INFORMATION, NETWORKS AND INFORMAL INSURANCE: EVIDENCE FROM A LAB EXPERIMENT IN THE FIELD

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(PRELIMINARY AND INCOMPLETE)

ABSTRACT. When communities engage in risk-sharing with asymmetric information, wherein a member of a risk-sharing group is unable to verify the income and shocks experienced by the others, they are unable to achieve full smoothing of income risk (Thomas and Worrall 1990). The frictions that drive the possible negative impacts of hidden income are likely to be mediated by the relationships among a risk-sharing group's members in the social network. Using a laboratory experiment in Karnataka, India, we study the interaction of informal insurance with hidden income, hidden savings, and social networks. Hidden income significantly reduces risk sharing: transfers between partner falls by ~40% on average when income is hidden, though the effect of hidden income is mitigated when player can chose their risk-sharing partners. Among self-selected dyads, there is a strong correlation between social proximity and better risk-sharing. However, social proximity does not improve risk sharing when partners of the same distance are randomly assigned. This suggests that aspects of social networks beyond geodesic proximity matter for risk sharing when information is hidden. Finally, for pairs with low social proximity, removal of commitment on top of hidden income and savings appears to further crowd out interpersonal risk-sharing, while pairs who are closely connected via the networks appear less affected by removal of commitment.

JEL CLASSIFICATION CODES: D82, D85, O16

KEYWORDS: Asymmetric information, insurance, social networks.

1. INTRODUCTION

Informal, inter-household insurance mechanisms are widespread throughout the world, particularly in low-income rural communities, yet these mechanisms are typically found not to achieve full smoothing of income risk (Townsend 1994, Udry 1994, etc.). One proposed explanation for this incomplete insurance is "hidden income": the inability of one network

Date: September 14, 2011.

We thank Robert Townsend, Abhijit Banerjee, Esther Duflo and Tavneet Suri for helpful comments. Research funding from the Consortium on Financial Systems and Poverty is gratefully acknowledged. Excellent research assistance was provided by Dhruv Parthasarathy and Manaswini Rao. The Centre for Microfinance at the Institute for Financial Management and Research, Gowri Nagaraj, and our field team were invaluable to the project's progress. Chandrasekhar is grateful for support from the National Science Foundation GRFP. Larreguy thanks the Bank of Spain and Caja Madrid Foundation for support.

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member to verify the income and other shocks experienced by the other (Townsend 1982, Kinnan 2011). If households have the ability to underreport income, the further ability to borrow or save without the knowledge of other network members may shut down interpersonal insurance entirely (Allen 1985; Cole and Kocherlakota 2001). However, the implications of the hidden income-hidden savings model have not, to our knowledge, been tested empirically.

The implications of hidden income are especially relevant now, as increased migration and remittance flows, more complex production activities and improved access to markets outside the community may make it harder for households within a community to ascertain one another's income in order to offer insurance. These developments may also affect households' ability to commit to informal risk sharing. At the same time, access to savings accounts and other forms of financial access is spreading in developing countries (The Economist, 2011), but from a very low base, with 62% of adults in Asia, Africa, Latin America and the Middle East lacking access to any kind of formal financial service such as a bank account or microloan (Chaia et al. 2009). These products may facilitate hiding savings, and crowd out more observable forms of savings such as ROSCAs, money-guarding, etc. (Collins et al., 2009).

The frictions that drive the possible negative impacts of hidden income, hidden savings and limited commitment are likely to be mediated by altruism, guilt or other forms of social preferences. Therefore, these frictions may have differential effects across agents who are socially "close" vs. "distant" from their risk-sharing partners. This raises the possibility that some agents, with socially close risk-sharing partners, may benefit from financial development when income and savings are hidden, while others, with distant risk-sharing partners, are hurt. A related question is whether individuals choose risk-sharing partners in a way that minimizes the temptations to hide income or savings. In short, empirically understanding the roles of hidden income, hidden savings and social proximity in risk sharing is of both theoretical and policy relevance. This is the goal of this paper.

This paper studies the interaction of informal insurance with hidden income, hidden savings and limited commitment using a unique lab experiment conducted in a field setting: rural Karnataka, India. We ran a series of experiments with actual villagers engaged in informal insurance in areas with limited financial development. The experiments captured the key features of the economic environment of Allen (1985) and Cole and Kocherlakota (2001). Participants played four versions of this consumption-smoothing game, which were designed to be easily understood by villagers: (1) observable income, observable savings, full commitment; (2) hidden income, observable savings, full commitment; (3) hidden income, hidden savings, full commitment; and (4) hidden income, hidden savings, limited commitment. In addition, the participants were placed into one of two rooms. In one room, partners were randomly assigned a risk-sharing partner in every game. In the other room, partners were given the opportunity to choose their partners (before the sequence of games was announced), for each of the four games. This allows us to study the value of endogenous partner choice.

Every game had an ex-ante unspecified number of rounds and the game ended with a 1/6 probability in order to simulate discrete-time, infinite-horizon models with discounting. After the end of the game, individuals were re-matched with new partners before commencing the following game. In each round of a game each individual had an independent, 50% chance to receive a high income level (Rs. 220) and 50% chance to receive a low income level (Rs. 30).

Before income was realized, in each round the individuals would decide upon state-contingent transfers to their partner for that round. These transfers allowed for the participants to smooth their consumption. As mentioned before, every individual played four versions of the game. In three versions, individuals had hidden income. In these games, individuals would make an announcement of their income after the income was realized. Specifically, individuals would indicate the level of income that they wanted to report to our survey staff, and after collecting this information for the pair, the staff would publicly announce the declared income levels. Moreover, in three versions of the game, individuals had access to full commitment, meaning that in each round an individual had to make the transfer that was decided upon before the realization of income.[1] Finally, in the game with limited commitment, after seeing their realized income and making announcements, participants had the opportunity to renege on the contingent transfers. Across all versions, players had an incentive to smooth consumption as they knew that they would be paid their consumption from one randomly chosen round from all the rounds they played.[2]

The ability of a group to share risk in an environment with private information as well as limited commitment depends on their embedding in the social network. As such, the interaction of participants outside the experiment may affect the incentives created by the researcher. We designed our experiment to exploit this phenomenon, making use of detailed social network data for the villages in our sample. In the exogenous pairing treatment, the random assignment of partners to pairs and pairs to treatments guarantees that our cross-treatment comparisons are not confounded by unobserved characteristics of pairs' relationships. Moreover, we use the social network data to construct a measure of the social proximity between paired individuals and include it in our analysis. In turn, we are able to estimate the heterogeneous effects of our treatments across social proximity. This unique design enables us to investigate whether social proximity may mitigate problems of hidden income, hidden savings, and limited commitment. By comparing dyads formed when players could choose partners to randomly-formed dyads of the same proximity, we can study to

[1]While this is clear in the case of observable income, notice that in the case of hidden income a full commitment contract means that the contract is a binding function of the announced income level.
[2]This is standard in the literature, e.g. Charness and Genicot (2007) and Fischer (2011).

what extent social proximity captures the features of social networks that mitigate problems of private information and limited commitment.

By conducting a lab experiment in the field we can carefully control the economic environment including commitment, observability, savings technology, social proximity to one's risk-sharing partner, all while holding the income process constant. It is difficult, if not impossible, to study these issues without data from a laboratory experiment, due to the endogeneity of financial access and commitment technologies. As a result, there is currently no empirical evidence on the interaction of hidden income, hidden savings, and social networks. One goal of our paper is to fill this gap.

In brief, our findings are the following: First, asymmetric information about risk-sharing partners' incomes ("hidden income") significantly reduces risk sharing. When players can misreport their income, they often do so, and sharing between partners falls as a result, by 30% on average when players choose their own partners, and 60% when players are randomly paired. Second, when risk-sharing partners are endogenously chosen, the effect of hidden income is mitigated among pairs who are are socially closer. When hidden income is introduced, the fall in the amount transferred by a high- to a low-income player is indistinguishable from zero when partners are socially close. When they have low social proximity (high social distance), endogenously-chosen pairs see an almost 50% reduction in transfers due to hidden income.

Our third finding is that the correlation between social proximity and better risk-sharing is absent when players do not choose their risk-sharing partners, that is when partners are randomly assigned. In the exogenously-paired sample, dyads who are randomly paired with a high-proximity partner do no better than those whose partners are socially distant. This may imply that geodesic social proximity misses some important features which players use to pick their partners, and which mitigate the effect of hidden income. It may also imply that there is a direct effect of players being able to choose their partners. Fourth, when savings is hidden, rather than observable, we find no additional crowdout of transfers or risk sharing (in contrast to the predictions of Allen (1985) and Cole and Kocherlakota (2001)). Nor do we find increased use of savings, suggesting that, contrary to theory (Attanasio and Pavoni, 2007), individuals may not be savings-constrained when income is hidden. When formal commitment is removed (on top of hidden savings and hidden income), transfers fall and risk sharing worsens. This effect, found for both close and distant pairs, suggests that formal contracting opportunities may be especially important when the degree of information asymmetry is high.

The remainder of the paper is organized as follows: Section 2 presents the theoretical frameworks. Section 3 details the setup of our experiment. Section 4 presents our results, and Section 5 concludes. Proofs and details of the models are in Appendix A; figures are in Appendix B; and tables are in Appendix C. An extract of the experimental protocol appears in Appendix D.

2. Framework: Insurance with hidden income

The problem of individuals[3] who would like to insure one another, but who cannot verify one another's incomes, was characterized by Townsend (1982) and Thomas and Worrall (1990). First, consider a simple case with no social proximity or social preferences: each individual has the utility function

$$U(\mathbf{c}_i) = \mathbb{E}\sum_{t=0}^{\infty}\beta^t v(c_{it}).$$

Individuals' income is i.i.d. and may be either low, y_l, or high, y_h, with equal probability.[4] Because incomes cannot be verified, full insurance is not incentive-compatible: an arrangement offering to fully insure against low income realizations by providing a transfer of $\tau^{full} = \frac{1}{2}(y_h - y_l)$ whenever y_l occurred (funded by an equal-sized transfer from those with high income) would result in individuals with high income realizations also claiming low income, since $v\left(y_h + \tau^{full}\right) > v\left(y_h - \tau^{full}\right)$. By a similar argument, any stationary insurance scheme, providing $\tau > 0$ whenever low income is realized, will be infeasible because those with high income will always prefer to be on the receiving than the giving end, so they will claim their income is low.

However, Townsend (1982) showed in a 2-period, 2-agent, 2-income level framework that partial interpersonal insurance of the first period shock is possible when incomes are hidden. This insurance takes the form of "soft loans," wherein high-income individuals lend to low-income individuals at a rate of interest less than the opportunity cost of funds. This credit-as-insurance arrangement is incentive compatible since high-income individuals expect (on average) lower income in the future than currently, so taking a loan, even on favorable terms, is not attractive, while receiving the proceeds from this loan in the future is. The arrangement manages to offer (partial) insurance to those with low income in the first period because the difference between the soft interest rate and the market rate functions as a transfer.[5] As well as interpersonal insurance, the arrangement offers intertemporal smoothing (borrowing in bad times and repaying in good) although the group as a whole must balance its budget each period. Thomas and Worrall (1990) characterize the constrained-efficient insurance contract for an infinite horizon with an arbitrary (discrete) income process, and show that it displays the same credit-as-insurance property as the 2-period case. Crucially, it is the fact that marginal utility is higher under low income than high income that makes truthful announcement of incomes, and hence partial interpersonal insurance, feasible.

[3]The agents may also be (unitary) households.

[4]Allowing for additional income levels is straightforward, with some extra notation: see Appendix A.

[5]No insurance of the second-period shock is possible because this is the terminal period, and so there is no way to discipline high-income individuals from claiming low income.

2.1. **Adding savings.** So far it has been assumed that the insurance network as a whole cannot borrow or save, or alternatively that any period t income not consumed at time t depreciates fully by the following period. What happens if individuals can save income across periods? The ability to save has a positive effect: savings can partially buffer aggregate risk (the risk that both members of the network receive low income at the same time) as well as uninsured idiosyncratic risk (since, as argued above, idiosyncratic risk cannot be fully insured when incomes are private information). However, if individuals' savings, like their incomes, are private information[6], the ability to use savings for intertemporal smoothing comes at the cost of completely shutting down interpersonal insurance (Allen 1985; Cole and Kocherlakota 2001). The intuition for this stark result is that the ability to sustain some insurance with hidden incomes relied on an individual with current high income anticipating that future marginal utility would be higher than current marginal utility. The ability to borrow and save allows individuals to equate current marginal utility with expected future marginal utility (Hall, 1978). Cole and Kocherlakota (2001) show that access to savings (no borrowing) is enough to rule out interpersonal insurance, because it is the high-income individuals whose incentive-compatibility constraints are binding, and they would like to save, not borrow. This also implies that individuals will be savings-constrained in the hidden income model, a prediction explored further in Attanasio and Pavoni (2007).

It should be emphasized that the Allen-Cole-Kocherlakota result does not imply that agents will not make transfers to each other. However, those transfers will obey a state-by-state budget constraint, with any money transferred from agent i to agent j eventually repaid:

$$\underbrace{y_H}_{\text{Income at } t} + Ra_{t-1} + \sum_{\tau=t+1}^{T} R^{t+1-\tau} y_\tau = \sum_{\tau=t}^{T} R^{t-\tau} c_\tau + \underbrace{a_T}_{\text{Savings at game end}} \tag{2.1}$$

$$\underbrace{y_L}_{\text{Income at } t} + Ra_{t-1} + \sum_{\tau=t+1}^{T} R^{t+1-\tau} y_\tau = \sum_{\tau=t}^{T} R^{t-\tau} c_\tau + \underbrace{a_T}_{\text{Savings at game end}} \tag{2.2}$$

This is the hallmark of pure credit, whereas insurance would allow permanent transfers from high- to low-income individuals.

2.2. **Removing commitment.** Thus far individuals were assumed to be able to commit to remain in the insurance arrangement; there was no possibility of "walking away" if utility within the arrangement fell below the utility one could get by reneging. This is a strong assumption in the context of insurance with hidden income, because the utility of at least half of the members of the insurance arrangement will eventually become arbitrarily negative,

[6]This argument also assumes that private savings bear the same interest rate and riskiness as the public savings technology available to the community; if the public savings technology bears a different return or risk, private savings may not completely rule out interpersonal insurance (Doepke and Townsend, 2006).

meaning that those agents would pay any amount to get out of the insurance contract (Thomas and Worrall, 1990; Phelan, 1995, 1998.

Thomas and Worrall (1990) show by construction that some insurance can be sustained in the presence of hidden income and one-sided limited commitment if the discount factor of the non-committed party is sufficiently close to one.[7] However, Cole and Kocherlakota's result for hidden income-hidden savings implies that removing commitment from such a setting will have no effect on interpersonal insurance, as it features none. There may, however, be constraints placed on the amount of credit provided. (See Appendix A for details.)

2.3. **The role of social proximity.** So far we have assumed that the incentive problems of the hidden income, hidden savings, and limited commitment problems could only be addressed by the transfer scheme: promising more consumption to those realizing and truthfully reporting high income. However, incentives outside of the transfer scheme may also play a role. These may include guilt, altruism, loss of other relationships, etc. All of these may be seen as forms of social proximity, channeled through social networks, which are increasingly understood to play a role in sustaining real world risk sharing (seeRosenzweig, 1988; Fafchamps and Lund, 2003; Bloch et al., 2008; Karlan et al., 2009; Angelucci and DeGiorgi, 2009; Chandrasekhar et al., 2011, among others).

If social proximity relaxes the temptations to underreport income, to privately save a different amount than recommended by the community, or to renege on the insurance agreement, an individual whose risk sharing partner is socially close to her–in the sense of geodesic network distance–may achieve better consumption smoothing than someone whose risk sharing partner is socially distant.

2.4. **The role of endogenous partner choice.** Much of the literature–both theoretical and empirical–analyzing the role of social networks in economic interactions has focused on geodesic distance and other statistics which can be computed from the graph. However, there are almost certainly elements of actual social embedding which are not captured by the network created by researchers. Directly observing these elements is by definition difficult. However, their presence can be adduced if individuals who are allowed (via random selection) to pick their risk sharing partners achieve better risk sharing than those who play identical games but with partners that are randomly assigned to them, and whose partners (by chance) have the same observable network characteristics as the endogenously-chosen pairings.[8]

[7]While Thomas and Worrall's contract is incentive feasible, it is not necessarily optimal: there might exist another contract which sustains more risk sharing. To our knowledge, the optimal contract subject to hidden income and two-sided limited commitment has not been characterized, because the presence of truth-telling and participation constraints renders the problem non-convex. Convexification by lotteries may not solve the problem (as it has been shown to do with only participation constraints (Ligon et al., 2002)) because the first order constraints of the relaxed problem may be saddle points, not optimal solutions, as has been pointed out in other mechanism design settings with multiple deviations (Kocherlakota, 2004). We do not create a hidden income-no commitment-no savings environment in our experiment, however.

[8]There also may be a direct effect of allowing individuals to choose their partners.

3. Experimental setup

Our experiment was conducted in 40 villages in Karnataka, India. The villages range from 1.5 to 3 hours' drive from Bangalore. The average village, according to our census data, contains 164 households, comprising 753 individuals. South India was chosen as the setting for our experiment because rural and periurban villages in South India have historically been characterized by a high degree of interpersonal risk-sharing, as demonstrated by Townsend (1994) and others for the ICRISAT villages, and because rural South India is currently experiencing rapid growth in the availability of savings, but from a low base. These particular villages were chosen because village censuses and social network data were previously collected on their inhabitants, as described below and in more detail in Banerjee at al. (2011) and Jackson et al. (2010). This gives us uniquely detailed data, not just on our experimental participants and their direct connections to their partners, but also on indirect linkages between partners, e.g. through mutual friends.

In each village, 32 individuals aged 18 to 40 were recruited to take part in the experiment. Each individual played four different games, described in more detail below. Sixteen of these individuals were randomly assigned to play games in which their partners were randomly selected by stratifying against the social proximity distribution. The remaining 16 were given the opportunity to choose partners according to randomly-assigned priorities. Partner choices were made after the four games were described, but players could not choose to play a particular game with a particular player. The partner choice proceeded as follows: players were randomly numbered from 1 to 16, and the person with priority #1 picked a partner, and both were removed from pool. Then the lowest number remaining picked a partner; he and his partner were removed from pool, and so on until all players were paired. Players were then renumbered, and the process was repeated (four times total). These four groups of pairs were randomly assigned to the four games, which we now describe.

3.1. **Overall game setup.** The purpose of our games was to replicate the incentives to share income risk that exist in real life, but to do so in a way that can be implemented in an experimental session lasting a few hours. For external validity, individuals should have strong incentives to smooth risk and to think carefully about their choices. Consumption smoothing has both intertemporal and interpersonal components. We create an interpersonal component by pairing individuals into groups of two. In all games, the members of a pair can make transfers to each other. To simulate the intertemporal smoothing motive, individuals play many rounds during the experiment (18 rounds, six per game on average), but are paid their consumption for one randomly-selected round. To make this salient, income is represented by imitations of Indian 10, 20, 50 and 100 rupee bills, and each consumption realization is written on a chip and placed in a bag that the player keeps with him or her during the entire experiment. At the end of the experiment, an experimenter draws one chip from the bag, and the individual is paid the amount shown on the selected chip. Incomes are risky: as in our theoretical setup, there is a high income level (Rs. 220), and a low income level (Rs. 30); incomes are i.i.d. across players and across rounds. Moreover, to simulate the (possibly unequal) wealth individuals have at the time when they enter into an insurance relationship, before round 1 of each game one partner is randomly chosen to receive an endowment of Rs. 60; the other receives Rs. 30. The games are described in the context of a farmer who may receive high income because of good rains this season or low income because of drought. (An excerpt of the experimental protocol, translated into English, appears in an Appendix D.)

To replicate an interaction that may extend indefinitely into the future, induce discounting and avoid a known terminal round, the game ends with $\frac{1}{6}$ probability at the end of each period, determined by drawing a ball from a bag that has five red balls and one black ball. Participants are told before each game that the game will end when the black ball is drawn, and that therefore at any point when they game has not ended, it is expected to continue for 6 more rounds. Once a game ends due to a black ball being drawn, individuals are re-paired. The order of the games is randomized, and we control for game order in our regressions. The options allowing players to decouple consumption from income vary by game. However, in all treatments, at the beginning of each round before incomes are realized (but after the endowment is realized in round 1), partners may decide on an income sharing plan. That is, each player picks the amount she gives to her partner as a function of her and her partner's *announced incomes*[9]:

	$y_i^* = 30$	$y_i^* = 220$
$y_j^* = 30$	τ_{iLL}	τ_{iHL}
$y_j^* = 220$	τ_{iLH}	τ_{iHH}

This plan may be asymmetric ($\tau^1_{t,y_1y_2} \neq \tau^2_{t,y_2y_{21}}$) and time-varying ($\tau^i_{t,y_1y_2} \neq \tau^i_{t',y_1y_2}$). A transfer could be made when both players received the same income, or players could chose to transfer nothing in those situations (indeed they could transfer zero when they received different incomes). Partners were also free to each promise a nonzero transfer to the other in the same state. For instance, if player 1 and player 2 both received Rs. 220, player 1 could transfer Rs. 60 to player 2 and player 2 transfer Rs. 20 to player 2, for a net transfer of Rs. 40 from player 1 to player 2. Communication between the partners was allowed while they made these decisions, to mimic real-life interactions, but one partner did not have veto power over the other's announced transfer.

3.2. **Game details.** The details of each treatment are as follows:

(1) ***Observable income, observable savings, full commitment:*** In this benchmark setup, with no informational or commitment frictions, partners first announce an income sharing plan. Once incomes are realized, the experimenter implements the

[9] In some games, announced incomes are mechanically actual incomes. In others, a player could announce an income different than her real income, as detailed below.

transfers implied by the two partners' income realizations. There is no opportunity for the players to misreport their incomes (that is, announced an income different from actual incomes) or change their minds (make a different transfer than promised). Once transfers are made, players can "consume" a given amount by placing the (imitation) bills in a consumption cup, or save bills by placing them in a savings cup (which is clear to facilitate observation by the other partner). Saved bills are available to consume in later rounds, but are lost when the game ends. The experimenter removes the bills from the consumption cup, writes the amount on a chip, and the chip is placed in the consumption bag.

(2) ***Hidden income, observable savings, full commitment:*** In this setup, a physical barrier is placed between the two players. As in game 1, partners begin by announcing an income sharing plan; however, they are told that the will not be able to see their partner's income (or vice versa), so the transfer will depend on what the two players *announce*. As before, incomes are realized, and each player is handed an envelope containing the corresponding amount in imitation bills. The envelope is handed over behind the barrier so the partner cannot see the amount. Once both players have received their incomes, the experimenter asks each player to announce her income. The experimenter implements the transfers implied by the two partners' income *announcements*. Conditional on the announcements, there is no opportunity for the players to change their minds about their transfers: the transfer implied by the announcements is carried out. Once transfers are made, players can consume by placing bills in the consumption cup, or save bills by placing them in the savings cup. The consumption cup is now kept behind the barrier, invisible to the partner. The savings cup is still kept in front of the barrier, visible to the other partner. Saved bills are available to consume in later rounds, but are lost when the game ends. The experimenter removes the bills from the consumption cup, writes the amount on a chip, and the chip is placed in the consumption bag.

(3) ***Hidden income, hidden savings, full commitment:*** In this setup, as in game 2, income is hidden. Now. savings are hidden as well (and players are informed of this). Partners begin by announcing an income sharing plan which, again, will depend on what the two players announce. Incomes realizations, announcements and transfers proceed as in game 2. In this setup, instead of a savings cup visible to the partner, each player has an envelope, which is kept behind the barrier, invisible to their partner. Consumption, savings and recording proceed as above.

(4) ***Hidden income, hidden savings, limited commitment:*** Again, income and savings are hidden. Players are told in that in this game, they and their partner can change their minds about what to transfer after both partners make their announcements. Incomes are realized, so the partner cannot see. Once both players

have received their incomes, the experimenter asks each player to announce her income. The experimenter reads out the transfer implied by the two partners' income announcements and the sharing plan, and asks the players if they want to change their minds. The experimenter implements the new transfers if either player changed their mind, otherwise the transfers implied by the announcements is carried out. As in game 3, each player has a savings envelope, which is kept behind the barrier, invisible to their partner. Consumption, savings and recording proceed as above.

3.3. **Testable implications and empirical questions.** The four experimental settings, combined with the framework detailed in section 2 lead to the following testable implications and empirical questions:

Proposition 3.1. *Average transfers under full information-full commitment (game 1) are equal one-half of the average income difference between players.*[10]

Proposition 3.2. *There is full smoothing of idiosyncratic risk under full information-full commitment (game 1).*[11]

Proposition 3.3. *Risk sharing (i.e. transfers) is reduced by the ability of individuals to hide their income (game 2).*

Proposition 3.4. *Welfare (i.e., consumption smoothing) is reduced by the ability of individuals to hide their income (game 2).*

Proposition 3.5. *Individuals are savings-constrained when incomes (but not savings) are hidden, so savings in game 3 should be higher than in game 2.*

Proposition 3.6. *Risk sharing (i.e. transfers) is reduced by the ability of individuals to hide savings (game 3).*

Proposition 3.7. *Welfare (i.e., consumption smoothing) is reduced by the ability of individuals to hide savings (game 3).*

[10] Note that the experimental income process is orthogonal to players' bargaining weights.

[11] Note that this and the preceding proposition will only hold if other barriers to full insurance, such as endowment effects, ambiguity aversion, etc. are absent.

Proposition 3.8. *Removing commitment (game 4) reduces the amount of interpersonal credit sustainable when hiding income and savings are possible.*

Proposition 3.9. *Removing commitment (game 4) reduces consumption smoothing (hence, welfare) when hiding income and savings are possible.*

Empirical question 3.1. *Do individuals mis-report their incomes in games 2-4?*

Empirical question 3.2. *Do individuals renege on their transfer agreements in game 4?*

Proposition 3.10. *Socially closer pairs achieve more risk sharing and better consumption smoothing under hidden income (game 2).*

Proposition 3.11. *Socially closer pairs achieve more risk sharing and better consumption smoothing under hidden savings (game 3).*

Empirical question 3.3. *Do socially close pairs experience a smaller fall in risk sharing and consumption smoothing due to removal of commitment (game 4)?*

Proposition 3.12. *If social proximity helps to mitigate the effects of hidden income, hidden savings and limited commitment, endogenous risk sharing networks will be formed with socially close individuals.*

Empirical question 3.4. *Do endogenously-formed risk sharing pairs mitigate the effect of hidden income, hidden savings and limited commitment to a greater extent than randomly-formed pairs with the same observable characteristics?*

We now turn to the results.

4. Results

Before presenting our results, we discuss how we measure the degree of insurance and the extent of consumption smoothing, and discuss our basic regression specifications.

4.1. **Measuring the degree of insurance and welfare.**

To examine the magnitude of interpersonal insurance, we examine average transfers made by individuals with high income realizations to those with low income realizations. Because Pareto weights are orthogonal to the in-game income process, under full risk-sharing average transfers will equal $\frac{\Delta_y}{2}$, where $\Delta_y \equiv \frac{1}{2}(y_h - y_l)$ is the average difference between the two players' incomes.[12] If players insure, on average, fraction α of their idiosyncratic risk, average transfers will equal $\alpha\frac{\Delta_y}{2}$. (For details, see Appendix.) This gives us a measure of the amount of interpersonal risk-sharing which does not rely on knowing the relative bargaining power or Pareto weights. Moreover, these comparisons do not rely on the assumption that individuals are on the Pareto frontier; merely that they are risk averse.

We can therefore interpret changes in transfers when moving from full information (game 1) to hidden income (game 2) as the change in interpersonal insurance due to binding truth-telling constraints; changes in transfers when moving from hidden income (game 2) to hidden income-hidden savings (game 3) as the change in insurance due to constraints arising from the desire to save a different amount than the social optimum (holding hidden income constant); and we can interpret changes in transfers when moving from hidden income-hidden savings (game 3) to hidden income-hidden savings-limited commitment (game 4) as the change in interpersonal insurance due to participation constraints, holding hidden income and hidden savings constant.

Examining transfers as an outcome tells us about the degree of interpersonal insurance. However, we are also interested in the implications for welfare. In particular: Is welfare different across games, and by how much? In general, the effect of different treatments on welfare would be comprised of an effect of the level of consumption and an effect on the variability of consumption. However, because the income process was fixed across treatments, there will be no difference in average consumption. Therefore, we can use consumption variability as a sufficient statistic for welfare.

4.2. **Regression specifications.**

4.2.1. *Baseline.* Our main estimation specification take the following form for outcomes defined at the individual-game-round level:

$$\omega_{igr} = \alpha + D_g + D_g \cdot T_i + X_g'\eta + \phi_i + Z_{ig}'\zeta + \varepsilon_{igr} \tag{4.1}$$

where ω_{igr} is an outcome for i in game g, round r. D_g is an indicator for a particular friction (hidden income, which takes the value zero in game 1 and one in games 2-4; hidden

[12] 50% of the time the difference is $(y_h - y_l)$; 50% of the time it is 0. In our experimental setting, $\Delta_y = 95$ so full risk-sharing implies average net transfers of 47.5.

savings, equal to one in games 3-4 or limited commitment, equal to one in game 4 only). This specification imposes additivity of each friction, e.g., the impact of hidden income is constrained to be the same whether it occurs alone (game 2), with hidden savings (game 3), or with hidden savings and limited commitment (game 4). (Below we present pairwise comparisons which relax this assumption.) X_g includes characteristics of the game (order-of-play and surveyor effects), ϕ_i is an individual-fixed effect, and Z_{ig} includes the geodesic proximity (the inverse of geodesic distance) between i and j in the social network. Pairs who are unconnected in the (observed) village social network have proximity of 0 (2.7% of pairs in our sample). T_i is an indicator for the exogenous-pairing treatment: the effects of hidden income, etc. are allowed to vary across the treatments.

The outcomes we consider which are defined at the individual-by-game-by-round level are: absolute deviations of consumption from the overall average for that game, $|c_{igr} - \bar{c}_g|$, and savings, s_{igr}. We also examine net transfers, τ_{igr}, made by individuals receiving high income to those receiving low income. Because we are interested in transfers as insurance, as opposed to pure redistribution, when analyzing transfers, we focus on individual-game-round observations in which the player received high income (Rs. 220), and their partner received low income (Rs. 30).[13] This occurs in 25% of all rounds, since partners' incomes are i.i.d. The dependent variable is then the net transfer from the lucky player to her unlucky partner.

For ease of comparison with the transfer results, we first show consumption deviations and savings for asymmetric-income rounds only (however, unlike transfers, we include both the lucky and unlucky players). We also show consumption deviations and savings for all rounds (i.e., including those where both partners received the same income). For brevity, when both samples yield qualitatively similar conclusions, we will only discuss the results for all rounds.

4.2.2. *Differing effects of social proximity.* We also examine how the effects of different forms of market incompleteness are mediated by social proximity. To do so, we separately consider the effects of hidden income, hidden savings and limited commitment and run regressions of the form

$$\omega_{igr} = \alpha + \beta_g D_g + \delta_1 \pi(i,j) + \delta_g D_g \cdot \pi(i,j) + D_g \cdot T_i + \phi_i + Z'_{ig}\zeta + \varepsilon_{igr} \tag{4.2}$$

where again ω_{igr} is an outcome for i in game g, round r and D_g is an indicator for the friction in question: hidden income, hidden savings or limited commitment. Now we include $\pi(i,j)$, the social network proximity between i,j, interacted with the game indicator. T_i is an indicator for the exogenous-pairing treatment, also interacted with the game indicator. This specification relaxes the additivity assumption imposed in equation (4.1).

[13]Note that when we restrict the sample based on income realizations, we always restrict based on actual income, not reported income.

The sum $\beta_g + \delta_g$ is the regression-adjusted effect of the effect in question for the closest pairs (proximity 1). (We compare hidden income only to full information; hidden income plus hidden savings to hidden income only; and hidden income plus hidden savings plus limited commitment to hidden income plus hidden savings.) The coefficient β_g is the effect for unconnected (proximity zero) pairs. The coefficient δ_1 is the effect of going from proximity of zero (unconnected) to proximity one (directly connected) in the "reference" treatment.

The estimation errors (ε) in our regressions may be correlated across individuals within a given game in a particular village, due, for instance, to slight idiosyncrasies of game explanation, disruptions in the experiment venue, etc. Therefore all regression standard errors are clustered at the game-village level.

4.3. **Direct evidence of truth-telling constraints.** When players can misreport, they do: a player with an income of Rs. 220 claimed her income was Rs. 30 almost 50% of the time. Players with income of Rs. 30 almost never claimed their income was Rs. 220. Figure (1) shows reported income as a function of actual income across the treatments. This answers Empirical question 3.1 in the affirmative.

4.4. **Direct evidence of participation constraints.** When players can renege on their transfer agreements, they do: players in the endogenous treatment chose to transfer an amount less than what they promised 55.8% of the time. Players with socially close partners (above-median; proximity 1/3 and above) renege slightly less often than those with socially distant (below-median) partners, but the difference is small (55.1% vs. 56.4%). Players in the exogenous treatment renege 51.3% of the time. Again, players with partners of above-median proximity renege slightly less often than those with below-median partners (50.7% vs. 51.6%). This answers Empirical question 3.2 in the affirmative.

The fact that endogenously-formed partners renege slightly more often is somewhat unexpected. However, endogenously-formed partners nevertheless transfer more on average than exogenously-formed partners: Rs. 25.92 vs. Rs. 24.93.

4.5. **Insurance, savings and welfare across games.** Table 1 shows levels of transfers, consumption absolute deviations, and savings across games (averaging across levels of social proximity). The effect of each game is allowed to differ for the endogenously- and exogenously-paired players. However, as noted above, this specification imposes additivity of each friction, e.g., the impact of hidden income is constrained to be the same whether it occurs alone, with hidden savings, or with hidden savings and limited commitment. We control for the main effect of social proximity, but not (yet) its interaction with the games.[14] The striking pattern which appears is the extent to which hidden income, alone or combined with other frictions, reduces insurance and consumption smoothing, consistent with Proposition 3.3 for risk sharing and Proposition 3.4 for transfers. Column 1 shows results for

[14]Results omitting the controls for distance are very similar.

transfers. The average level of net transfers under full information (game 1) is Rs. 48.4.[15] Introducing just hidden income (HI) reduces net transfers by Rs. 13.93, or almost 30%, for endogneously-paired dyads. Notably, the impact of hidden income, alone or combined with other frictions, is significantly greater for the exogenously-formed pairs: for exogneously-paired dyads the fall is 13.93+14.76 or 28.69, or almost 60%. Making savings hidden on top of hidden income does not further reduce transfers, in either sample. Adding limited commitment to hidden income and hidden savings reduces net transfers by Rs. 2.31. The limited commitment effect is insignificant in this pooled specification, but we show below that when we allow the impact of limited commitment to differ by social proximity, we find significant evidence that limited commitment reduces risk-smoothing for unconnected pairs.

Column 4 shows results for consumption absolute deviations, i.e. the inverse of consumption smoothing, for all rounds (whether income was symmetric or asymmetric). Under full information average consumption absolute deviations are Rs. 62, two thirds of the Rs. 95 that would obtain with no consumption smoothing. Hidden income increases consumption variability by Rs. 5.59 in the endogenous pairing and Rs. 13.69 in the exogenous pairing, consistent with Proposition 3.4 and answering Empirical question 3.4–do exogenously-formed pairs suffer more from market incompleteness?–in the affirmative for hidden income. Adding hidden savings has no additional effect on consumption variability in the endogenous or exogenous samples. Adding limited commitment does not increase consumption variability significantly in the all-rounds sample.

The results for consumption variability in asymmetric income rounds only (column 2) show that consumption smoothing worsens more due to hidden income in those rounds than in symmetric-income rounds, although the baseline (full information) amount of consumption variability is less: Rs. 46 vs. Rs. 62. The effect of limited commitment is now significant in the endogenously-pooled sample (a fall of Rs. 2.13). This is intuitive, since the motives for sharing in symmetric-income rounds are not risk-pooling–there is no idiosyncratic risk to pool, but may instead be due to one player having greater bargaining power than the other. Differences in bargaining power (or non-insurance transfers in general) should not be affected by private information. This pattern is repeated in all subsequent tables, unless otherwise noted.

Column 5 shows results for savings, for all rounds. Under full information average savings balances are Rs. 14.1. Hidden income, hidden savings and limited commitment do not significantly affect savings levels. The lack of an increase in savings contradicts the prediction that individuals are savings-constrained under hidden income (Proposition 3.5).

Notably, the main effects of social proximity are significant and intuitively signed: averaging across games, more distant pairs transfer less and have more variable consumption. It is worth noting that the average pair in the endogenous treatment is closer than in the

[15]This is when one partner receives 220 and the other 30. This is significantly lower than the Rs. 95 predicted by Proposition 3.1.

exogenous treatment (3.42 vs. 3.71), because the exogenous treatment over-sampled distant pairs as noted above. All results control for the main effect social proximity. Below we show evidence that in the exogenous pairing only, the effects of proximity are uniformly smaller in magnitude, and insignificant.

4.6. **Differing effects of social proximity across games.** Now we examine how the effects of different forms of market incompleteness are mediated by the social network. To focus on how social proximity mediates each particular friction (hidden income, hidden savings or limited commitment), each table compares two regimes (e.g., full information vs. hidden income only), as discussed in section 4.2.2. We begin by pooling the endogenous and exogenous pairing treatments. However, guided by the differing main effects of social proximity in the baseline specifications, we also present results separately for the endogenous vs. exogenous pairing treatments.

4.6.1. *Graphical differences in transfers across games.* The results for transfers across games for different levels of social proximity are summarized graphically in Figures 3 and 4 for endogenously- and exogenously-formed pairs, respectively. Notably, for pairs with median distance (4) or above, when income is made hidden, transfers fall and remain similar as hidden savings and then also limited commitment are introduced. For endogenously-formed pairs with below-median distance (3 or less)–pairs that we expect to sustain the most insurance, transfers fall incrementally as markets become less and less complete. The pattern for exogenously-formed close pairs is somewhere in between endogenously-close pairs and distant pairs.

4.6.2. *Social networks and hidden income.* Table 2 shows results estimating specification 4.2 where the comparison is between full information and hidden income (games 1 vs. 2), including exogenously- and endogenously-formed pairs (but allowing the hidden income effect to differ between them). Column 1 shows that, for endogenously-formed pairs with proximity zero, hidden income causes a fall in transfers of Rs. 19.34. For the closest pairs (proximity 1), making income hidden causes an insignificant fall in transfers of -19.3+16.8 = Rs. 2.5. Exogenous pairs experience a significantly larger fall due to hidden income (a further Rs. 15), and the effect of proximity in mitigating this fall is not significant (although the point estimate is fairly large at -10.2).

Column 4 shows a similar pattern for consumption absolute deviations: for endogenously-formed pairs with proximity zero, hidden income causes an increase in variability of Rs. 10.7. The effect for exogenous pairs is larger by Rs. 5.98. For the closest endogenous pairs (proximity 1), consumption variability does not fall at all. Proximity is not significantly beneficial for the exogenous pairing. When the outcome is levels of savings (column 5), higher-proximity pairs save more when income is hidden. However, this affect is absent in asymmetric-income rounds only (column 3).

In all, this evidence supports Proposition 3.3 and Proposition 3.4: insurance and welfare fall due to hidden income. Proposition3.10 is also supported: endogenous pairs weather hidden income better than exogenous pairs. Thus, while social proximity *per se* may not be able to mitigate hidden income's effect on consumption variability (as shown by the results in the exogenous samples), social proximity more broadly does appear to play an important role. The results for the endogenous samples suggest that some dyads are better-able to overcome hidden income, and that the characteristics of these dyads are positively correlated with social proximity.

4.6.3. *Social networks and hidden savings.* Table 3 shows results estimating specification (4.2) where the comparison is between hidden income-observed savings and hidden income-hidden savings (games 2 vs. 3), for endogenously- and exogenously-formed pairs. These are the effects of making savings hidden, holding fixed the unoberservability of income. None of the effects of hidden savings or social proximity are significant in the endogenous or exogenous pairings. In short, there is no evidence that making savings hidden further crowds out total risk sharing.

However, it is worth keeping in mind that the fact that average transfers do not fall in response to hidden savings is not clear-cut evidence that the level of *interpersonal* insurance is not changed. Transfers can serve as credit as well as insurance, and one possible interpretation of our is that players are shifting from use of the intertemporal savings technology to "borrowing" from one another; the results when commitment is removed, which we discuss next, are consistent with the crowding out of credit as well as insurance.[16] The fact that savings levels do not increase contradicts Proposition 3.5.

4.6.4. *Social networks and the removal of commitment.* Finally, in Table 4 we examine the effect of social proximity when moving from hidden income-hidden savings-full commitment to hidden income-hidden savings-no commitment (games 3 vs. 4). Thus, these are the effects of removing commitment, holding fixed the unoberservability of income and of savings. As noted above, a reduction in the level of transfers is neither necessary nor sufficient to diagnose the closing off of interpersonal insurance under hidden income+hidden savings+full commitment predicted by Allen (1985) and Cole and Kocherlakota (2001). However, these reduced-form estimates are nonetheless informative about the additional effect of limited commitment, in a setting with hidden income and savings. This setting may correspond to many real-world environments in developing countries when formal savings are available.

Column 1 shows results for transfers. Endogenous, proximity 0 pairs see a fall in transfers of Rs. 4.7 due to limited commitment. The differential effect by social proximity is not significant, but suggests that endogenously-close pairs do not see a fall in transfers due to limited commitment. In column 2, when the outcome is consumption smoothing (i.e., welfare) in

[16]We have run Townsend (1994)-style regressions to investigate whether the correlation between consumption and own income, conditional on total pair income, is increased by the addition of savings, but we do not find that this is the case. Results are available on request.

asymmetric-income rounds only, a similar story is seen: endogenous, proximity 0 pairs see an increase in consumption variability of Rs. 4.19 due to limited commitment. Again, the differential effect by social proximity is not significant, but suggests that endogenously-close pairs do not see an increase in consumption variability due to limited commitment. No effects are found for savings.

These results answer Empirical question 3.9 in the affirmative: there is a loss in transfers and consumption smoothing due to limited commitment, which may be due to reduction in interpersonal insurance, or of interpersonal credit. There is suggestive evidence that Empirical question 3.3 is also answered affirmatively: socially closer pairs may weather limited commitment better, but this is not conclusive.

4.7. **Causal effects of social proximity?** In the endogenously-paired sample, players could choose their partners. They could not choose to play a certain game with a certain partner, but they were told that some of the games they would play would involve the fact that their partner could not directly see their income, and that one would feature the ability to change one's mind about the transfer made to the partner. This raises the possibility that, in the endogenously-paired sample, players chose partners not based on social proximity per se, but based on other characteristics correlated with social proximity (e.g., the ease of reading someone's face or the belief that a given person will feel guilty and hence not renege on their agreement). The fact that the effects of social proximity in the endogenously-paired sample are much larger and more significant than in the exogenously-paired sample lends credence to this view.

To emphasize this point, Tables 5-7 repeat the analysis of hidden income, hidden savings and limited commitment for the exogenously-paired sample only. The larger effect of hidden income in this sample is shown in Table 5. Tables 6 and 7 show that there is no additional effect of hidden savings or limited commitment in this sample. However, most striking in all three tables is that the main effects of social proximity are quite small in magnitude, and never significant. The interaction effects of proximity with the different games are also insignificant. Thus, in the exogenously-paired sample, being paired with a closer partner does not help.

4.7.1. *In search of an instrument.* In an attempt to identify the causal effect of social proximity in the endogenously-paired sample, we attempted to make use of the fact that priority to pick one's partner was randomly assigned. Hence, how soon a given dyad formed has a random component that could be used as an instrument for proximity. However, this instrument,

$$z_{ij} = min\,(priority_i, priority_j)$$

has little power in predicting the social proximity of the dyad and so cannot be used as an instrument.

As an alternative, we constructed a measure that reflects the distance of the closest pairing player i could have had when her priority came up, assuming everyone pairs with someone of the closest possible distance. That is, the player with priority 1, who picks first, is assigned the proximity of the closest person to her among the other 15 playing the games in her treatment group. Call this person j. Then i and j are removed from the pool, the person remaining with lowest priority is paired with her closest match, and the process repeats until all 16 are paired. This possible instrument has more power in predicting the social proximity of the dyads that actually form, but the resulting IV estimates are nevertheless very noisy and uninformative.

Finally, we constructed a third measure that reflects the distance of the closest pairing player i could have had when her priority came up, given what preceding dyads had already formed. That is, the player with priority 1, who picks first, is assigned the proximity of the closest person to her among the other 15 playing the games in her treatment group. Then i and the person i actually picked, say k, are removed from the pool, the person remaining with lowest priority is assigned the distance to her closest possible match, and the process repeats until all 16 are paired. This possible instrument has the best first stage in predicting the social proximity of the dyads that actually form, but again the resulting IV estimates are nevertheless very noisy and uninformative.

Thus, we are only able to conclude that when it is randomly assigned, social proximity per se does not mitigate hidden income, hidden savings, or limited commitment. When players can choose their partners, they do so in a way that is correlated with social proximity, and the resulting pairs weather the effects of hidden income and (perhaps) limited commitment better than random pairings. We are continuing to explore strategies to identify the causal effect of social proximity.

5. Conclusion

One notable conclusion from this experiment is that asymmetric information about risk-sharing partners' incomes significantly reduces risk sharing. When players can misreport their income, they often do so, and sharing between partners falls as a result, by ~40% on average. Another key result is that the effect of hidden income is mitigated when risk-sharing partners are endogenously socially closer (that is, when the members of the dyad chose to form a pair, and are socially close). When hidden income is introduced and partners are endogenously socially close, the amount transferred by a high- to a low-income player does not fall at all. However, the correlation between social proximity and better risk-sharing is absent when players are randomly assigned to pairs. This suggests that while social proximity is correlated with features players use to pick partners with whom they can sustain informal insurance, geodesic distance in the social network *per se* is not enough to sustain risk sharing.

Several policy conclusions are suggested by these findings. First, as economic and financial development increase the opacity of households' incomes, the informal risk-sharing mechanisms that have sustained surprisingly good risk sharing in many settings may erode. This is especially true if the same forces that make incomes easier to hide, such as urbanization, also weaken social ties, given that risk sharing with a socially distant partner is more affected by hidden information. This suggests that developing formal safety nets, such as well-functioning public health insurance and old-age pension systems, work guarantee programs, etc. should be a priority alongside financial development.

The fact that endogenously-close risk sharing groups seem to maintain insurance better when savings and income are hidden suggests that there may be benefits to allowing endogenous formation of groups such as microcredit joint-liability groups, ROSCAs, etc. However, endogenously-distant groups do not fare better, suggesting that endogenous group formation may widen disparities between the well-connected (who may also be wealthier, etc.) and the more socially isolated.[17]

In continuing research, we are analyzing the causal effect of network connections to a non-random partner and testing additional predictions of the hidden income and hidden income+hidden savings models. We are also examining how these informational frictions affect welfare at the extremes of the income distribution (for instance, sharing and consumption smoothing at the 75th and 25th percentiles of the distribution).

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[17]It is also interesting that overall, exogenously-formed groups achieve more risk sharing under full information. We are continuing to explore this result.

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Appendix A. Model details and proofs

As a simplified approximation to the environment in a village, consider 2 risk-averse households who interact over an infinite time horizon in a mutual insurance network. Let $i \in \{1,2\}$ index households and t index time. Each household evaluates per capita consumption and effort plans according to:

$$U(\mathbf{c}_i) = \mathbb{E}\sum_{t=0}^{\infty} \beta^t v(c_{it})$$

Absolute risk aversion is non-increasing:

$$d\left(\frac{-v''(c_{it})}{v'(c_{it})}\right)/dc_{it} \le 0$$

This assumption guarantees the concavity of the value function in the hidden income model Thomas and Worrall (1990); it is satisfied by the commonly-used constant relative risk aversion and constant absolute risk aversion utility functions.

Output can take on P values, $\{y_1, ..., y_P\}$. Indices are chosen so that a higher index means more output: $r > q \Rightarrow y_r > y_q$. The number of possible output realizations is restricted to be finite (although potentially very large). Output level y_r occurs with probability p_r.

Household income is not observable by other households. Potentially $P\,(P-1)$ incentive-compatibility constraints are added to the planner's problem:

$$v(y_r + \tau_{irt}) + \beta u_{ir,t+1} \ge v(y_r + \tau_{ir',t}) + \beta u_{ir',t+1}$$
$$r' \in \mathcal{P}\backslash y_r$$

These constraints require that a household realizing any of the S income levels must not gain by claiming any of the $S-1$ other possible levels. However, Thomas and Corral (1990) show that only the $S-1$ local downward constraints, which require that an agent getting income y_r not prefer to claim the slightly lower income y_{r-1}, will be binding at the optimum. These constraints are:

$$v(y_r + \tau_{irt}) + \beta u_{ir,t+1} = v(y_r + \tau_{i,r-1,t}) + \beta u_{i,r-1,t+1},$$
$$r = 2, ..., P$$

We want to show two main results. First, that Cole and Kocherlakota's proof of no interpersonal insurance with hidden income and hidden savings carries over to our setting. Second, that removing commitment from such a setting will not affect the level of consumption smoothing.

Lemma A.1. *Hidden income and hidden savings rule out interpersonal insurance.*

Proof. We provide an argument that mirrors Cole and Kocherlakota's, noting differences where needed.

Cole and Kocherlakota show that it is without loss of generality to set individual storage (i.e., that held by agents) equal to 0 while all storage is done publicly, by the planner. In our setting, all storage (whether public or private) is held by the agents. However this is just another normalization. Let s_i be individual i's storage and S be public storage. For Cole and Kocherlakota's allocation $(c_1, c_2, 0, 0, \tau_1, \tau_2, S)$with $s_i = 0$, there exists a continuum of "incentive identical" allocations $(c_1, c_2, s_1, s_2, \tau_1', \tau_2', 0)$ that satisfy the same incentive (i.e., Euler and truth-telling) and feasibility constraints. Household 1 can hold fraction α of the storage for $\alpha \in [0, 1]$, while household 2 holds fraction $(1 - \alpha)$. WOLOG let $\alpha = 1$. Then net transfers under public savings $(c_1, c_2, 0, 0, \tau_1, \tau_2, S)$ and under individual savings by 1 $(c_1, c_2, s_1, 0, \tau_1', \tau_2', 0)$ are related as follows:

$$\tau_{1t}' = \tau_{1t} + S_t - R^{-1} S_{t-1}$$

$$\tau_{2t}' = \tau_{2t}$$

The pairs' optimal change to storage, $S_t - R^{-1} S_{t-1}$, is transferred to 1. 2 receives the same transfer as before; whatever portion of 2's income that was being placed into storage before is now given to 1 instead. Clearly the τ' are feasible if the τ were feasible. The τ_1' also inherit incentive compatibility from τ_1 since the additional resources held by 1 have to be paid out (either to 1 or 2) in an NPV-neutral way. Hence by the same argument that shows that from $(c_1, c_2, 0, 0, \tau_1, \tau_2, S)$, neither household wants to privately save (or borrow) more than the recommended 0, from $(c_1, c_2, s_1, 0, \tau_1', \tau_2', 0)$they do not want to deviate, either.

Thereafter Cole and Kocherlakota's argument applies, *mutatis mutandis*, substituting $(c_1, c_2, s_1, 0, \tau_1', \tau_2', 0)$for $(c_1, c_2, 0, 0, \tau_1, \tau_2, S)$, since the former is a bijective mapping from the latter. □

Lemma A.2. *Removing commitment from the hidden income-hidden savings environment (which supports only zero-NPV transfers), reduces consumption smoothing.*

Proof. Note that, even in the "full information, within period commitment" regime of game 1, individuals cannot formally commit at the beginning of the game to a contract that dictates behavior at every subsequent node. Instead, only one-period contracts are enforced. Hence, all allocations must respect a "one period ahead" participation constraint. Ignoring the no-net-borrowing constraint, the value function, called 1P for "one period commitment" is:

$$V^{1P}(a) \equiv max_{q,a'} u(y + q) + V^{1P}(a')$$

subject to

$$a - Rq = a' \tag{A.1}$$

$$V^{1P}(a) \geq u(y + q) + V^{1P,aut}(a') \tag{A.2}$$

where

$$V^{1P,aut}(a') \equiv max_{q,a'} u(y+q) + V^{1P}(a')$$

again, subject to (A.1). Since $V(.) = V^{aut}(.)$, there is no deviation possible: the agent can do no better than choose optimal borrowing or lending each period, repaying or collecting interest on last period's asset balance. In other words, a pure borrowing-lending allocation can be implemented by trading one-period bonds. The key to this result is that the contingent transfer agreed to at the beginning of period t must be honored: defaulting on one-period bonds is not possible.

When one-period commitment is removed, the problem becomes:

$$V^{LC}(a) \equiv max_{q,a'} u(y+q) + V^{LC}(a')$$

subject to (A.1) and

$$V^{LC}(a) \geq u(y) + V^{LC,aut}(a') \tag{A.3}$$

where

$$V^{LC,aut}(a') \equiv max_{q,a'} u(y+q) + V^{LC}(a')$$

The difference is that now the agent can default on her one-period bond by refusing to make the transfer q she agreed to initially. Since, for an agent called on to make a positive transfer, $u(y) + V^{LC,aut}(a') > u(y) + V^{1P,aut}(a')$, the "LC" program imposes a tighter no-default constraint and hence, if the participation constraints bind, will support less credit, lower transfers and less consumption smoothing.

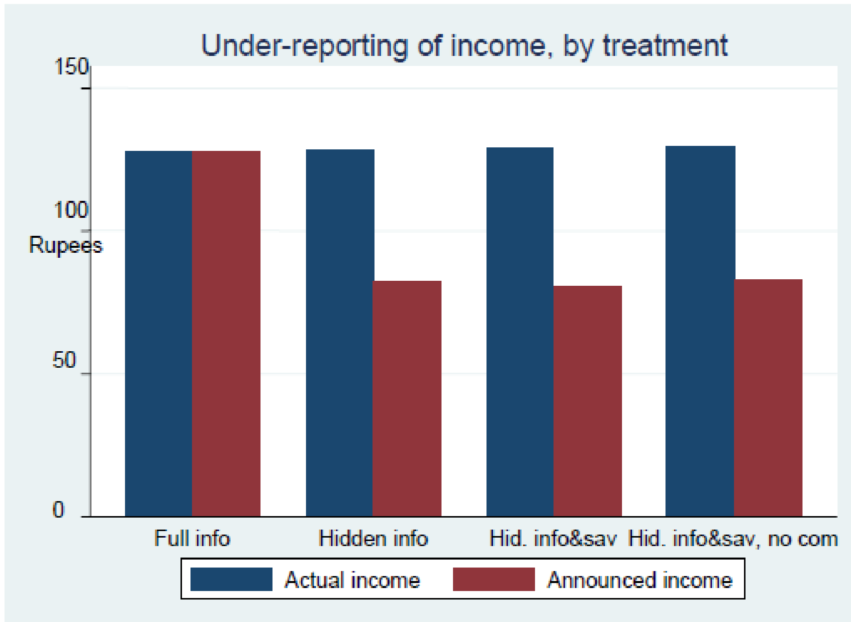

Figure 1. Evidence of truth-telling constraints: underreporting income

□

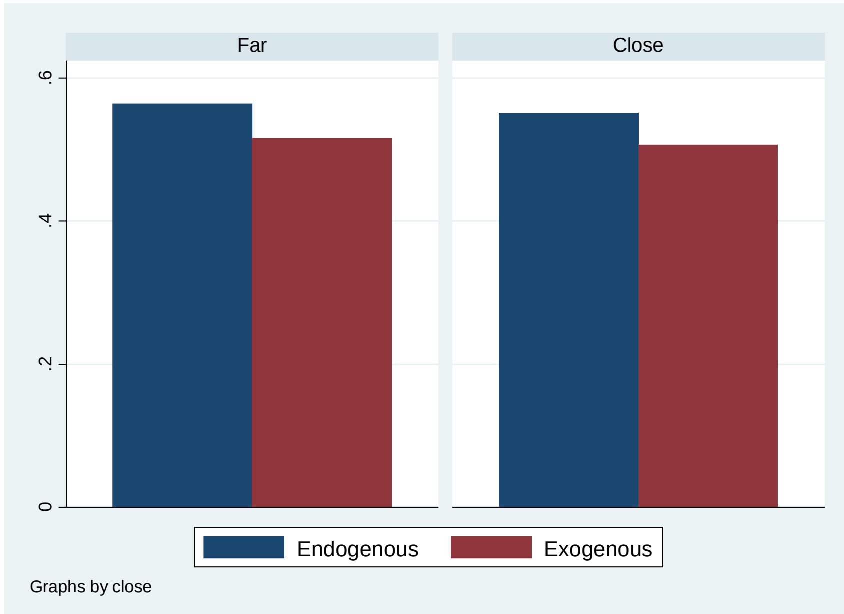

FIGURE 2. Evidence of participation constraints: reneging

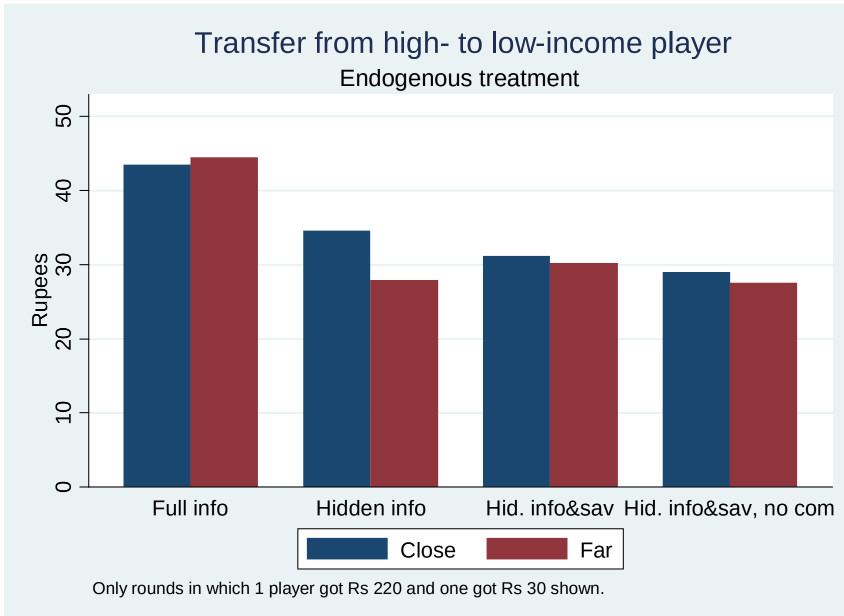

Figure 3. Change in transfers across games (Endogenous)

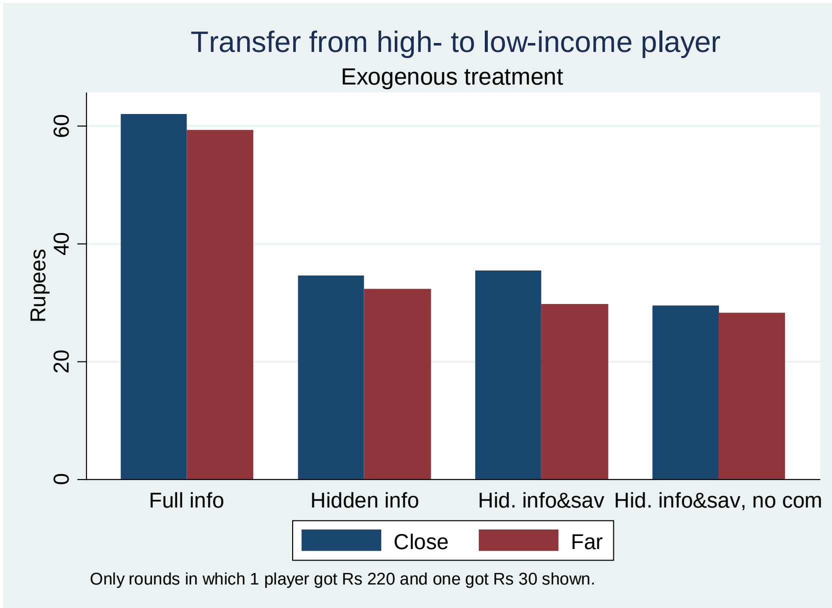

FIGURE 4. Change in transfers across games (Exogenous)

Appendix C: Tables

Table 1: Transfers, consumption smoothing and savings

	(1)	(2)	(3)	(4)	(5)
	Asymmetric income rounds only			All rounds	
	Transfers	Cons. Dev	Savings	Cons. Dev	Savings
HI	-13.93***	9.537***	0.891	5.589***	0.555
	[2.118]	[1.591]	[.9685]	[1.267]	[.9938]
HI*exog	-14.76***	9.579***	-0.617	6.101***	-0.538
	[3.324]	[2.438]	[1.518]	[1.809]	[1.51]
HS	-0.0538	-0.862	-0.137	-0.684	-0.942
	[1.712]	[1.267]	[.9246]	[1.014]	[.9996]
HS*exog	-0.293	1.442	-0.0873	1.061	1.056
	[2.794]	[2.19]	[1.494]	[1.563]	[1.455]
LC	-2.309	2.132*	-1.01	0.451	0.0796
	[1.699]	[1.269]	[.9833]	[1.12]	[1.02]
LC*exog	1.123	-1.236	0.914	-1.214	-0.401
	[2.656]	[2.142]	[1.557]	[1.596]	[1.458]
Proximity	8.773***	-8.366***	1.477	-5.685***	1.663
	[3.147]	[2.119]	[1.447]	[1.577]	[1.255]
Constant	53.80***	42.82***	13.64***	54.88***	13.77***
	[3.563]	[2.336]	[1.818]	[2.06]	[1.618]
N	6420	12839	12840	22481	22482
r2	0.451	0.28	0.267	0.183	0.218
ar2	0.316	0.201	0.186	0.134	0.171
Ref. grp. mean	48.41	46.34	13.72	62	14.14
Ref. grp. std. dev.	32.03	28.33	19.35	33.39	20.81

Regressions at the individual-game-round level. Player and partner FEs included. Transfer regressions include only rounds in which one partner had high income and one low income; transfer is from high- to low-income player. Robust standard errors, clustered at the village by treatment by game level, in brackets.

* p<.1, ** p<.05, *** p<.01

Table 2: Does the graph mitigate the hidden income problem?

	(1)	(2)	(3)	(4)	(5)
	Asymmetric income rounds only			All rounds	
	Transfers	Cons. Dev	Savings	Cons. Dev	Savings
HI	-19.34***	14.52***	0.388	10.73***	-1.22
	[4.136]	[2.634]	[1.163]	[1.786]	[1.099]
HI*proximity	16.81*	-15.52***	1.843	-15.84***	5.375*
	[9.876]	[5.817]	[2.985]	[4.23]	[3.12]
HI*exog	-14.99***	9.643***	-0.535	5.975***	-0.488
	[3.558]	[2.315]	[1.405]	[1.544]	[1.281]
Proximity	3.381	1.345	0.769	3.564	0.398
	[6.891]	[5.006]	[2.468]	[3.814]	[2.794]
Exog*proximty	-10.17	1.188	0.387	-0.502	-1.282
	[10.68]	[7.554]	[4.013]	[5.103]	[3.563]
Constant	53.56***	36.89***	12.52***	54.22***	12.34***
	[7.605]	[4.01]	[3.206]	[3.136]	[2.592]
N	3191	6382	6382	11246	11246
r2	0.61	0.399	0.389	0.244	0.316
ar2	0.366	0.252	0.239	0.148	0.229
Ref. grp. mean	41.93	48.64	13.54	62.05	14.43
Ref. grp. std. dev.	27.65	26.78	18.99	31.19	21.31

Regressions at the individual-game-round level. Player and partner FEs included. Transfer regressions include only rounds in which one partner had high income and one low income; transfer is from high- to low-income player. Robust standard errors, clustered at the village by treatment by game level, in brackets.

* p<.1, ** p<.05, *** p<.01

Table 3: Does the graph mitigate the hidden savings problem?

	(1)	(2)	(3)	(4)	(5)
	Asymmetric income rounds only			All rounds	
	Transfers	Cons. Dev	Savings	Cons. Dev	Savings
HS	2.131	-2.082	-0.98	-0.516	-0.591
	[3.075]	[2.187]	[1.31]	[1.64]	[1.019]
HS*proximity	-7.122	2.807	2.231	-0.785	-0.567
	[8.354]	[5.317]	[3.454]	[4.52]	[2.908]
HS*exog	-0.289	1.909	-0.143	1.213	0.648
	[2.769]	[1.996]	[1.369]	[1.372]	[1.23]
Proximity	24.13***	-17.18***	4.057	-10.93***	6.766***
	[7.53]	[4.865]	[2.892]	[3.655]	[2.439]
Exog*proximty	-24.55**	12.59*	-10.43***	15.15***	-9.901***
	[10.07]	[6.49]	[3.889]	[4.86]	[3.343]
Constant	35.95***	58.08***	13.28***	66.78***	12.47***
	[5.504]	[4.028]	[3.05]	[2.745]	[2.352]
N	3194	6388	6388	11312	11312
r2	0.577	0.361	0.351	0.235	0.295
ar2	0.31	0.204	0.191	0.138	0.206
Ref. grp. mean	41.93	48.64	13.54	62.05	14.43
Ref. grp. std. dev.	27.65	26.78	18.99	31.19	21.31

Regressions at the individual-game-round level. Player and partner FEs included. Transfer regressions include only rounds in which one partner had high income and one low income; transfer is from high- to low-income player. Robust standard errors, clustered at the village by treatment by game level, in brackets.

* p<.1, ** p<.05, *** p<.01

Table 4: Does the graph mitigate the limited commitment problem?

	(1)	(2)	(3)	(4)	(5)
	Asymmetric income rounds only			All rounds	
	Transfers	Cons. Dev	Savings	Cons. Dev	Savings
LC	-4.694*	4.190**	-0.438	1.205	0.716
	[2.488]	[2.115]	[1.467]	[1.483]	[1.298]
LC*proximity	7.882	-6.885	-0.799	-2.557	-2.055
	[5.273]	[4.954]	[3.604]	[3.408]	[2.727]
LC*exog	1.46	-1.757	0.71	-1.156	-0.365
	[2.54]	[1.954]	[1.468]	[1.281]	[1.24]
Proximity	7.608	-5.102	1.047	-5.087	0.186
	[6.779]	[4.65]	[2.925]	[3.432]	[2.133]
Exog*proximty	-9.689	1.253	0.773	4.592	2.504
	[11.67]	[7.273]	[3.698]	[4.267]	[2.872]
Constant	35.49***	50.73***	14.21***	58.35***	16.42***
	[5.985]	[3.87]	[1.892]	[2.977]	[1.347]
N	3229	6457	6458	11235	11236
r2	0.573	0.355	0.371	0.237	0.312
ar2	0.309	0.198	0.218	0.139	0.225
Ref. grp. mean	41.93	48.64	13.54	62.05	14.43
Ref. grp. std. dev.	27.65	26.78	18.99	31.19	21.31

Regressions at the individual-game-round level. Player and partner FEs included. Transfer regressions include only rounds in which one partner had high income and one low income; transfer is from high- to low-income player. Robust standard errors, clustered at the village by treatment by game level, in brackets.

* p<.1, ** p<.05, *** p<.01

Table 5: Does the graph mitigate the hidden income problem? Exogenous only

	(1)	(2)	(3)	(4)	(5)
	Asymmetric income rounds only			All rounds	
	Transfers	Cons. Dev	Savings	Cons. Dev	Savings
HI	-29.96***	23.52***	-0.598	14.33***	-1.627
	[6.185]	[3.155]	[1.777]	[2.116]	[1.602]
HI*proximity	2.54	-13.42	3.329	-8.096	5.111
	[16.64]	[8.906]	[4.875]	[6.539]	[3.957]
Proximity	-0.491	1.561	0.476	-0.462	-0.72
	[11.48]	[6.995]	[4.983]	[4.833]	[3.877]
Constant	56.97***	40.51***	17.29***	53.05***	17.73***
	[4.778]	[2.447]	[1.972]	[2.074]	[1.978]
N	1560	3120	3120	5616	5616
r2	0.619	0.416	0.407	0.233	0.34
ar2	0.372	0.268	0.256	0.135	0.256
Ref. grp. mean	48.41	46.34	13.72	62	14.14
Ref. grp. std. dev.	32.03	28.33	19.35	33.39	20.81

Regressions at the individual-game-round level. Player and partner FEs included. Transfer regressions include only rounds in which one partner had high income and one low income; transfer is from high- to low-income player. Robust standard errors, clustered at the village by treatment by game level, in brackets.

* p<.1, ** p<.05, *** p<.01

Table 6: Does the graph mitigate the hidden savings problem? Exogenous only

	(1)	(2)	(3)	(4)	(5)
	Asymmetric income rounds only			All rounds	
	Transfers	Cons. Dev	Savings	Cons. Dev	Savings
HS	-1.56	0.233	-0.24	2.158	-0.162
	[4.534]	[2.693]	[2.085]	[2.065]	[1.525]
HS*proximity	4.18	1.504	-0.662	-5.584	0.153
	[14.3]	[8.67]	[5.732]	[7.167]	[4.251]
Proximity	-5.753	-3.892	-5.047	7.004	-3.522
	[12.9]	[7.415]	[3.546]	[5.654]	[2.808]
Constant	31.99***	58.38***	20.62***	61.93***	19.06***
	[5.372]	[3.178]	[2.067]	[2.332]	[1.894]
N	1532	3064	3064	5648	5648
r2	0.56	0.328	0.333	0.2	0.285
ar2	0.269	0.154	0.159	0.0985	0.194
Ref. grp. mean	48.41	46.34	13.72	62	14.14
Ref. grp. std. dev.	32.03	28.33	19.35	33.39	20.81

Regressions at the individual-game-round level. Player and partner FEs included. Transfer regressions include only rounds in which one partner had high income and one low income; transfer is from high- to low-income player. Robust standard errors, clustered at the village by treatment by game level, in brackets.

* p<.1, ** p<.05, *** p<.01

Table 7: Does the graph mitigate the limited commitment problem? Exogenous only

	(1)	(2)	(3)	(4)	(5)
	Asymmetric income rounds only			All rounds	
	Transfers	Cons. Dev	Savings	Cons. Dev	Savings
LC	-1.258	2.312	-0.44	-2.267	-0.167
	[3.426]	[2.942]	[2.355]	[1.977]	[1.671]
LC*proximity	1.252	-6.536	1.579	5.151	-0.324
	[9.952]	[9.064]	[6.153]	[6.201]	[4.452]
Proximity	0.641	-3.665	0.704	-3.198	1.705
	[10.34]	[6.579]	[4.293]	[4.699]	[3.34]
Constant	28.86***	54.51***	17.13***	62.14***	16.63***
	[5.902]	[3.704]	[1.744]	[2.635]	[1.268]
N	1561	3121	3122	5619	5620
r2	0.538	0.315	0.361	0.202	0.302
ar2	0.236	0.141	0.198	0.1	0.214
Ref. grp. mean	48.41	46.34	13.72	62	14.14
Ref. grp. std. dev.	32.03	28.33	19.35	33.39	20.81

Regressions at the individual-game-round level. Player and partner FEs included. Transfer regressions include only rounds in which one partner had high income and one low income; transfer is from high- to low-income player. Robust standard errors, clustered at the village by treatment by game level, in brackets.

* p<.1, ** p<.05, *** p<.01

THIS COPY BELONGS TO: ____

PROTOCOL – COMPUTER PAIRING

Games we will play in the order we will play them:

- **Game 1: and your partner can see each other's income and savings**
- **Game 2: You and your partner cannot see each other's income, but you can see each other's savings**
- **Game 3: You and your partner cannot see each other's income or each other's savings**
- **Game 4: You and your partner cannot see each other's income or other's savings, and you can change your mind**

INTRODUCTION (Public):

- Thanks for coming!
- Motivation: We are researchers from Institute for Financial Management and Research (IFMR). We are conducting research about financial decision making.
- Today we will play 4 games, each with some rounds.
- You will make some decisions. The decisions will determine how much money you can take home today.
- The games are very easy. There are no right and wrong answers. There are no winners nor losers! The games will represent situations and decisions you make every day in your life. You EARN some money, you SAVE some money, you might GIVE some money to your neighbors or friends if they are having a hard time, and you CONSUME by using some money to buy food, school material for your kids, clothing, etc.
- In each of the games you will be assigned a partner that will be different in each game. The computer will select your partner for each game.

PAYMENT (Public):

- How can you make money today?
- First, you will receive Rs 20 for staying through the whole experiment.
- Second, you will win money from the games.
- You will win anywhere from Rs 30 to Rs 400 today with a very low chance of winning only 0. It is most likely that you will take home an amount of money that you will be happy with. In previous villages people have won between Rs 100 and Rs 400.
- In every round of every game you will get income in the form of bills. This income will be paid in play bills
  Show examples of play bills.
  At the end of the game, you will be paid in real money, depending on the choices you make. We will explain later how the choices you make affect the money you can take home today.
- You will decide how much to CONSUME, how much to SAVE, how much to TRANSFER to your partner. CONSUMPTION is very important!
- In each round we will write down the amount you want to CONSUME on these CONSUMPTION CHIPS and put that chip in the CONSUMPTION RECORDING BAG.
  Show consumption chips
- After playing all of the games, we will randomly pick one CONSUMPTION CHIP from one the CONSUMPTION RECORDING BAG without looking.
- Very important: you will not get paid if your CONSUMPTION RECORDING BAG does not have the same number of CHIPS as the total number of rounds. So in our example, if there are 4 games with a total of 25 rounds,

then your bag must have exactly 25 CHIPS. If we count less or more than 25 CHIPS, even if you have 24 or 26 CHIPS, you will not receive payment today. Do not remove any CHIPS from the bag and if you have a problem, talk to a researcher immediately.

- Any questions?

- Demo example: 5 games, total of 25 rounds. Then CONSUMPTION RECORDING BAG has 25 CONSUMPTION CHIPS. Close your eyes, pick one CONSUMPTION CHIP from the CONSUMPTION RECORDING BAG.

- Any questions?

GAMES INTRODUCTION (Public):
Now we will tell you how to play the games.

As we said before, the games are extremely simple. You do in the games what you also do in your everyday life.

BEGINNING OF GAME MONEY BAG
Before the game starts, before any of the rounds begin, we will give some money to you and your partner. Call this the BEGINNING OF GAME MONEY.

One person will get Rs. 30, meaning 3 bills worth Rs. 10 each, and the other person will get Rs. 60, meaning 6 bills worth Rs. 10 each.

We will decide who gets Rs. 30 and who gets Rs. 60 using this BEGINNING OF GAME MONEY BAG. There are two sheets of paper, one with Rs 30, one with Rs 60. We will close our eyes and give each of you a sheet of paper. You will receive that much money in your INCOME ENVELOPE. If you receive 60 Rs., this means that your partner has received 30 Rs., and if you receive 30 Rs., this means that your partner has received 60 Rs.

INCOME

In each round, you and your partner will earn income. Imagine that you are farmers selling crops. In each round you may be lucky or unlucky, and your partner may be lucky or unlucky. If you are lucky, you have had a good harvest and have earned Rs 220. If you are unlucky, you have had a drought and have earned Rs 30.
In some games your partner will be able to see whether you are lucky or unlucky and therefore the income you get. However, in other games your partner will not be able to see whether you are lucky or unlucky. Later on we will explain how we will implement this in detail.

INCOME BAG
In each round how do we decide whether you and your partner are each lucky or unlucky?

In each round there is a bag which we call the INCOME BAG with a green ball and a brown ball in it. We will close our eyes and give one ball to you. If you receive the green ball you are lucky, have a good harvest, and earn Rs 220. If you receive the brown ball you are unlucky, have a drought, and earn Rs 30.
Then, we will replace that ball and give one ball to your partner, again without looking. If your partner receives the green ball he is lucky, has a good harvest, and earns Rs 220. If he receives the brown ball he is unlucky, has drought, and earns Rs 30.
Recall that in some games you will be able to see whether you partner is lucky or unlucky and therefore her income but in some other games you will not. Then, you might not know the exact income of the partner you might be sharing your income with. Also, in real life there are certain sources of income you might earn that are not observable to others.
The way we will implement this is using curtains. In the games where you and your partner will not be able to see each other's income we will use curtains when deciding whether you and your partner are lucky or unlucky. For research purposes it is very important that you do not peek to the other side of the curtain.

Furthermore, it is completely forbidden to tell your partner whether you are lucky of unlucky and therefore the income you got before the experimenter asks you to make an announcement.

INCOME ENVELOPE
The play bills for the income you get will be put in your INCOME ENVELOPE. *Show INCOME ENVELOPE.*
Recall that sometimes your partner will not be able to see the amount of money in your envelope, and you will not be able to see the amount of money in your partner's envelope. Recall that it is completely forbidden to tell your partner the contents of your INCOME ENVELOPE before the experimenter asks you to make an announcement.

Any questions?

How will you use your income in each round? You will use your income in the game the same way as you do in your life.

You will decide how much you want to CONSUME, how much you want to TRANSFER to your partner, and how much you want to SAVE for the next rounds.

CONSUMPTION ENVELOPE
First, you can use your income to buy household goods such as clothing, schooling for kids, etc. We will call this CONSUMPTION.

In order to consume, you will put the bills you want to consume in your CONSUMPTION ENVELOPE.
Show CONSUMPTION ENVELOPE.

CONSUMPTION RECORDING BAG
We will come to you, take the bills you have put in your CONSUMPTION ENVELOPE, and write the amount you chose to consume on a CONSUMPTION CHIP. Then, we will put it in your CONSUMPTION RECORDING BAG.
Recall that sometimes you and your partner will not be able to see each other's income. Accordingly, sometimes you will not be able to see each other's consumption.
In this case, it is completely forbidden to tell your partner the amount you consumed.

Any questions?

TRANSFERS
Sometimes your neighbors (in this game your partners) may not earn as much as they had anticipated. Then you might give them some money. Sometimes you might not earn as much as you anticipated. Then they might give you some money. In these games, like in real life, you and your partner may be able to give each other money.

SAVINGS ENVELOPE / PLATE
Lastly, whatever money from your income you have left over – that is, whatever you did not CONSUME nor TRANSFER to your partner – you can SAVE for the next round. You might want to SAVE because if in the future you are unlucky and earn less money, you can CONSUME from your SAVINGS.

You do not have to save. However, remember that if you are unlucky in a round and you have Rs 30 income and no savings, you will CONSUME very little. That round may be selected to as the payment round.

Recall that sometimes you and your partner will not be able to see each other's income. Accordingly, sometimes you will not be able to see each other's savings. Therefore, for the cases where you are not able to see each other's savings, the way you will keep your savings to bring them from one round to the next we will be using this SAVINGS ENVELOPE.
Show SAVINGS ENVELOPE.
As with income, it is completely forbidden to tell your partner the content of your SAVINGS ENVELOPE.

On the other hand, in games where you and your partner are able to see each other's savings, the way you will keep your savings to bring them from one round to the next will be in a SAVINGS *PLATE*.
Show SAVINGS PLATE.
In this case your partner will be able to see your savings and therefore you can freely talk about the money you have saved in the savings plate.

After you finish your CONSUMPTION decision and we record it on the CONSUMPTION CHIP and put it in the CONSUMPTION RECORDING BAG, we will check whether the game continues for another round.
ENDING OF THE GAME BAG
The length of a game will be random. At the end of each round, we will randomly decide whether the game will continue or not… How do we decide whether the game continues or not?

Show the audience the “ENDING BAG” with 5 red balls and 1 black ball.

In this BAG, which we will call the “*ENDING* BAG”, we have 6 balls – 5 are red, and 1 is black. At the end of each round, we will pick a ball from the BAG without looking. If a red ball is chosen, then the game continues for another round. If the black ball is chosen, then the game has ended, and there are no more rounds of that game.

Show the participants the “ENDING BAG” with 5 red balls and 1 black ball and demonstrate to them as you explain how you will pick a random ball from it without looking. Pick balls from it several times to show how there is a greater chance that you pick a red ball.

Any questions?

Now we will play the games

Game 1: You and your partner can see each other’s income and savings
CODE: FC + OI + OS

- In this game you can CONSUME, TRANSFER money to your partner, and SAVE. You and your partner will be able to see each other’s income and savings. Then, in order to SAVE you will use your savings plate, but not your savings envelope.

- COMPUTER has paired you with a NEW partner.
“The computer has randomly chosen one of the partners you picked for you to play this game with. You have not played with this partner in any previous game, and you will not play with them again.”

- **Endowment:** BEGINNING OF GAME BAG with Rs 30, Rs 60

- **Beginning of game money:** BEGINNING OF GAME BAG with Rs 30, Rs 60

- **Promise:** Before each round, each of you will make four PROMISES: A promise about how much you will transfer to your partner if you are lucky and win Rs 220 and your partner is unlucky and wins 30; A promise about how much you will transfer to your partner if you are lucky and your partner is lucky; A promise about how much you will transfer to your partner if you are unlucky and your partner is lucky; And promise about how much you will transfer to your partner if you are unlucky and your partner is unlucky. We will record this. You cannot change your mind after seeing your and your partner’s incomes. You and your partner may promise different amounts. You do not need to make the same promise as your partner.

- **Important:** You CANNOT change your mind. The promise is a promise. Think of it as a contract for this round.
ಇದು ಬರೀ ಊಹೆ ಮಾತ್ರ. ಜ್ಞಾಪಕ ಇಟ್ಕೊಳ್ಳಿ. ಮನಸ್ಸು ಬದಲಾಯಿಸಿ ಕಡಿಮೆ ಅಥವಾ ಜಾಸ್ತಿ ದುಡ್ಡನ್ನ ಕೊಡಬಹುದು.
- **Income:** GREEN BALL and BROWN BALL. We will put Rs 220 in INCOME ENVELOPE of any person who draws a green ball and is lucky. We will put Rs 30 in INCOME ENVELOPE of any person who draws a brown ball and is unlucky. You will be able to see the amount in your partner’s envelope and your partner will be able to see the amount in your envelope.

- **Transfers:** We will TRANSFER the amount of money that you promised to transfer.

- **Consumption:** Decide how much to CONSUME and how much to SAVE.

- ENDING BAG: Draw a ball from the ENDING BAG with 5 red balls and one black ball.

- *Public demo*
- *Play game with your pairs*

Game 2: You and your partner cannot see each other’s income, but you can see each other’s savings
CODE: FC + HI + OS

- In this game you can CONSUME, TRANSFER money to your partner and SAVE. In this game you will not be able to see each other’s income but you will be able to see each other’s savings. Then, in order to SAVE you will use your savings plate, which your partner can see. You cannot save in your savings envelope, which your partner cannot see.

- The COMPUTER has paired you with a partner. *[Pair people.]*
  "The computer has randomly chosen one of the partners you picked for you to play this game with. You have not played with this partner in any previous game, and you will not play with them again."

- **Beginning of game money:** BEGINNING OF GAME BAG with Rs 30, Rs 60

- **Promise:** Before each round, each of you will make four PROMISES. As you and your partner will not be able to see each other's income, promises will be depend on the ANNOUNCEMENTS that you and your partner domake about you respective incomes. Then, before each round, each of you will make four PROMISES: A promise about how much you will transfer to your partner if you ANNOUNCE that you are lucky and won Rs 220 and your partner ANNOUNCES she is unlucky and wins 30; A promise about how much you will transfer to your partner if you ANNOUNCE that you are lucky and your partner ANNOUNCES she is lucky; and so on. We will record this. You cannot change your mind about how much to transfer after you and your partner ANNOUNCE your incomes. You and your partner may promise different amounts. You do not need to make the same promise as your partner.

Any questions?

- **Important:** You CANNOT change your mind. The promise is a promise.

- **Income:** GREEN BALL and BROWN BALL. We will put Rs 220 in the INCOME ENVELOPE of any person who draws a green ball and is lucky. We will put Rs 30 in the INCOME ENVELOPE of any person who draws a brown ball and is unlucky. You will not be able to see the amount in your partner's envelope and your partner will not be able to see the amount in your envelope.

- **Announcement:** You and your partner will ANNOUNCE your income. We will come privately to each of you and show you a sheet with Rs 220 and Rs 30. You will point to the amount, Rs 220 or Rs 30, to indicate what you want to ANNOUNCE to your partner. Note: you do not have to ANNOUNCE your actual income. If you received Rs 220, you can ANNOUNCE Rs 30 or Rs 220. Similarly if you received Rs 30, you can ANNOUNCE Rs 30 or Rs 220. Just bear in mind that what you ANNOUNCE will determine the transfers that you and your partner will have to make to each other.
  Show example.

- **Transfers:** We will transfer money to your partner according to the PROMISE you made and the incomes you and your partner ANNOUNCED

- **Consumption:** Decide how much to CONSUME and how much to SAVE. If you save in your SAVINGS PLATE, your partner will be able to see what you save. However, at no time you can tell your partner the amount you consumed.

- ENDING BAG: Draw a ball from the ENDING BAG with 5 red balls and one black ball.

- *Public demo*
- *Play game with your pairs*

Game 3: You and your partner cannot see each other's income or each other's savings
CODE: FC + HI + HS

- In this game you can CONSUME, TRANSFER money to your partner and SAVE. When saving, you cannot SAVE in your savings plate. You can save in your savings envelope, which your partner CANNOT see.

- The COMPUTER has paired you with a partner. *[Pair people.]*
  "The computer has randomly chosen one of the partners you picked for you to play this game with. You have not played with this partner in any previous game, and you will not play with them again."

- **Beginning of game money:** BEGINNING OF GAME BAG with Rs 30, Rs 60

- **Promise:**
  Before each round, each of you will make four PROMISES. As you and your partner will not be able to see each other's income, promises will depend on the ANNOUNCEMENTS that you and your partner make about you respective incomes. Then, before each round, each of you will make four PROMISES: A promise about how much you will transfer to your partner if you ANNOUNCE that you are lucky and your partner ANNOUNCES she is unlucky; and so on. We will record this. You cannot change your mind after you and your partner ANNOUNCE their income. You and your partner may promise different amounts. You do not need to make the same promise as your partner.

- **Important:** You CANNOT change your mind. The promise is a promise. Think of it as a contract.

- **Income:** GREEN BALL and BROWN BALL. We will put Rs 220 in INCOME ENVELOPE of any person who draws a green ball and is lucky. We will put Rs 30 in INCOME ENVELOPE of any person who draws a brown ball and is unlucky. You will not be able to see the amount in your partner's envelope and your partner will not be able to see the amount in your envelope.

- **Announcement:** You and your partner will ANNOUNCE your income. We will come privately to each of you and show you a sheet with Rs 220 and Rs 30. You will point to the amount, Rs 220 or Rs 30, to indicate what you want to ANNOUNCE to your partner. Note: you do not have to ANNOUNCE your actual income. If you received Rs 220, you can ANNOUNCE Rs 30 or Rs 220. Similarly if you received Rs 30, you can ANNOUNCE Rs 30 or Rs 220. Just bear in mind that what you ANNOUNCE will determine the transfers that you and your partner will have to make to each other.
  Show example.

- **Transfers:** We will transfer money to your partner according to the PROMISES and the income you and your partner ANNOUNCED.

- **Consumption:** Decide how much to CONSUME and how much to SAVE. If you save in your SAVINGS ENVELOPE, your partner cannot see what you save. If you save in your SAVINGS PLATE, your partner will be able to see what you save. However, at no time you can tell your partner the amount you consumed.

- ENDING BAG: Draw a ball from the ENDING BAG with 5 red balls and one black ball.

- *Public demo*
- *Play game with your pairs*

Game 4: You and your partner cannot see each other's income or each other's savings, and you can change your mind
CODE: LC + HI + HS

- In this game you can CONSUME, TRANSFER money to your partner, and SAVE.

- COMPUTER has paired you with a NEW partner.
  "The computer has randomly chosen one of the partners you picked for you to play this game with. You have not played with this partner in any previous game, and you will not play with them again."

- **Endowment:** BEGINNING OF GAME BAG with Rs 30, Rs 60

- **Guess:** Each of you will make four GUESSES. As you and your partner will not be able to see each other's income, GUESSES will depend on the ANNOUNCEMENTS that you and your partner make about you respective incomes. Then, before each round, each of you will make four GUESSES: A guess about how much you will transfer to your partner if you ANNOUNCE that you are lucky and your partner ANNOUNCES she is unlucky; and so on. We will record this.

  You and your partner may guess different amounts. You do not need to make the same guess as your partner.

- **Important:** You CAN change your mind after seeing your income and hearing what your partner announces. The guess is simply a guess. Then, after both of you ANNOUNCE the income you want to announce you got, you and your partner can then see whether you want to follow your GUESS or transfer a different amount of money to each other, if any.

- **Income:** GREEN BALL and BROWN BALL. We will put Rs 220 in INCOME ENVELOPE of any person who draws a green ball and is lucky. We will put Rs 30 in INCOME ENVELOPE of any person who draws a brown ball and is unlucky. You will not be able to see the amount in your partner's envelope and your partner will not be able to see the amount in your envelope.

- **Announcement:** You and your partner will ANNOUNCE your income. We will come privately to each of you and show you a sheet with Rs 220 and Rs 30. You will point to the amount, Rs 220 or Rs 30, to indicate what you want to ANNOUNCE to your partner. Note: you do not have to ANNOUNCE your actual income. If you received Rs 220, you can ANNOUNCE Rs 30 or Rs 220. Similarly if you received Rs 30, you can ANNOUNCE Rs 30 or Rs 220. Just bear in mind that what you ANNOUNCE will determine the transfers that you and your partner will have to make to each other.
  Show example.

- **Transfers:**

- After you and your partner's income announcements, if you CHANGED your mind:
- We will TRANSFER the new amount of money that you want to transfer, if any.
- After you and your partner's income announcements, if you DIDN'T CHANGE your mind:
- We will TRANSFER the same amount that you had GUESSED you would transfer.

- **Consumption:** Decide how much to CONSUME and how much to SAVE. If you save in your SAVINGS ENVELOPE, your partner will NOT be able to see what you save. At no time you can tell your partner your income or the amount you consumed.

- ENDING BAG: Draw a ball from the ENDING BAG with 5 red balls and one black ball.

- *Public demo*
- *Play game with your pairs*