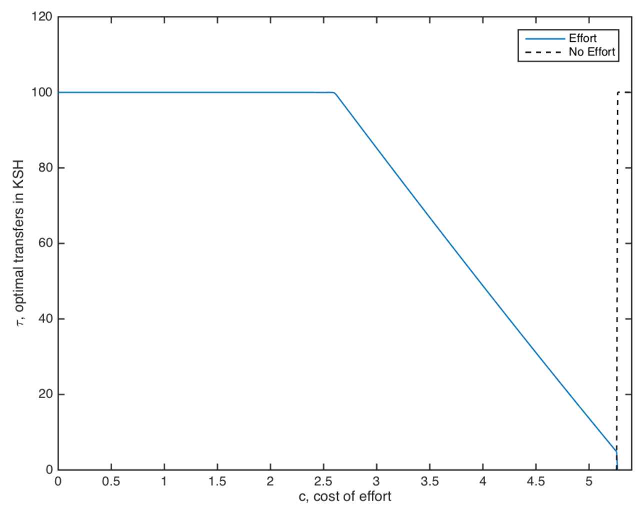


Figure 2: Optimal Transfers as a Function of Cost of Effort



Observable Effort



Unobservable Effort

Notes: This figure assumes an isoelastic utility function, $U_i(\pi, e) = \frac{(\omega+\pi-\tau)^{1-\rho}}{1-\rho} - c(e) - b_i(r_{AB}) - d(r_{AB})$ where τ is the level of transfer, $\pi = H, L$ is pre-transfer income, and ρ is the constant coefficient of relative risk aversion and bargaining costs such that the participant constraint holds. $\rho = 0.5$, $H = 450$, $L = 250$, and thus full risk charing corresponds to $\tau = 100$.

Table 1: Characteristics of Subject Pool

	(1) Nairobi/Kenya	(2) Busara Subjects	(3) Experiment	(4) Range
Age (years)		31.34	32.19	19-65
Male	51.15 *	45.47	40.00	
Education (%)				
Some Primary	36.95 *	47.81	34.70	
Some Secondary	32.30 *	39.99	51.90	
Some College or University	19.13 *	9.05	13.20	
Native Language (%)				
Luhya	13.83	19.47	31.29	
Luo	10.48	19.16	35.29	
Kikuyu	17.15	25.04	10.35	
Other	58.54	36.33	23.07	
Married (%)				
Single	19.74	47.79	45.88	
Married or Cohabiting	71.17	44.84	46.32	
Divorced, separated, widowed	9.08	7.37	7.80	
Other Sessions Attended			1.98	0-13

Notes: 425 observations. Statistics for Nairobi/Kenya are taken from Haushofer et al. (2014). *Data used for Nairobi.

Table 2: Summary Statistics for Outcomes of Interest

	(1) Observable Effort Game	(2) Unobservable Effort Game	(3)=(2)-(1) Difference Means	(4) Min	(5) Max	(6) N
Contract With Any Transfers Promised	0.686	0.639	−0.046	0	1	426
	[0.023]	[0.023]	[0.032]			
Transfers Promised^						
Conditional on Effort°	25.801	24.566	−1.235	-100	200	406
	[1.746]	[1.663]	[2.410]			
Conditional Effort° if Non-Zero Transfers	44.013	40.250	−3.763	-100	200	295
	[2.347]	[2.235]	[3.240]			
Max Transfers HL in Obs Game×	33.181	24.566	−8.615***	-100	200	424
	[1.821]	[1.662]	[2.466]			
Completed Task	0.537	0.589	0.052	0	1	406
	[0.025]	[0.024]	[0.034]			

Notes: Between-subject comparison. N refers to number of observations. ^Transfer is the transfer promised from a participant to her partner if the participant receives high income and her partner receives low income. °Transfer promised depending on realized efforts, i.e. whether the participant and her partner completes the task in the Observable Effort game. Completed Task indicates whether a participant correctly answered 45 grids on the counting task. ×Highest transfer from four transfers promised, $\{\tau^{EE}, \tau^{EN}, \tau^{NE}, \tau^{NN}\}$, in Observable Effort game. Standard errors are in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 3: The Effects of Imperfect Monitoring and Social Proximity: Any Transfers Promised (Extensive Margin)

	(1) All	(2) Same VE Group	(3) Partner Rel	(4) Partner Rel Two Way
Unobservable Effort Game (α_1)	-0.047^{**}	-0.062^{*}	-0.073^{**}	-0.081^{***}
	[0.024]	[0.036]	[0.028]	[0.026]
Relationship (α_2)		0.094	0.097	0.036
		[0.061]	[0.061]	[0.067]
Relationship * Unobs Effort Game (α_3)		0.033	0.116^{*}	0.290^{***}
		[0.052]	[0.062]	[0.086]
Coefficient: $\alpha_2 + \alpha_3$		0.127^{**}	0.213^{***}	0.326^{***}
Std. Dev.: $\alpha_2 + \alpha_3$		[0.061]	[0.062]	[0.073]
Coefficient: $\alpha_1 + \alpha_3$		-0.029	0.043	0.209^{***}
Std. Dev.: $\alpha_1 + \alpha_3$		[0.034]	[0.052]	[0.078]
Obs Game & No Relationship Mean	0.685	0.692	0.685	0.696
Obs Game & No Relationship Std. Dev.	[0.465]	[0.463]	[0.465]	[0.461]
R-squared	0.009	0.019	0.036	0.055
Observations	852	852	852	852
Individuals	426	426	426	426

Note: Any Transfers indicates whether the participants reached an agreement with any (non-zero amount of) transfers promised. Sample data is for observable and unobservable effort games only. Due to the within-subject design, the regressions include individual fixed-effects. Standard errors are in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Same VE Group indicates whether a participant speaks the same language and lives in the same village within Kibera as their partner (mean 0.519). Partner Rel indicates whether a participant claims to know their partner outside the experiment (mean of 0.252). Partner Rel Two Way indicates whether a participant claims to know their partner outside the experiment and their partner claims to know them outside the experiment (mean of 0.136).

Table 4: The Effects of Imperfect Monitoring and Social Proximity: Transfers Promised Conditional on Non-Zero Transfers (Intensive Margin)

	(1) All	(2) Same VE Group	(3) Partner Rel	(4) Partner Rel Two Way
Unobservable Effort Game (α_1)	3.676	7.178	1.035	1.811
	[2.888]	[4.666]	[3.460]	[3.223]
Relationship (α_2)		−5.394	−12.190	−1.205
		[7.201]	[7.594]	[9.378]
Relationship * Unobs Effort Game (α_3)		−5.830	10.450	12.660
		[6.518]	[7.763]	[10.878]
Coefficient: $\alpha_2 + \alpha_3$		−11.223	−1.738	11.460
Std. Dev.: $\alpha_2 + \alpha_3$		[7.251]	[7.689]	[8.336]
Coefficient: $\alpha_1 + \alpha_3$		1.348	11.487*	14.476
Std. Dev.: $\alpha_1 + \alpha_3$		[4.063]	[6.521]	[9.902]
Obs Game & No Relationship Mean	37.952	32.561	40.600	39.131
Obs Game & No Relationship Std. Dev.	[36.889]	[27.996]	[36.197]	[36.606]
R-squared	0.007	0.018	0.021	0.017
Observations	548	548	548	548
Individuals	329	329	329	329

Note: Transfer promised refers to the non-zero transfer promised when the participant receives high income and her partner receives low income (conditional on effort in the Observable Effort Game). Sample data is for observable and unobservable effort games only. Due to the within-subject design, the regressions include individual fixed-effects. Standard errors are in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Same VE Group indicates whether a participant speaks the same language and lives in the same village within Kibera as their partner (mean 0.519). Partner Rel indicates whether a participant claims to know their partner outside the experiment (mean of 0.252). Partner Rel Two Way indicates whether a participant claims to know their partner outside the experiment and their partner claims to know them outside the experiment (mean of 0.136).

Table 5: The Effects of Imperfect Monitoring and Social Proximity: Task Completion

	(1) All	(2) Same VE Group	(3) Partner Rel	(4) Partner Rel Two Way
Unobservable Effort Game (α_1)	0.039	0.022	0.027	0.013
	[0.026]	[0.041]	[0.031]	[0.029]
Relationship (α_2)		-0.113^{*}	-0.043	-0.053
		[0.066]	[0.066]	[0.073]
Relationship * Unobs Effort Game (α_3)		0.029	0.047	0.192^{**}
		[0.058]	[0.068]	[0.094]
Coefficient: $\alpha_2 + \alpha_3$		-0.085	0.004	0.140^{*}
Std. Dev.: $\alpha_2 + \alpha_3$		[0.065]	[0.068]	[0.079]
Coefficient: $\alpha_1 + \alpha_3$		0.051	0.074	0.205^{**}
Std. Dev.: $\alpha_1 + \alpha_3$		[0.037]	[0.057]	[0.085]
Obs Game & No Relationship Mean	0.537	0.564	0.569	0.564
Obs Game & No Relationship Std. Dev	[0.499]	[0.497]	[0.496]	[0.496]
R-squared	0.006	0.013	0.007	0.017
Observations	832	832	832	832
Individuals	426	426	426	426

Note: Sample data is for observable and unobservable effort games only. Completed Task indicates whether the participant correctly answered 45 grids on the counting task. These regressions include individual fixed-effects. Standard errors are in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Same VE Group indicates whether a participant speaks the same language and lives in the same village within Kibera as their partner (mean 0.519). Partner Rel indicates whether a participant claims to know their partner outside the experiment (mean of 0.252). Partner Rel Two Way indicates whether a participant claims to know their partner outside the experiment and their partner claims to know them outside the experiment (mean of 0.136).

Table 6: Characteristics of Social Connections

	(1)	(2)	(3)	(4)	(5)	(6)
	Same Village-Ethnic Group		Partner Relationship		Partner Relationship Two Way	
Belief Partner Completed Task Correct	0.017	0.032	−0.002	0.001	−0.042	−0.019
	[0.080]	[0.051]	[0.062]	[0.044]	[0.048]	[0.034]
Index Knowledge Partner	−0.333		−0.304		−0.248*	
	[0.245]		[0.191]		[0.147]	
Constant	0.693***	0.503***	0.374***	0.248***	0.277***	0.139***
	[0.161]	[0.039]	[0.126]	[0.034]	[0.096]	[0.026]
Observations	169	406	169	406	169	406
R-squared	0.011	0.001	0.015	0	0.021	0.001

Notes: Data is from the unobservable effort game. Standard errors are in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Belief Partner Completed Task Correct (mean 0.594) indicates whether the participant correctly guessed whether their partner completed the task in the Unobservable Effort game. "Index Knowledge Partner" is an index, ranging from 0 to 1 (mean 0.616), of how well a participant knows their partner based on the number of questions about the partner that was answered correctly.