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Abstract

In many developing countries, unexpected income shocks are common, formal insurance is absent, and informal inter-household risk-sharing networks are unable to provide full insurance. An important question is therefore whether risk sharing within the household is effective. I conducted a field experiment in Western Kenya in which 142 married couples were followed for approximately 8 weeks. Every week, each individual had a 50% chance of receiving an income shock equivalent to a few days' income. Since these shocks are, by definition, small relative to lifetime income, they should not affect intra-household bargaining power and should only affect a Pareto efficient household through the pooled budget constraint. However, I find that men increase their private consumption when they receive the shock but not when their wives do, a rejection of efficiency. I present evidence that such behavior is not specific to the experiment - both husbands and wives spend more on themselves in weeks in which their labor income is higher. The results suggest that insurance is limited even within the households in this sample.

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1 Introduction

Individuals in developing countries are subject to considerable risk but most lack access to formal mechanisms that would allow them to insure themselves against unexpected income shocks. Instead, households often use informal systems of gifts and loans to pool idiosyncratic risk. While these informal networks do provide some protection against shocks, they also face substantial problems of asymmetric information and payment enforceability, and existing evidence suggests that inter-household risk sharing networks are rarely, if ever, efficient (Townsend, 1994; Udry, 1994; Fafchamps and Lund, 2003).

In the absence of effective formal or informal inter-household insurance mechanisms, a natural place for individuals to choose to cope with risk is within the household. Though such arrangements will be somewhat limited because income shocks are likely to be correlated within households, whether these mechanisms are effective in insuring the idiosyncratic risk that remains is an important question. In particular, since information and enforcement are presumably better within a single household than between different households, intra-household insurance is the "best hope" for an informal insurance scheme to overcome information and payment enforceability problems. If risk is not insured even within the household, despite the substantial incentives household members should have to insure each other in the absence of other risk-coping strategies, then programs which impact the ability of individuals to cope with risk will likely have large welfare impacts (such as formal savings accounts or microinsurance programs).

This paper presents results from a field experiment in Kenya designed to directly test whether intra-household risk-sharing arrangements are efficient. The experiment followed 142 married couples for 8 weeks. Every week, each individual had a 50% chance of receiving a 150 Kenyan shilling (US $2) income shock, equivalent to roughly 1.5 days' income for men and 1 week's income for women. As these shocks are, by definition, random, transitory, and idiosyncratic, the experimental design makes it possible to directly and simply test for allocative efficiency, by comparing the difference in the responsiveness of private consumption to shocks received by an individual and to those received by his spouse. The empirical approach is based on the assumption that, even though men and women may have very different preferences, the shocks are too small (relative to lifetime income) to affect intra-household bargaining power. This is

in contrast to larger income shocks which may well affect bargaining power and, by extension, consumption decisions.[1] While responses to permanent income shocks suggest differences in intra-household preferences, they do not necessarily indicate inefficiency. In regards to transitory shocks, however, assuming that household members are risk averse, failing to insure these shocks would leave potential gains from trade unexploited, and would constitute a rejection of the collective model of the household (Chiappori, 1992; Browning and Chiappori, 1998; Browning et al., 1994)), which is based on the assumption that even if spouses have different preferences and bargain over outcomes, they are still able to achieve a Pareto efficient outcome.

In the context of this experiment, if the household pools risk efficiently, increases in private consumption should be the same for shocks received by an individual and those received by his spouse. However, I find that husbands increase their expenditures on privately consumed goods in weeks in which they receive the shock but do not change their expenditures in weeks in which their wives receive the shock, a rejection of Pareto efficiency. I do not detect statistically significant differences for women. These general results are robust to examining changes over several weeks rather than to just the week in which the shock was received.

This paper contributes to a growing literature in development economics which tests for intra-household efficiency. These studies typically test for either productive efficiency (that households maximize profits) or for allocative efficiency (by testing whether allocation decisions are sensitive to transitory income shocks). The most notable study in the former category is Udry (1996), who rejects efficiency by showing that inputs could be profitably reallocated from male-controlled plots to female-controlled plots in Burkina Faso.

This paper fits into the second category. All of these studies require the identification of exogenous, idiosyncratic shocks which affect income realizations but do not affect preferences or intra-household bargaining power. Thus while the shocks must be substantial enough to be economically meaningful, they must not be large enough to affect bargaining weights. Typically

[1] Many studies have shown that household decisions are sensitive to ostensibly exogenous changes in relative intra-household incomes. Examples include Duflo (2003), Thomas (1990), Lundberg, Pollak, and Wales (1997), and Haddad and Hoddinott (1994). Similarly, Anderson and Baland (2002) argue that intra-household conflict over savings/expenditures is a reason that so many women join ROSCAs in Kenya.

the shocks which are used are rainfall or weather shocks among agricultural households (Duflo and Udry, 2004; Dubois and Ligon, 2009; Doss, 2001), health shocks (Dercon and Krishnan, 2000; Goldstein, 2004), or agricultural shocks such as pests or plant disease (Goldstein, 2004). While each of these studies utilizes a different approach with different populations, each rejects efficiency.[2]

However, the current paper is the only study I am aware of in which the variation in incomes is explicitly randomized. Thus, while all of these other studies do a convincing job of ruling out alternative hypotheses for their main findings (for instance, that aggregate shocks affect relative prices, or that idiosyncratic health shocks affect preferences directly), this study represents a particularly direct and straightforward way of testing for efficiency.[3]

While there are other experimental studies on risk sharing (all of which focus on risk sharing outside the household), this is the only one (to my knowledge) to work with real-world risk sharing networks and to observe outcomes outside of a laboratory or other controlled setting. For instance, Charness and Genicot (2009) examine risk sharing among UCLA undergraduates. Those studies which work with pre-existing insurance networks include Barr (2003) and Iversen et al. (2006), which both look at behavior within a controlled experiment among households which share risk outside the experiment (in Zimbabwe and Uganda, respectively). Similarly, Chandrasekhar et al. (2010) test for limited commitment and for the role of access to savings within a controlled experiment in India. The closest study to this one is likely thus Ashraf (2009), who examines how observability and communication possibilities affect intra-household savings decisions in the Philippines, though the experiment here focuses on risk rather than on intra-household savings decisions.

The experimental setup admittedly comes at some cost, however. First, the results come from a stylized experiment in which all shocks were positive. If people spend windfall income differently than their regular labor income, the results may not generalize. However, I attempt

[2] One study from a somewhat more developed country (Mexico) which does not reject efficiency is Bobonis (2009). The author argues that this may be due to better property rights institutions in Mexico than in the developing countries studied in other papers (many of which use data from West Africa).

[3] For instance, see Imbens (2009) for a discussion of how, when it is feasible, randomization is preferable to observational methods.

to address this by examining how private expenditures respond to weekly fluctuations in labor income and I find that both men and women increase private expenditures in weeks in which their labor income is higher (this increase in response to income shocks is similar to that found by Duflo and Udry (2004) with respect to harvest income shocks). While changes in labor income in this study are not necessarily exogenous and so should be interpreted with some caution, they are at least very suggestive that the overall findings are robust. A second issue is that while I have detailed data on each household in the sample, there are relatively few households (142) and all of them were sampled from daily income earners in one part of Western Kenya.

While the welfare consequences of failing to insure these small shocks over a short time period are not likely to be very large, they suggest that insurance is incomplete, which could well have important welfare effects. For example, an experiment conducted with a similar group of daily income earners in this same part of Kenya (but in different market centers) found that the inventories of small entrepreneurs are vulnerable to transitory health shocks (Dupas and Robinson, 2011). However, providing even basic savings accounts mitigated such vulnerability, and the demand for such accounts was substantial. The findings in this paper, which suggest that risk is uninsured even within the household, are therefore complementary, and suggest that programs which provide more formal risk coping mechanisms could improve welfare.[4]

2 Theoretical Framework

In this section, I lay out a brief motivating framework for interpreting the main results (this follows from Browning and Chiappori, 1998 and related papers, as well as Duflo and Udry, 2004). Under the Pareto efficient collective model of the household, the household's optimization problem can be written as maximizing the following utility function:

$$\max_{\{q_{mt},q_{ft},Q_t\}} \sum_{t=0}^{T} u_m(q_{mt}, q_{ft}, Q_t) + \lambda u_f(q_{ft}, q_{mt}, Q_t) \tag{1}$$

[4] An important question is why insurance is limited in this setting. In an earlier version of this paper, I find some suggestive evidence that insurance is constrained by limited commitment though the power of those tests is low. For evidence of limited commitment in risk sharing agreements, see Coate and Ravallion (1993), Ligon, Thomas, and Worrall (2002), Foster and Rosenzweig (2001) and Wahhaj (2007).

subject to the pooled budget constraint:

$$W_t = RW_{t-1} + Y_{mt} + Y_{ft} + S_{mt} + S_{ft} - p_{1t}(q_{mt} + q_{ft}) - p_{2t}Q_t \tag{2}$$

For all variables, the subscript m refers to the male and f to the female. The vectors q_{mt} and q_{ft} refer to private consumption, while Q_t refers to shared consumption. p_{1t} and p_{2t} are prices for private and shared consumption, respectively, while Y_{mt} and Y_{ft} represent labor income. I assume here that labor is supplied inelastically, which should be an innocuous assumption given that it does not respond to the income shocks (as will be shown in the empirical section). W_t is household wealth, which earns a return R in any period.

The key variables for this experiment are S_{mt} and S_{ft}, the experimental shocks. The key assumption is that $\frac{d\lambda}{dS_{mt}} = \frac{d\lambda}{dS_{ft}} = 0$: receiving the income shocks has no effect on the bargaining share. This seems plausible given that the shocks represent only a day and a half's worth of income for men and a week's for women. From the pooled budget constraint, then, it is clear that $\frac{du_1(q_1,q_2,Q)}{dS_1} = \frac{du_1(q_1,q_2,Q)}{dS_2}$: income shocks should have the same effect on each member's private consumption whether they are received by the husband or the wife.

Empirically, the test for unconstrained Pareto efficiency will be performed by comparing changes in private consumption between weeks in which the husband receives the shock and weeks in which the wife receives the shock. Since these shocks are, by definition, transitory, the Permanent Income Hypothesis suggests that households should choose to intertemporally smooth their consumption and save the money (as has been tested in, for instance, Paxson, 1992). For this reason, it will only be possible to reject efficiency if personal savings do not allow for complete intertemporal consumption smoothing.

3 Experimental Design

3.1 Sampling

This project was conducted between April and October 2006 among a sample of 142 couples, drawn from a group of daily income earners (men who work as bicycle taxi drivers - called *boda bodas* in Kiswahili - and women who sell produce and other items in the marketplace) in three

towns in Western and Nyanza Provinces, Kenya.[5] Daily income earners were targeted because the project is focused upon transitory shocks to income, which are more commonly encountered among daily income earners than in a sample of, for instance, farmers. The sample is similar to Dupas and Robinson (2011), though drawn from different market centers. Also, the sample in this paper includes the spouses of all participants.

The towns targeted in this study are semi-urban areas located along a major highway from Nairobi, Kenya to Kampala, Uganda. Though many people in the area earn their living from agriculture, a substantial fraction earn at least some income from self-employment, as is common in the developing world (Banerjee and Duflo, 2007). Many of these individuals work in town during the day but live in the surrounding rural areas.

To recruit individuals into the study, a trained enumerator conducted a census in the market centers of the three towns selected for the study. For the screening interview, the enumerator approached an individual at his place of work and asked to meet with him individually for a few minutes. The enumerator first asked the individual if he was married, and all those that were single were not interviewed further.[6] For those who were married, the enumerator then asked the respondent if he would be interested in participating in a project that would take approximately 8 weeks to complete, and that would require the administration of weekly monitoring surveys to both the respondent and his spouse. A precondition for participation was that the enumerator be allowed to visit the spouse at home without the primary respondent's supervision. Individuals were told that the weekly monitoring survey would take approximately 1 hour per week to complete, and that they would be compensated if they agreed to participate. If the individual was interested in the project, the enumerator took the respondent's name and contact information, and told the respondent that he would return later to begin the project. The spouse's consent was obtained later, at the first monitoring interview.

In total, 181 married individuals were interviewed the census. Of these, 142 couples enrolled in the full study (78.5%). Of the 39 couples who did not participate, 22 refused later (even though they initially expressed interest), 6 could not be included because the spouse was often away and couldn't be traced for interviews, 6 were never found after the initial interview, 2 had

[5] The towns were Busia, Sega, and Ugunja.

[6] Two individuals lied about being married and were dropped from the study.

moved, 2 were sick, and 1 person's spouse died shortly after enrolling the study.

3.2 Experimental Income Shocks

As mentioned in the motivating framework, testing for intra-household Pareto efficiency requires identifying exogenous, transitory shocks to relative incomes. Further, the shocks must be small enough so that they do not affect intra-household bargaining weights (which may respond to bigger shocks). To cleanly identify such shocks, this project randomly provided 150 Kenyan shilling (about US $2.14)[7] income shocks to participants at the end off the weekly monitoring visit. The probability of receiving the shock in a given week was 50% for all participants. To make the payment of the shocks as transparent as possible, each enumerator carried with him a black plastic bag containing 56 slips of paper with the numbers 1-56 on them. Each number corresponded to a payment for *both* spouses. For each spouse, the drawing of 28 of the slips resulted in payment, while the drawing of the other 28 resulted in no payment. The shocks were announced to each spouse, so that each knew what the other had gotten. Payments were made privately, however, and individuals were told that they could spend the money however they chose.

This experimental design has several advantages. First, while the shocks are small compared to total lifetime income, they are not trivial either - they are equivalent to approximately 1.5 days' income for men and 7 days' income for women (Table 2, Panel A). Second, since the shocks were announced to both spouses and thus publicly observable (unlike many real-world shocks, which are usually only partially observable), any observed inefficiency is not attributable to the information available to the spouse. Third, through the data collected with the monitoring surveys, it is possible to compare the experimental results with real world responses to fluctuations in weekly labor income.

An important disadvantage of the study which is important to acknowledge, however, is that (for ethical and practical reasons) the income shocks provided were always positive, unlike real-world shocks which can of course be either positive or negative. Thus it's possible that people may have treated these payments as "windfall" income. I will attempt to address this

[7] The exchange rate was about 70 Kenyan shillings (Ksh) to $1 US during the study.

in the empirical section by testing whether private expenditures respond to more natural labor income fluctuations.[8] I find qualitatively similar results from that approach.

4 Data

There are 3 main data sources in this paper. First, a background survey was administered which included basic questions on demographics, credit, savings, asset ownership, and related issues. An important note is that the background survey was conducted at the end of the study and some individuals were not traced for that survey. Second, a separate survey was administered to measure risk aversion. The survey followed Charness and Genicot (2009) and asked respondents to choose how much of a given amount that they would like to invest in a risky asset which paid off 2.5 times the amount invested 50% of the time, but for which the amount invested was completely lost the other 50% of the time. To ensure truth-telling, respondents were told that one question would be picked later and actually paid out. After the survey ended, a question was randomly picked, a coin was flipped to determine if the amount invested would be multiplied by 2.5 or would be lost, and payouts were made.

The most important source of data, however, were the weekly monitoring surveys. For approximately 8 weeks, a trained enumerator separately visited both spouses each week and administered a detailed monitoring survey that included questions on consumption, expenditures, income (and income shocks), and labor supply over the previous 7 days. The survey also included information on transfers given and received, both to the spouse and to all other individuals. These transfers include cash as well as all other in-kind payments of goods or services (respondents were asked to value these transfers themselves). Thus, these surveys should give a comprehensive summary of all financial transactions for each individual in every week.

The surveys were conducted privately and confidentially, and information was not shared with the spouse.[9] If one of the spouses could not be found on the day of the survey, the

[8] The original experiment was also designed to test for limited commitment by varying the correlation in the shocks across couples. Those correlations have no effect on the basic tests performed here as the overall probability of receiving a shock was the same in all treatment groups. In any case, the sample is balanced across the correlations.

[9] In most cases, the primary respondent was interviewed at work and the spouse at home.

enumerator tried again for the next several days; if this individual was eventually traced, the enumerator asked about the same time period that was asked of the spouse (the 7 days prior to the scheduled meeting). If the individual could not be traced that week, the spouse's survey was also dropped, so the analysis to be presented below includes only those weeks in which information is available for both spouses.

Due to some early problems with some enumerators, particularly towards the beginning of the data collection activities, the database is trimmed of the top and bottom 1% of responses for individual and household expenditures, as well as savings outliers. In addition, some surveys were missing information on one of the key dependent variables necessary for the main regressions and were therefore dropped. This leaves 898 visits for 142 couples.

4.1 Background Statistics

Table 1 presents summary statistics from the background survey, as well as a check that the randomization was implemented properly.[10] First, means are reported in Columns 1 (men) and 4 (women). From Panel A (which presents demographic information), just over 84% of the men in the sample are bicycle taxi drivers, while the rest are distributed among various other jobs. Fifty-three percent of women report having no job. The sample is predominantly of the Luo tribe, and the remainder is Luhya.[11] The average man in the sample is 30.6 years old and has received 7.7 years of education, while the average woman is younger (24.5) and less educated (with 7.0 years of schooling). The average couple has 2.5 children and 3.0 dependents. Though not shown in this Table, most respondents live in the surrounding rural areas and travel to town for work.

Panel B presents statistics on access to savings and credit. As is common in rural Kenya, access to formal savings and credit is very rare: just 2% of men and 1% of women have savings

[10] Table 1 includes information on 136 men and 131 women, out of 142 in the sample. The remainder could not be traced for this survey (as mentioned previously, the background survey was conducted at the end of the survey).

[11] The Luo are the most populous tribe in Nyanza Province (making up 53% of the Province's population), and the Luhya are the most populous in Western Province (making up 84% of the Population). Overall, the Luo make up 12% of the Kenyan population and the Luhya 15% (Central Bureau of Statistics, 2004).

accounts. An equal number received a formal loan in the past year. Informal savings and credit are common, however. Sixty-three percent of men and 44% of women participate in Rotating Savings and Credit Associations (ROSCAs).[12] Men and women are about equally connected to informal credit (92% of men received a loan in the past year and 89% gave a loan, compared to 91% and 80% of women, respectively). Panel C presents statistics on asset ownership. As expected, men are richer than women. They own 0.79 acres of land, compared to 0.15 acres for women. Similarly, women control a total of a bit less than 950 Ksh (US $14) worth of animals and other durable goods, compared to more than 5,600 Ksh (US $80) for men.[13]

Taken together, these results suggest major differences among many dimensions between men and women in this sample. As such, differences in behavior between genders may be attributable to any number of observable or unobservable characteristics. Thus the purpose of this paper is not to highlight level differences between genders. Instead, it takes these differences as given and examines how small, transitory income shocks affect household allocations.

4.2 Randomization Check

Table 1 also presents regressions to check for randomization of the experimental treatments. As will be discussed below, the specification to test for efficiency will utilize household fixed effects. The identifying assumption is thus that *within* the household weeks in which a shock is received by a given individual are randomly determined. However, a stronger test is that the total number of shocks received over the entire experiment should be random across households. Table 1 tests this by running the following regression

$$characteristic_i = \beta_1 \frac{\sum_{t=1}^{8} shock_{it}^{m}}{\sum_{i=1}^{8} traced_{it}} + \beta_2 \frac{\sum_{t=1}^{8} shock_{it}^{f}}{\sum_{i=1}^{8} traced_{it}} + \varepsilon_i \tag{3}$$

where the dependent variable is a given background characteristic. $shock_{it}^{m}$ and $shock_{it}^{f}$ are indicator variables for the male and female in household i receiving the experimental shock in

[12] That men are more likely than women to participate in ROSCAs is in contrast to, for instance, Anderson and Baland (2002). This is likely because so many women do not have regular jobs in this sample.

[13] Durable goods include beds, sofas, tables, chairs, cookers, radios, TVs, mobile and landline phones, clocks, watches, sewing machines, irons, bicycles, and bednets.

week t, and $traced_{it}$ is an indicator for being traced for the survey in week t (recall that observations are dropped if either spouse could not be traced so that households only appear if both spouses completed the survey that week). Thus the independent variables are the empirical probability that the spouse received the shock in a given week. If treatment were truly randomized, the coefficients β_1 and β_2 should be small and statistically insignificant for most variables.

The coefficients are reported in Columns 2-3 (men) and 5-6 (women) in Table 1. There are few statistically significant differences across households. Men who received more shocks saved more in ROSCAs, were more likely to give a gift or loan, and were less likely to have occupations other than a bicycle taxi driver. Women who received more shocks were less likely to have an occupation other than market vendor or housewife. Also, women whose husbands received more shocks were more likely to be housewives. On the whole, however, there appear to be minimal differences even across households and the results appear consistent with random chance.

Finally, given the fixed effects empirical approach, another more direct test is that the shocks should not affect outcomes *before* they are received. As I will discuss in more detail later (when the exact specification is discussed), I find no effects from these placebo regressions (see Appendix Table A1) which suggests again that randomization was implemented effectively.

4.3 Summary Statistics from the Monitoring Surveys

Table 2 provides some summary information from the weekly monitoring visits. Panel A presents summary statistics on weekly labor income and hours (not including agriculture). Here, income for those selling produce or other items (who are mostly female), is calculated as the difference in sales and money spent restocking. Of the couples sampled for the survey, men make about 719 Kenyan shillings per week (just over US $10) and women about 143 shillings (about US $2). For men, this income comes primarily from their regular job; for women, income comes largely from informal sources, such as occasional sales of agricultural produce, rather than regular labor income. Even women without regular jobs earn some money: average income for such women is 53 Ksh (US $0.70) per week, compared to 231 Ksh (US $3.30) for women with jobs. In relative terms, then, the experimental income shocks are relatively large, especially for women: the $2

shock is equivalent to roughly 1.5 days' income for men and over a week's income for women. To put this in terms of a developed country equivalent, for men, the shock is equivalent to roughly $200 for a worker making $50,000 per year. For women, the shock is much larger, equivalent to roughly $950.

Though consumption was recorded in the surveys, expenditures will be used in the main specifications, for several reasons. First, to reduce the length of the monitoring survey, the consumption questions were asked only at the household level so that I do not have specific measures of individual consumption shares and thus they would have to be imputed. Second, the main test of efficiency is the consumption of private goods (alcohol, cigarettes, soda, clothing and shoes, hairstyling, entertainment, newspapers, own meals in restaurants, transportation and various other items), and expenditures on these items are equal to consumption in most cases. Any allocation of such items to others would have been recorded as in-kind transfers and, while some items could in principle be saved for future use, empirically people usually consume these items immediately.

Panel B presents the expenditure data. The first row of Panel B show total expenditures: men spent about 820 Ksh a week, compared to 369 Ksh for women. Total household expenditures are therefore around $2.42 per day, indicating how poor these households are. The next few rows break expenditures into various broad categories: shared food, spending on children,[14] medical expenses, other shared expenses,[15] and total private expenditures. Though shared food and other shared expenses are the biggest categories, both men and women spend substantial sums on private items: private expenses makes up about 18% of total expenditures for men and 11% for women.

The bottom part of the panel breaks down private expenditures into their primary components.[16] Men spend much more on meals in restaurants (usually lunch in town when they are working) and on alcohol, soda, and cigarettes. However, women also spend relatively sizeable amounts (given their income) on clothing for themselves and on other private items.

[14] This includes clothing, school fees, and school supplies.

[15] Other shared expenditures include cleaning supplies, rent, water, household bills, and other related expenses.

[16] "Other" private expenditures includes hairstyling, entertainment, newspapers, transportation, mobile phone airtime, and related items.

Panel C presents summary statistics on transfers (which are defined as positive for outflows and negative for inflows and which include cash and in-kind transfers) between spouses and with individuals outside of the household, and on imputed savings (estimated as the difference between total cash flows and total expenditures). In total, women receive an average of 59 Ksh per week from their husbands, the vast majority of which are gifts rather than loans. Both men and women regularly send and receive transfers, and overall savings levels are quite low (they are in fact slightly negative here, which might reflect some underreporting of income as is common in surveys of this type).

5 Experimental Results

5.1 Empirical Framework

Given the experimental design, the basic regression is straightforward. I will run a reduced form fixed effects specification as follows:

$$y_{it}^{j} = \gamma S_{it}^{j} + \delta S_{it}^{k} + \nu_i + \mu_t + \varepsilon_{it}^{j} \tag{4}$$

where i indexes the household and t time. The regression is run separately both genders j (where k indexes the spouse). y_{it}^{j} are the outcomes of interest (principally private expenditures, though I will also present results for all other expenditure categories, as well as labor supply, transfers, and savings). S_{it}^{j} and S_{it}^{k} are the key independent variables: indicators for whether each spouse received the experimental shock. Finally, μ_t is a fixed effect for the week of the interview and ν_i is a household fixed effect. Identification therefore is based on the assumption that weeks in which a given household receives the shock are randomly determined.[17]

The test of Pareto efficiency is simply that the shocks only affect private expenditures through their effect on the pooled budget constraint, or that:

$$\gamma = \delta \tag{5}$$

[17] If the shocks are truly random, then the shocks should have no effect on outcomes in the weeks before they are received. Appendix Table A1 implements this regression and, reassuringly, finds no effects from this placebo test. This result suggests that inference will be unbiased.

As the money may not be spent immediately, I run another specification which includes current and lagged shocks. Nevertheless, if households save all of these transitory shocks, even over for a few weeks (either out of a consumption smoothing motive or because they would prefer to save up for larger purchases), it will be impossible to reject efficiency as it is impossible to tell who controls household savings with the data which is available. The effects are therefore likely a lower bound on inefficiency.

5.2 Results

The results from estimating the reduced form specification (4) by fixed effects are presented in Panels A (for men) and B (for women) in Table 3. For ease of interpretation, all coefficients have been divided by the size of the experimental shock (150 Kenyan shillings), so that the coefficients in the Table can be interpreted as a propensity to consume out of a shilling's worth of shock.

The first seven rows present the expenditure results for the main categories listed in Table 2. From Panel A, the only statistically significant increase in expenditures for men are private expenditures (which are significant at 1%). The estimated propensity to spend on private items out of own income is 0.169. Interestingly, private expenditures do not change in weeks in which the wife receives the shock (the sign is actually negative). Consequently, the null hypothesis for efficiency (that these marginal propensities are equal) can be rejected at the 5% level. Though the other expenditure categories are less easily interpretable as a test of efficiency (since they are shared), there is little evidence of differences in expenditure responses to own and spouse shocks.

By contrast, for women, private expenditures do not respond to the shocks (received either by herself or her husband). Private expenditures are actually slightly lower in such weeks, though statistically insignificant. Women do spend more on medical expenses when they receive a shock (significant only at the 10% level), but the effect is weak. There is also no discernible effect on other categories which have been associated with female preferences in other studies (for instance, spending on children).

Columns 8 and 9 examine transfers to the spouse (these results are symmetric across spouses

by definition, as every shilling sent by one spouse is received by the other). Men transfer 7.7% of the shock to their wives (which is insignificant) while women transfer 16.3% to their husbands. Both men and women also appear to transfer some outside the household in such weeks (though the results are statistically insignificant). Columns 10-11 show that there is no discernible effect on weekly labor supply.[18] Finally, Column 12 presents imputed savings. For men, it is evident that they save much of the shock. The estimated propensity to save is lower for women, though the standard errors are very large.[19] The lower propensity is also partially attributable to the fact that men receive some of the shock through transfers.

Since these regressions include only current outcomes on the current realization of shocks, it is possible that they do not fully capture the dynamics of household spending (for example, if people save the shocks over a week and spend the shocks later on). To examine this, I run specifications which also include measures for whether the respondent and his spouse received a shock the week before. The cost of doing this is that I can only include observations which were tracked in successive weeks. This reduces the total number of observations to 618 (from 898) and the number of households from 142 to 140.[20]

The results are presented in Table 4. For men (Panel A), the current week increase in private expenditures persists. The propensity to expend is 0.215 out of own current shock income (significant at 1%) and 0.039 out of the wife's. Though this difference is no longer significant due to the decreased sample size, the pattern is very similar of the main results in Table 3. Again, there are few statistically significant changes in other outcomes (though there is a small decrease in labor hours which is significant at 10%). None of the lagged shocks on own income are significant for men.

There are few evident trends in lagged spouse's experimental income as well. One exception is that "other shared" expenditures by men tend to decrease when their wife receives the shock (perhaps because the wife purchases these items out of her income - indeed this seems to be the

[18] It might be that the labor supply responses are over a smaller time period such as a few days (as it is among, for instance, sex workers in this part of Kenya in Robinson and Yeh, 2011).

[19] The general pattern of the results look similar when conditioning on labor income, or when including an interaction between the 2 shocks.

[20] Though all households were tracked for a minimum of 4 weeks, some were not found in consecutive weeks.

case in Panel B). However, this decrease does not translate into increased spending on private items (since the lagged spouse shocks do not affect private expenditures), so this result does not indicate a rejection of efficiency.

Panel B presents results for women. Again, there is no discernible effect on private expenditures. Though women increase total expenditures, this is mostly in shared categories. Labor income also appears to go down somewhat for women after the receipt of shocks, though the effect is imprecisely estimated. This could be evidence, however, that women treat own income shocks differently than spouse's income shocks in determining labor supply (which would itself be a rejection of efficiency). However, the effect appears to be too weak to make definitive conclusions.[21]

A final check of these results is that, if the shocks are truly random, they should have no effect on allocations before they are received. In Appendix Table A1, I regress current expenditures on future shocks (which have not yet been received). Reassuringly, this placebo test reveals no effect of future shocks (as it should), providing confidence that the results are not due to omitted factors.

6 External Validity and Alternative Hypotheses

6.1 Behavior Outside of Experiment

While the experimental approach adopted in this paper provides a clean test of intra-household efficiency within the experiment, a drawback of the approach is that the environment is somewhat stylized. In particular, the shocks are always positive and the experimental payout is akin to a small "windfall" separate from their normal income source.[22] While these issues are not relevant

[21] Another specification to deal with the possibility that money is not spent immediately is to compare total expenditure levels over the entire experiment on the total number of shocks received. The general results look similar from such a specification but the power is low since there is only 1 observation per household. Thus, given that Table 4 suggests that most private spending is immediate, I do not report these results here.

[22] A related issue is that people may treat gains differently than losses, for example because they are loss averse (i.e. Kahneman and Tversky 1979). If so, they will tend to be risk averse over gains and risk loving over losses. As the experiment involves only gains, loss averse individuals should have been more likely to insure each other than they would have been for losses. Thus, loss aversion seems unlikely to explain the results.

if people treat all sources of income similarly, I attempt to address this issue by examining labor income fluctuations outside of the experiment.

Ideally, there would be an instrumental variable which would affect labor income but not preferences or bargaining power (rainfall, for instance). If exogenous labor income changes could be identified with this instrument, it would be possible to causally test for efficiency. Unfortunately, I do not have such an instrument (those that are potentially available, such as sickness or other shocks) are either not strong enough to predict income or may directly affect preferences for private expenditures.

Thus, I have to rely solely on weekly labor income. To attempt to get a measure of labor income shocks which are not due to differences in work intensity, I also control for hours and run the following regressions:

$$y_{it}^{j} = \gamma L_{it}^{j} + \delta L_{it}^{k} + \pi H_{it}^{j} + \theta H_{it}^{k} + \nu_i + \mu_t + \varepsilon_{it}^{j} \tag{6}$$

where L and H index labor income and labor hours, respectively. Identification requires that weekly labor income for a given household (conditional on hours) is uncorrelated with preferences. As this assumption is difficult to verify with this data, the results should be taken with some care.[23]

That caveat in mind, the results are very supportive of the main experimental findings (Table 5). As the standard errors in these regressions are smaller than in the experimental section (given that there is more variation in income than the shock dummy), tighter inference is possible. Most notably, both men and women spend significantly more on private expenditures when they earn more labor income. While the magnitudes are not very large (0.025 for men and 0.022 for women), efficiency is rejected in both cases (at the 5% level for men and the 10% level for women). Again, the majority of these fluctuations are saved which might suggest that they are indeed transitory shocks.

While these results are speculative given the possible endogeneity of weekly labor income even after controlling for hours, they do at least suggest that the experimental findings were not

[23] Results look similar controlling for other shocks (such as sickness) though I do not include them here as that information is missing for several respondents.

necessarily specific to the experiment.

6.2 Alternative Hypothesis: Differences in Risk Preferences

Recent work has shown that men and women have different preferences for risk. In particular, women tend to be more risk averse than men (Croson and Gneezy, 2009). Such differences are important for the structure of risk sharing arrangements. In particular, the less risk averse individual could insure the more risk averse individual by accepting more consumption variance in exchange for a higher average level of consumption. Mazzocco and Saini (2010) find evidence for such heterogeneity across households in the ICRISAT dataset used by Townsend (1994), and show that accounting for this makes an important difference in empirical inferences.

I address this by making use of the experimentally elicited risk preferences in which individuals were asked how much of 50 or 100 Ksh that they wanted to invest in a risky asset which would pay out 2.5 the amount invested half the time but nothing the other half of the time. I then regress this measure on an indicator for the gender of the respondent. To be as transparent as possible, I do not include any other controls.

Results are presented in Appendix Table A2 (note that I have information here on only 129 couples). Women invest 20.4 Ksh and 44.6 Ksh of the 50 Ksh and 100 Ksh amounts, respectively, in the asset (the constant in this regression). Men invest a bit more (2.1 and 2.4 Ksh, respectively), but these differences are insignificant and very small. For example, the standard deviation of the amount invested out of 100 Ksh is 22, so these difference is equivalent to only 0.1 of a standard deviation. I further check that these differences are not driving the results by re-running Equation (4) for spouses with similar risk preferences (those with less than or equal to a 10 or 20 Ksh difference in the amount invested).[24] While the significance is of course reduced, the main findings remain, suggesting that differential risk preferences are not the explanation.

[24] In total, 43.4% of couples have no more than a 10 Ksh difference in the amount invested, and 62.8% have no more than a 20 Ksh difference.

7 Conclusion

Any test of intra-household risk coping must identify exogenous shocks which affect relative incomes but do not affect bargaining parameters or preferences. The contribution of this paper is to provide random shocks in a controlled experiment among married couples in Western Kenya. The experimental shocks are well suited for testing efficiency - they are randomly determined, transitory, idiosyncratic, and small relative to lifetime income. They are also perfectly observable (because they were announced to both spouses), so that information asymmetries are not relevant. Thus, the experiment represents a particularly direct and easily interpretable test of Pareto efficiency.

The results suggests that risk sharing is incomplete and that efficiency is not achieved. More speculative evidence further suggests that even outside of the experiment, these couples do not achieve efficiency over weekly labor fluctuations. Despite the prevalence of income shocks in this part of Kenya, it appears that spouses do not fully insure each other.

Understanding the effectiveness of intra-household risk coping is important because numerous other studies have shown that both inter-temporal and inter-household risk mechanisms are only partially effective (including several studies in this part of Kenya). If potentially insurable individual risk is not insured even within the household, then it strongly suggests that the provision of more formal risk coping devices (at the individual level) could have large effects. For example, other work with a very similar population of daily income earners suggests that, while female market vendors are quite vulnerable to income shocks and disinvest in the business when shocks hit, providing even simple savings accounts can mitigate this vulnerability (Dupas and Robinson, 2011). Similar interventions seem well worth exploring given the incompleteness of informal risk sharing, both within and across households.

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Table 1. Summary Statistics

	(1)	(2)	(3)	(4)	(5)	(6)
		MALES			FEMALES	
		Coefficient of Regression of Dep. Var. on Ave. Num of Shocks Received by:[1]			Coefficient of Regression of Dep. Var. on Ave. Num of Shocks Received by:	
	Mean	Respondent	Spouse	Mean	Respondent	Spouse
Panel A. Demographic Information						
Occupation:						
Bicycle Taxi Driver	0.84	0.20	-0.13	0.00	-	-
		(0.17)	(0.18)		-	-
Market Stall	0.05	0.10	-0.09	0.31	0.24	-0.30
		(0.09)	(0.10)		(0.22)	(0.21)
Housewife / no job	0.02	-0.07	0.09	0.53	0.06	0.41
		(0.05)	(0.06)		(0.23)	(0.23)*
Other	0.09	-0.29	0.11	0.15	-0.29	-0.11
		(0.13)**	(0.14)		(0.17)*	(0.16)
Luo Tribe	0.88	-0.06	0.21	0.86	0.00	0.03
		(0.15)	(0.16)		(0.17)	(0.16)
Age	30.57	-0.54	4.53	24.47	1.20	-3.33
	(8.71)	(3.93)	(4.15)	(6.83)	(3.23)	(3.14)
Education	7.72	-0.96	1.29	7.02	-1.25	-1.03
	(2.41)	(1.10)	(1.16)	(2.07)	(1.01)	(0.96)
Literate (Swahili)	0.85	0.12	-0.04	0.72	-0.03	0.23
	(0.36)	(0.16)	(0.17)	(0.45)	(0.21)	(0.21)
Number of children	2.45	-0.49	-0.06	2.45	-0.06	-0.49
	(1.75)	(0.81)	(0.83)	(1.75)	(0.83)	(0.81)
Number of dependents[2]	2.95	0.68	-0.63	2.95	-0.63	0.68
	(2.05)	(0.96)	(0.99)	(2.05)	(0.99)	(0.96)
Panel B. Savings and Credit						
Has Formal Savings Account	0.02	0.03	-0.06	0.01	-0.03	0.01
	(0.12)	(0.06)	(0.06)	(0.09)	(0.04)	(0.04)
Received Formal Loan	0.02	0.10	0.04	0.01	-0.01	-0.01
in past year	(0.15)	(0.07)	(0.07)	(0.09)	(0.04)	(0.04)
Participates in ROSCA	0.63	0.24	0.00	0.44	-0.06	-0.12
	(0.48)	(0.23)	(0.23)	(0.50)	(0.24)	(0.23)
Amount Saved in ROSCAs	3097	4636	2310	2035	-56	445
(for those in ROSCAs)	(4733)	(2,545)*	(2809)	(3200)	(2571)	(2131)
Received gift or loan	0.92	0.10	0.01	0.91	0.11	0.02
in past year	(0.27)	(0.12)	(0.13)	(0.29)	(0.14)	(0.13)
Amount received in gifts and	2393	225	1178	1589	332	-683
loans in past year	(2593)	(1171)	(1236)	(2083)	(987)	(959)
Gave gift or loan	0.89	0.26	0.02	0.80	-0.05	0.06
in past year	(0.32)	(0.14)*	(0.15)	(0.40)	(0.19)	(0.19)
Amount given in gifts and	1806	298	-169	930	-287	-919
loans in past year	(2944)	(1337)	(1410)	(1428)	(673)	(654)
Panel C. Asset Ownership						
Acres of land owned	0.79	-0.71	0.02	0.15	-0.04	0.01
	(1.64)	(0.74)	(0.78)	(0.50)	(0.24)	(0.23)
Value of Durable Goods	2708	1646	334	797	268	-662
Owned	(4570)	(2066)	(2181)	(1652)	(782)	(760)
Value of Animals Owned	2914	10784	-3987	145	299	-16
	(15635)	(7017)	(7407)	(838)	(397)	(386)
Amount invested (out of 100	46.98	-11.06	5.51	44.57	-9.60	-4.47
Ksh) in Risky Asset[3]	(22.17)	(10.13)	(10.61)	(21.87)	(10.48)	(10.01)
Observations	136			131		

Notes: All figures are self-reported means. There are a fewer observations than in the monitoring surveys (in which there are 142 couples) because the background survey was administered after the project started and some could not be traced for this survey. All monetary figures in Kenyan shillings. Exchange rate was roughly 70 Kenyan shillings to $1 US during this time period.
Columns 1 and 4: standard deviations in parentheses. Columns 2-3 and 5-6: standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

[1]These are coefficients of a regression of the dependent variable on the probability that the respondent received the experimental shock over the 8 weeks of the experiment (the total number of shocks divided by the number of weeks). The probability is used rather than the total number of shocks because some respondents weren't traced in some weeks.

[2]The number of dependents must be the same within the household. In cases where responses differ, the wife's response is used.

[3]The risky asset paid off 2.5 times the amount invested with probability 50%, and 0 with probability 50%.

Table 2. Summary Statistics from Monitoring Surveys

	(1) Male	(2) Female
Panel A. Income		
Total Labor Income	718.64	143.01
	(746.15)	(573.68)
Total Hours Worked	55.35	16.47
	(65.42)	(33.04)
Panel B. Expenditures		
Total Expenditures	820.05	369.21
	(525.34)	(397.01)
Shared Food	380.51	192.67
	(274.09)	(203.02)
Children	18.77	16.61
	(71.10)	(54.54)
Medical	42.59	25.34
	(103.42)	(90.75)
Other Shared	126.72	59.92
	(228.13)	(119.09)
Transportation	107.98	34.75
	(121.14)	(113.29)
Total Private	143.71	39.92
	(161.32)	(92.32)
Private Categories		
Clothing	21.41	21.87
	(85.65)	(77.54)
Meals in Restaurants	71.75	5.33
	(76.08)	(24.28)
Alcohol, Soda, Cigarettes	28.04	4.39
	(51.52)	(17.97)
Other Private Expenditures	22.49	8.34
	(74.95)	(25.11)
Panel C. Transfers and Savings		
(Net) Transfers to Spouse	59.46	-59.46
	(147.44)	(147.44)
(Net) Transfers Outside HH	11.03	6.28
	(371.85)	(326.65)
Savings	-23.34	-52.00
	(863.52)	(642.60)
Observations	898	898
Number of IDs	142	142

Notes: In Panel B, "Total private" expenditures include the subcategories listed in the bottom of the Panel. The "other private expenditures" category includes hairstyling, entertainment, newspapers, transportation, mobile phone airtime, and similar items. Shared food includes all food consumed jointly at home. Spending on children includes school fees, school supplies, and clothing. Other shared expenditures includes cleaning supplies, rent, water, household bills, and related expenses. In Panel C, transfers are defined as positive for outflows and negative for inflows and include cash and in-kind transfers. Savings are imputed as the sum of total income (including the experimental shocks), transfers, and bank and ROSCA flows minus total expenditures.
Standard deviations in parentheses.

Table 3. Experimental Shocks on Individual-Level Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Expenditures							Net Transfers To:		Labor Supply		Savings[2]
	Total	Private	Shared Food	Medical	Children	Other Shared	Transport	Spouse	Outside Household	Hours	Labor Income	
Panel A. Men												
Respondent Received Shock	0.190	0.169	-0.025	0.048	-0.012	-0.096	0.102	0.077	0.090	0.018	0.139	0.937
	(0.194)	(0.064)***	(0.089)	(0.041)	(0.032)	(0.102)	(0.068)	(0.065)	(0.202)	(0.017)	(0.366)	(0.421)**
Spouse Received Shock	-0.163	-0.027	-0.016	0.057	-0.019	-0.086	-0.069	-0.163	-0.133	-0.036	-0.145	0.584
	(0.192)	(0.069)	(0.087)	(0.045)	(0.030)	(0.111)	(0.060)	(0.060)***	(0.157)	(0.035)	(0.312)	(0.366)
Observations	898	898	898	898	898	898	898	898	898	898	898	898
Number of Households	142	142	142	142	142	142	142	142	142	142	142	142
F-test of equality	0.21	0.05**	0.93	0.84	0.88	0.95	0.09*	0.001***	0.31	0.27	0.48	0.54
Mean of Dependent Variable (Ksh)[1]	889.32	135.66	413.77	56.95	24.09	144.77	114.55	76.78	2.81	52.18	698.56	-250.99
S.D. of Dep. Var. (Ksh)	557.30	122.24	298.74	143.25	84.40	250.88	106.76	159.89	436.18	24.14	852.24	877.03
Panel B. Women												
Respondent Received Shock	0.180	-0.020	0.056	0.079	0.032	0.041	-0.007	0.163	0.050	-0.031	-0.020	0.403
	(0.148)	(0.042)	(0.067)	(0.041)*	(0.026)	(0.059)	(0.047)	(0.060)***	(0.190)	(0.020)	(0.185)	(0.275)
Spouse Received Shock	-0.058	-0.026	-0.051	0.015	-0.025	0.050	-0.021	-0.077	-0.010	0.009	0.031	0.298
	(0.123)	(0.039)	(0.064)	(0.034)	(0.024)	(0.041)	(0.039)	(0.065)	(0.160)	(0.011)	(0.195)	(0.266)
Observations	898	898	898	898	898	898	898	898	898	898	898	898
Number of Households	142	142	142	142	142	142	142	142	142	142	142	142
F-test of equality	0.14	0.91	0.23	0.07*	0.1*	0.88	0.77	0.001***	0.63	0.14	0.86	0.77
Mean of Dependent Variable (Ksh)	428.51	47.28	227.98	28.43	18.25	68.51	38.07	-76.78	-11.15	16.77	165.33	-127.78
S.D. of Dep. Var. (Ksh)	482.65	123.77	262.65	94.87	65.80	119.21	101.60	159.89	549.09	24.88	604.19	715.34

Notes: All regressions are estimated by fixed effects with controls for the week of the interview. All coefficients are divided by 150 shillings, the size of the experimental shock (including hours). See Table 2 for explanations of the various expenditure categories.

Standard errors clustered at the household level in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

[1]The mean and standard deviation reported here is for weeks when neither spouse receives the shock.

[2]Savings are imputed as the sum of labor and experimental income, transfers, ROSCA payouts, and bank withdrawals minus total expenditures. ROSCA and bank withdrawals are not reported to save space.

Table 4. Current and Lagged Experimental Shocks on Individual-Level Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Expenditures							Net Transfers To:		Labor Supply		Savings[2]
	Total	Total Private	Shared Food	Medical	Children	Other Shared	Transport	Spouse	Outside Household	Hours	Labor Income	
Panel A. Men												
Respondent Received Shock this week	0.431	0.215	0.188	0.042	-0.008	-0.138	0.132	0.125	-0.089	-0.039	-0.321	0.249
	(0.245)*	(0.081)***	(0.117)	(0.051)	(0.036)	(0.124)	(0.082)	(0.079)	(0.185)	(0.022)*	(0.534)	(0.593)
Respondent Received Shock last week	0.055	0.039	-0.015	-0.059	-0.020	0.064	0.047	0.048	-0.107	-0.059	-0.440	-0.476
	(0.227)	(0.075)	(0.132)	(0.046)	(0.030)	(0.112)	(0.063)	(0.072)	(0.139)	(0.047)	(0.522)	(0.570)
Spouse Received Shock this week	-0.082	0.067	0.114	0.031	-0.037	-0.228	-0.028	-0.167	-0.274	-0.041	-0.530	0.217
	(0.200)	(0.067)	(0.101)	(0.050)	(0.035)	(0.132)*	(0.070)	(0.060)***	(0.166)	(0.059)	(0.468)	(0.496)
Spouse Received Shock last week	-0.285	0.011	0.079	-0.049	-0.070	-0.304	0.049	-0.060	0.147	0.005	-0.190	-0.126
	(0.209)	(0.062)	(0.112)	(0.045)	(0.041)*	(0.150)**	(0.054)	(0.080)	(0.233)	(0.013)	(0.410)	(0.490)
Observations	611	611	611	611	611	611	611	611	611	611	611	611
Number of Households	140	140	140	140	140	140	140	140	140	140	140	140
p-value for test:												
Respondent shock = spouse shock (this week)	0.1*	0.12	0.62	0.83	0.55	0.63	0.12	0.001***	0.48	0.97	0.58	0.96
Respondent shock = spouse shock (last week)	0.28	0.79	0.61	0.89	0.31	0.06*	0.98	0.33	0.33	0.19	0.76	0.70
Respondent shock this week + last week = 0	0.23	0.06*	0.46	0.83	0.55	0.69	0.13	0.12	0.35	0.14	0.45	0.81
Spouse shock this week + last week = 0	0.18	0.43	0.25	0.78	0.1*	0.01***	0.83	0.02**	0.68	0.57	0.17	0.88
Sum respondent shocks = sum spouse shocks	0.08*	0.29	0.95	1.00	0.26	0.08*	0.31	0.02**	0.86	0.33	0.97	0.75
Mean of Dependent Variable (Ksh)[1]	760.20	114.64	356.01	34.69	18.81	142.85	93.20	64.88	52.95	55.33	768.13	-87.03
S.D. of Dep. Var. (Ksh)	508.59	92.01	303.29	91.17	58.62	214.88	88.06	107.20	156.32	21.39	1259.78	1051.85

Notes: All regressions are estimated by fixed effects with controls for the week of the interview. All coefficients are divided by 150 shillings, the size of the experimental shock (including hours). See Table 2 for explanations of the various expenditure categories.

Standard errors clustered at the household level in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

[1]The mean and standard deviation reported here is for weeks when neither spouse receives the shock.

[2]Savings are imputed as the sum of labor and experimental income, transfers, ROSCA payouts, and bank withdrawals minus total expenditures. ROSCA and bank withdrawals are not reported to save space.

Table 4. Current and Lagged Experimental Shocks on Individual-Level Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Expenditures							Net Transfers To:		Labor Supply		Savings[2]
	Total	Total Private	Shared Food	Medical	Children	Other Shared	Transport	Spouse	Outside Household	Hours	Labor Income	
Panel B. Women												
Respondent Received Shock this week	0.434	-0.009	0.107	0.083	0.048	0.126	0.079	0.167	-0.119	-0.026	-0.141	0.222
	(0.190)**	(0.064)	(0.076)	(0.084)	(0.030)	(0.078)	(0.061)	(0.060)***	(0.170)	(0.025)	(0.241)	(0.306)
Respondent Received Shock last week	0.012	0.013	-0.136	0.074	-0.005	0.058	0.008	0.060	-0.105	-0.024	-0.374	-0.508
	(0.232)	(0.055)	(0.064)**	(0.060)	(0.036)	(0.108)	(0.073)	(0.080)	(0.144)	(0.010)**	(0.215)*	(0.270)*
Spouse Received Shock this week	0.101	-0.020	-0.032	0.055	0.008	0.063	0.027	-0.125	-0.133	0.012	-0.244	-0.041
	(0.148)	(0.058)	(0.067)	(0.050)	(0.029)	(0.056)	(0.041)	(0.079)	(0.146)	(0.011)	(0.233)	(0.288)
Spouse Received Shock last week	-0.230	0.066	-0.139	-0.030	0.015	-0.138	-0.004	-0.048	0.216	-0.029	-0.197	-0.203
	(0.222)	(0.080)	(0.079)*	(0.075)	(0.026)	(0.095)	(0.057)	(0.072)	(0.127)*	(0.023)	(0.267)	(0.312)
Observations	611	611	611	611	611	611	611	611	611	611	611	611
Number of Households	140	140	140	140	140	140	140	140	140	140	140	140
p-value for test:												
Respondent shock = spouse shock (this week)	0.09*	0.89	0.20	0.63	0.30	0.38	0.34	0.001***	0.92	0.21	0.78	0.53
Respondent shock = spouse shock (last week)	0.55	0.58	0.98	0.37	0.65	0.29	0.92	0.33	0.19	0.86	0.67	0.50
Respondent shock this week + last week = 0	0.23	0.97	0.78	0.21	0.43	0.30	0.27	0.02**	0.40	0.09*	0.06*	0.50
Spouse shock this week + last week = 0	0.62	0.70	0.12	0.69	0.57	0.45	0.76	0.12	0.65	0.46	0.29	0.59
Sum respondent shocks = sum spouse shocks	0.26	0.79	0.36	0.40	0.75	0.27	0.58	0.02**	0.35	0.14	0.88	0.95
Mean of Dependent Variable (Ksh)[1]	356.01	51.81	178.49	34.50	12.69	51.52	27.00	-64.88	18.76	14.54	162.75	-91.40
S.D. of Dep. Var. (Ksh)	432.48	154.72	190.52	121.84	58.01	98.90	59.16	107.20	262.05	23.46	848.83	834.79

Notes: All regressions are estimated by fixed effects with controls for the week of the interview. All coefficients are divided by 150 shillings, the size of the experimental shock (including hours). See Table 2 for explanations of the various expenditure categories.

Standard errors clustered at the household level in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

[1]The mean and standard deviation reported here is for weeks when neither spouse receives the shock.

[2]Savings are imputed as the sum of labor and experimental income, transfers, ROSCA payouts, and bank withdrawals minus total expenditures. ROSCA and bank withdrawals are not reported to save space.

Table 5. Response to Labor Income Fluctuations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Expenditures							Net Transfers To:		Savings[2]
	Total	Private	Shared Food	Medical	Children	Other Shared	Transport	Spouse	Outside Household	
Panel A. Men										
Respondent Labor Income	0.184	0.025	0.041	0.012	0.002	0.075	0.029	-0.006	0.090	0.799
	(0.039)***	(0.013)*	(0.016)**	(0.017)	(0.003)	(0.046)	(0.011)***	(0.010)	(0.040)**	(0.031)***
Spouse Labor Income	-0.005	-0.004	-0.014	0.008	-0.001	0.010	-0.005	0.007	-0.016	0.005
	(0.031)	(0.005)	(0.008)	(0.015)	(0.003)	(0.018)	(0.006)	(0.014)	(0.022)	(0.041)
Observations	898	898	898	898	898	898	898	898	898	898
Number of Households	142	142	142	142	142	142	142	142	142	142
F-test of equality	0.001***	0.04**	0.001***	0.87	0.51	0.19	0.01***	0.55	0.02**	0.001***
Mean of Dependent Variable (Ksh)[1]	820.05	143.71	380.51	42.59	18.77	126.72	107.98	59.46	11.03	-23.34
S.D. of Dep. Var. (Ksh)	525.34	161.32	274.09	103.42	71.10	228.13	121.14	147.44	371.85	863.52
Panel B. Women										
Respondent Labor Income	0.126	0.022	0.057	0.008	0.010	0.027	0.003	-0.007	0.083	0.843
	(0.044)***	(0.006)***	(0.031)*	(0.011)	(0.006)*	(0.009)***	(0.006)	(0.014)	(0.024)***	(0.054)***
Spouse Labor Income	0.036	0.010	0.011	0.002	0.001	0.013	0.000	0.006	-0.024	0.011
	(0.013)***	(0.004)***	(0.007)	(0.003)	(0.002)	(0.006)**	(0.004)	(0.010)	(0.014)*	(0.034)
Observations	898	898	898	898	898	898	898	898	898	898
Number of Households	142	142	142	142	142	142	142	142	142	142
F-test of equality	0.07*	0.07*	0.17	0.58	0.13	0.15	0.64	0.55	0.001***	0.001***
Mean of Dependent Variable (Ksh)	369.21	39.92	192.67	25.34	16.61	59.92	34.75	-59.46	6.28	-52.00
S.D. of Dep. Var. (Ksh)	397.01	92.32	203.02	90.75	54.54	119.09	113.29	147.44	326.65	642.60

Notes: All regressions are estimated by fixed effects with controls for the week of the interview. All regressions also control for labor hours for both spouses. All coefficients are divided by 150 shillings, the size of the experimental shock (including hours). See Table 2 for explanations of the various expenditure categories.

Standard errors clustered at the household level in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

[1]The mean and standard deviation reported here is over all weeks.

[2]Savings are imputed as the sum of labor and experimental income, transfers, ROSCA payouts, and bank withdrawals minus total expenditures. ROSCA and bank withdrawals are not reported to save space.

Appendix Table A1. Placebo Test - Outcomes on Shocks Received the Following Week

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Expenditures							Net Transfers To:		Labor Supply		Savings[2]
	Total	Private	Shared Food	Medical	Children	Other Shared	Transport	Spouse	Outside Household	Hours	Labor Income	
Panel A. Men												
Respondent Received Shock	-0.100	-0.043	0.021	-0.028	-0.094	0.130	-0.085	0.020	0.031	0.007	-0.350	-0.618
Following Week	(0.222)	(0.087)	(0.098)	(0.048)	(0.062)	(0.121)	(0.061)	(0.068)	(0.223)	(0.013)	(0.295)	(0.447)
Spouse Received Shock	0.220	-0.047	0.159	0.030	0.044	0.072	-0.035	0.075	0.384	0.040	-0.055	-0.467
Following Week	(0.237)	(0.099)	(0.130)	(0.078)	(0.047)	(0.119)	(0.058)	(0.067)	(0.228)*	(0.045)	(0.340)	(0.444)
Observations	611	611	611	611	611	611	611	611	611	611	611	611
Number of Households	140	140	140	140	140	140	140	140	140	140	140	140
F-test of equality	0.28	0.98	0.41	0.47	0.07*	0.62	0.57	0.53	0.20	0.45	0.35	0.74
Mean of Dependent Variable (Ksh)[1]	824.52	159.91	349.91	42.23	37.45	121.34	113.69	65.36	12.70	56.17	732.75	9.54
S.D. of Dep. Var. (Ksh)	494.83	157.13	258.07	128.76	119.53	195.20	121.70	153.10	419.72	21.52	777.58	774.48
Panel B. Women												
Respondent Received Shock	0.099	0.027	-0.089	0.037	0.019	0.014	0.090	-0.075	0.108	-0.028	0.238	0.306
Following Week	(0.175)	(0.043)	(0.100)	(0.052)	(0.028)	(0.049)	(0.052)*	(0.067)	(0.144)	(0.023)	(0.186)	(0.316)
Spouse Received Shock	-0.180	-0.031	-0.051	-0.083	-0.013	0.026	-0.027	-0.020	0.074	0.006	-0.006	0.001
Following Week	(0.169)	(0.062)	(0.092)	(0.053)	(0.028)	(0.047)	(0.050)	(0.068)	(0.126)	(0.017)	(0.168)	(0.316)
Observations	611	611	611	611	611	611	611	611	611	611	611	611
Number of Households	140	140	140	140	140	140	140	140	140	140	140	140
F-test of equality	0.24	0.42	0.77	0.20	0.34	0.86	0.12	0.53	0.82	0.35	0.35	0.54
Mean of Dependent Variable (Ksh)	388.75	45.08	217.91	30.94	14.24	52.71	27.88	-65.36	-27.16	16.73	83.72	-102.75
S.D. of Dep. Var. (Ksh)	359.78	107.53	225.50	83.21	38.11	70.41	61.88	153.10	196.73	24.68	309.86	462.74

Notes: All regressions are estimated by fixed effects with controls for the week of the interview. All coefficients are divided by 150 shillings, the size of the experimental shock (including hours). See explanations of the various expenditure categories.

Standard errors clustered at the household level in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

[1]The mean and standard deviation reported here is over those weeks when neither spouse receives the shock (for those households who have information on current and future shocks).

[2]Savings are imputed as the sum of labor and experimental income, transfers, ROSCA payouts, and bank withdrawals minus total expenditures. ROSCA and bank withdrawals are not reported to s

Appendix Table A2. Gender Differences in Risk Aversion

	(1)	(2)
	Amount Invested in a Risky Gamble out of:	
	50 Ksh	100 Ksh
Male	2.09	2.40
	(1.37)	(2.74)
Constant	20.39	44.57
	(0.97)***	(1.94)***
Observations	258	258

Notes: There are no other covariates included so the constant represents the mean for women. The risky gamble paid off 2.5 times the amount invested with probability 50% and 0 with probability 50%.
Standard deviations in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%