Morals, Markets and Mutual Insurance: Using Economic Experiments to Study Recovery from Hurricane Mitch

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Abstract

Hurricane Mitch devastated rural communities in Honduras in 1998. While many of these communities received some inflow of external aid, the absence of insurance contracts and the thinness of capital markets meant that most households had to rely either on their own resources to engineeer an economic recovery, or on resources that they could broker through social relationships. Using a suite of economic experiments designed to gauge the norms of altruism and trust within these rural communities, this paper explores this latter mechanism of recovery. Econometric analysis of the experimental data gives evidence of durable community norms that are reinforced by endogenouse social interactions. The analysis also shows that these community norms played a strong, but uneven role in facilitating recovery from Hurricane Mitch, assisting most strongly a favored subset of households. While thus establishing the importance of moral norms, the analysis here warns against naive the presumption all community members are equally well-seved by social mechanisms of insurance and recovery.

1 Introduction

Hurricanes and other environmental shocks punctuate the lives of poor and vulnerable populations in many parts of the world. When Hurricane Mitch struck Honduras in 1998, poor rural households lost 30% to 40% of their crop income and measured poverty immediately increased 5.5 percentage points, rising from 69.2% of households to 74.6% (Morris *et al.*, 2002). In addition to these immediate income effects, Mitch also destroyed productive assets, washing away land, livestock and plantations, compromising future earnings and livelihoods

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for many households. On average, these losses amounted to 15% to 20% of all assets held by lower wealth households according to Morris *et al.* (2001). While inflows of external aid to Honduras were substantial in the wake of Mitch, they amounted to less than 5% of the total losses suffered by households surveyed for this study, a finding confirmed by the Morris study. The longer term effects of disasters like Mitch on poverty depend very much then on households' ability to maintain and rebuild their depleted stocks of productive assets in the wake of the shock.

Unfortunately market mechanisms for protecting and rebuilding assets are often limited in poor rural communities like those of Honduras.[1] This paper explores the efficacy of informal mechanisms of mutual aid and insurance in this context. A growing body of economic literature has explored informal insurance. Building on the pessimistic insights of Fafchamps (1992) and Coate and Ravallion (1994) about the viability of mutual insurance,[2] Ligon (1998) and Ligon, Thomas and Worrall (2002) and others have gone on to derive and test propositions about the limits to mutual insurance in the absence of moral norms that effectively compel the sharing and trustworthy behavior that would make mutual insurance commitments credible and effective. Empirical findings of incomplete insurance are interpreted to demonstrate the veracity of commitment constraints, private information, and, implicitly, the weakness of moral norms that might underwrite more ample mutual insurance.

This paper's approach is somewhat different. Rather than assume that people operate in a moral vacuum and then evaluate observed mutual insurance against theoretical benchmarks, this paper employs economic experiments to measure the degree to which altruism and trust shape people's economic behavior, and then explores the impact of such moral norms of on the efficacy of mutual insurance. This approach complements Foster and Rosenzweig (2001) who show that mutual aid and insurance is more effective within than between families, a result they attribute to intra-family altruism. By directly measuring altruism and trust, this paper is able to eschew universal assumptions of complete selfishness (or complete intra-family altruism) and is positioned to ask whether norms facilitate mutual insurance beyond the family. In addition, rather than exploring the impact of mutual insurance on coping with the immediate income impacts of shocks, this paper explores its effect on the asset recovery that shapes long term poverty and livelihood dynamics.

The chief findings of this paper are threefold. First, there is notable variation in the degree of altruism and trust in the Honduran communities where

[1] Among the sample of 850 rural Honduran households which will be studied here, only two reported receipt of insurance payments to offset Mitch-related damages (and the two cases were for medical costs covered by a health insurance plan). Bouyant capital markets could in principal substitute for these missing insurance markets. But again in rural Honduras, these markets are weak. Boucher, Barham and Carter (2004) report that only 20% of the sampled Honduran households had accessed capital through formal market channels, while 40% of the sample indicated that there were rationed out of that market by non-price mechanisms.

[2] The incentive problems of mutual insurance worsen when individuals can also self-insure by strategically builing up private buffer assets as Ligon *et al.* (2000) and Carter and Zimmerman (1993) show with dynamic programming analyses.

the experimental work was carried out. Econometric estimates indicate the presence of endogenous social effects which serve to reinforce these distinctive, community-based normative environments. Second, post-disaster asset growth and recovery regressions (which account for the endogeneity of norms) indicate that higher levels of altruism promote more rapid recovery from the shock of Hurricane Mitch. Indeed, the estimates indicate that absent these norms, recovery would be extremely modest. Third and finally, further exploration of the asset recovery relationship using quantile regressions reveals that mutual insurance mechanisms invigorated by norms work only for a small subset of the households. While demanding further analysis, this latter finding suggests that there may be a pattern of unequal access to socially mediated capital and insurance.

At the heart of the analysis is a suite of experimental economic games designed to measure the strength of norms of altruism and trust. As explained in Section 3 below, these games were implemented in mid-2002 in a random sample of communities which were part of a panel living standards study which had last visited those communities in 2001. The 2001 living standards study–which took place 30 months after Mitch–collected detailed retrospective data on the effects of the hurricane, as well as on current household assets. It is the marriage of this real living standards data with the experimental results which makes possible the analysis of the impact of altruism and trust on asset recovery.

The remainder of this paper is organized as follows. Section 2 lays out a framework for thinking about the economic anatomy of an environmental shock. After introducing the available living standards data, section 2 then uses the framework to organize the Honduran data and articulates the basic hypotheses to be tested using an asset growth and recovery framework. Section 3 describes the experimental protocol and presents the basic experimental data. Section 4 then puts forward a social interactions model of norms. An econometric strategy is then devised and implemented that permits the identification of endogenous social interactions that reenforce norms and also allows the unearthing of the pre-Mitch community norms that would have shaped subsequent recovery from the hurricane. Finally, section 5 explores the impact of the norms on recovery from Mitch, while section 6 concludes the paper.

2 Economic Anatomy of Hurricane Mitch

Figure 1 presents the stylized economic anatomy of an environmental shock from a household's perspective. The x-axis measures time and the y-axis measures asset stocks and income shocks. The time interval over which an environmental shock occurs could be very brief (as with a hurricane), or it could be an extended period (as in the case of a prolonged drought). Households can also be buffeted by a sequence of such events.

An environmental shock has two direct impacts. First, it may destroy assets (washing away land, killing livestock) by an amount Θ. In Figure 1, this first

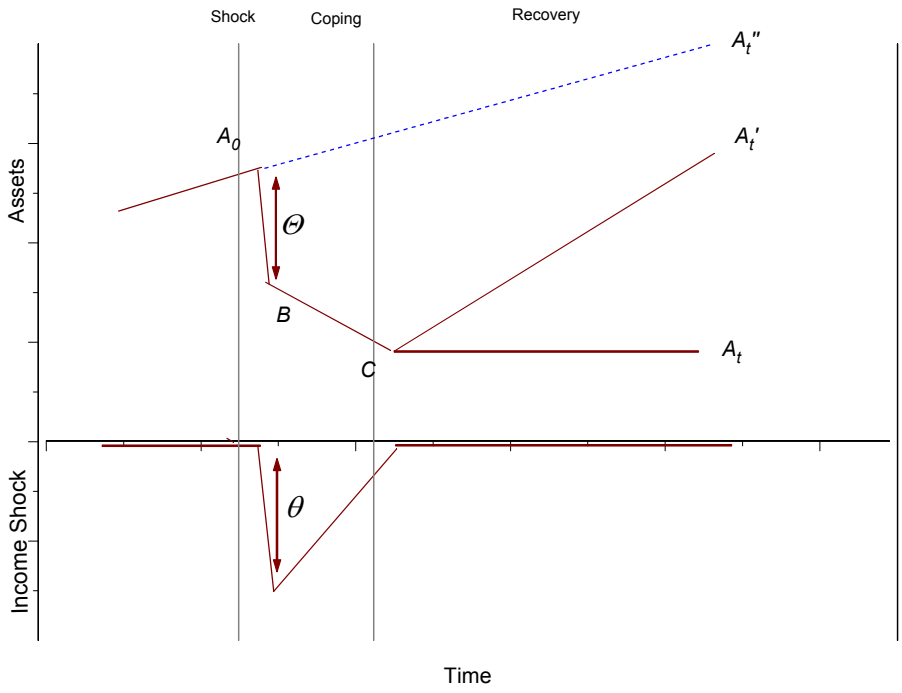

Figure 1:

impact is shown by the by the sudden interruption of the household's asset trajectory as its assets decline from point A_0 to point B. The second direct impact is that it reduces disposable household income below its normal level (crops fail or households suddenly must devote income to medical expenses). This deviation from normal disposable income levels is shown in the figure by the negative shock θ. Different environmental events will be characterized by distinctive patterns of asset and disposable income shocks.

Once the shock is realized, the household enters the coping period. During the coping period the household must deal with the shock to its disposable income. One coping strategy is to reduce expenditures. Another is to redirect or increase work time (reduce leisure). The effectiveness of this strategy will depend on access to labor markets. Households with good financial market access can borrow against future earnings to smooth current consumption, or draw down on insurance indemnity payments. Informal finance and insurance arrangements (perhaps underwritten by norms of trust or altruism) can play the

same role, as can receipt of disaster assistance. Finally, households can also cope by further drawing down on assets. This additional decline in household assets is shown in Figure 1 by the drop in assets from B to C. Note that two factors will shape the severity of this secondary asset decline. The first is simply the household's ability to employ the alternative coping strategies listed above. The second is changes in the prices of assets relative to the price of food and other necessities. Unfavorable asset price swings (as would be expected to happen if all households in an area respond to a drought by selling cattle) will serve to further decapitalize households in the wake of a shock. Mutual insurance can in principal prevent households from further decapitalizing themselves in this immediate post-shock coping period.

The third and final stage is termed the recovery phase in Figure 1. The market and social mechanisms that broker access to employment and financial services will also shape the post-shock asset trajectory. A household with good access to capital (via social or market mechanisms) can borrow against future earnings to immediately rebuild asset stocks. A key question is whether or not the household is able to rebuild its asset base (shown in Figure 1 as the movement from C to $A_t^{'}$), or whether it gets trapped at a low asset level (shown by the C to A_t trajectory). Note that point $A_t^{''}$ in Figure 1 indicates the asset level the household would have enjoyed had the environmental shock not occurred. Norms of altruism and trust that facilitate inter-temporal contracting could again be expected to bolster recovery.

2.1 Measuring the Effects of Hurricane Mitch

In 2001, 850 producer households were surveyed in 5 departments in Honduras regarding the 2000 agricultural year. This sample can be broken into two distinct sub-samples: panel and cross section. The panel households (500) originate from a study conducted in 1994 (Lopez and Valdes 2000) in which 450 farm households were interviewed to analyze the impacts of the initial land titling programs. The 2001 survey attempted to follow both these baseline households and the land they cultivated. Of the original baseline households, 362 were resurveyed. In addition, 138 "new" panel households were added. In 2000, these households were cultivating land that had been worked by the original panel households in 1994. The remaining 350 cross-sectional households were added in regions that were not covered in the 1994 study. The stratification process for this sub-sample was as follows. First, nine municipalities in three departments were non-randomly identified. Within each municipality, three towns (caserios) were randomly selected. A census of each town was conducted and used to classify households into 5 farm size categories. To ensure coverage across farm size, households were randomly drawn from each category.

In addition to standard income and asset data, the 2001 survey solicited detailed information on damages suffered during Hurricane Mitch, which hit Honduras in late October, 1998. Matching the concepts displayed in Figure 1, the data were aggregated into an asset shock measure (Θ, in the notation of Figure 1), and an income and expenditure shock (θ). Assets shocks include

the value of land washed away, permanent crops (primarily coffee plantations) destroyed, as well the value of livestock and machinery that were killed or destroyed. Income and expenditure shocks include the imputed net value of crops that were washed away, costs of medical expenses, lost off-farm earnings and reductions in remittances. Assets were priced using median values by geographic locale, and all the values of asset and income shocks were inflated to the price level at the time of the 2001 survey. Using the data, it was possible to construct measures of the total value of productive assets immediately before Mitch (A_0) and again at the time of the survey, some 30 months after Mitch (A_t). Measures of intermediate asset reductions that may have taken place during the coping period are not available.

Table 1 displays basic descriptive statistics on the Honduran household sample. Drawing on the experimental results (explained below), Table 1 divides households up into low, medium and high trust communities. A community's status as a low, medium or high trust area is based on behavior by community residents in the so-called trust game. Low trust communities are simply those in the lowest tercile of the trust distribution, with similar definitions used for medium and high trust communities. In low trust communities, the average participant in the trust game entrusted 37% of his or her experimental budget endowment to an unknown trustee who was under no obligation to return any of it.[3] The average budget share sent away in medium trust communities was 48%, while it was 62% in high trust communities. Low trust communities also exhibit lower levels of altruism–as evidenced by play in a dictator game–then do medium and high trust communities.[4]

For each of these community types, table 1 displays basic information on loss and recovery from Hurricane Mitch. Data on households that suffered productive assets losses (which range from 46% to 59% of all households) are shown separately from data on households that did not suffer losses of productive assets. As the degree of loss is highly variable (and skewed), both median and mean values are shown for key indicators.

For those households suffering loss of productive assets, the median loss varies from about 7500 to 13,000 Lempira across the three types of communities. Mean values are about three times higher than the median. To help place these figures in perspective, median (mean) household income in this sample was 13,500 (30,200) Lempira in 2001. Median income loss ranged from 0 to 2700 Lempira, while mean losses ranged from roughly 6,000 to 9,000 Lempira.

Households that did not suffer productive asset losses still in many instances suffered income losses, as the lower half of the Table 1 shows.[5] Over the 30

[3] As explained below, in our trust game, any money snet by the "trustee" to the "trustor" was tripled. The trustor who received the tripled funds had the option of returning any amount of the funds received to the trustee. The idea of course is that in communities with greater levels of trust, trustors will be more confident that funds will be returned to them and hence they will sned larger budget shares to trustees.

[4] The dictator game is similiar to the trust game except that the person to whom funds are sent is unable to return any funds to the sender. Amounts sent in the dictator game can be thus taken as an indicator of the degree of altruism within a community.

[5] Some of these housholds alos suffered loss of housing stock. These values have not been

Table 1: Descriptive Statistics on Loss and Recovery
Median [Mean] Values

	Community Type		
	Low Trust	*Medium Trust*	*High Trust*
Community Characteristics			
Households with Losses	46%	51%	59%
Altruism Budget Shares	28%	42%	53%
Trust Budget Shares	37%	48%	62%
Households with Losses			
Productive Asset Loss*	12,786 [39,579]	7421 [23,872]	12,283 [43,3121]
Income Loss*	2656 [9054]	0 [6978]	1847 [5835]
External Aid Received*	0 [770]	0 [266]	0 [604]
Pre-Mitch Assets*	343,197	110,394	316,807
Recovery (% growth)	-3.6%	-8.5%	-1.0%
Households without Losses			
Income Loss*	0 [1351]	0 [2124]	0 [908]
External Aid Received*	0 [104]	0 [451]	0 [172]
Pre-Mitch Assets*	83,930	46,060	88,310
Post-Mitch Asset Growth	5.7%	4.5%	7.4%
2001 Annual Household Income		13,500 [30,200]	

* Monetary value in Lempiras (~17 Lempira = 1 $US)

month following Mitch, the stock of productive assets held by these households grew between 4.5 and 7.5% in real terms. These growth rates are roughly 10 percentage points higher than the -9% to -1% asset growth experienced by the households that had suffered losses. As shown in Table 1, 30 months after Mitch, the median household that had suffered an asset loss had still not fully recovered to their pre-Mitch level. In high trust communities, the median household has almost recovered as 2001 assets were only 1% below pre-Mitch asset levels. The corresponding figure for low and medium trust communities are 4.5% and 7.5%, respectively.

It is of course tempting to take this descriptive data as evidence that norms of altruism and trust indeed facilitate coping with environmental shocks. However, norms themselves are part of a broader social process. Among other things, the occurrence of a shock may itself enhance (or dampen) norms. Interestingly, the high trust communities are also those communities where more households suffered losses and where losses were themselves highest. In addition, norms may themselves be the product of a variety of contextual factors, including the economic health and history of a community. Devising a strategy to identify the portion of norms that is independent of these contextual factors is the topic of Section 3 below

included in the measures of asset losses as available data do not permit calculation of pre-Mitch housing values.

2.2 A Model of Asset Growth

The following model of asset growth will be used to analyze the Honduran data:

$$A_{i0} = A_{it} e^{r(z_i, \Theta_i, \theta_i, \beta_{g(i)}) + \upsilon_i}, \qquad (1)$$

where A_{it} is asset stock of household i at the end of the 30 month recovery period, A_{i0} is the pre-Mitch asset level, and the function $r(z_{it})$ is the 30 month rate of change (growth or contraction) of the asset stock expressed as a function of household characteristics (z_i), shocks received (Θ_i and θ_i), and the norms of altruism and trust of household i's community group, $\beta_{g(i)}$. The error term, ε_i captures unobserved factors that also affect the rate of change of assets. Taking logs and rearranging terms yields:

$$\ln(A_{i0}/A_{it}) = r(z_i, \Theta_i, \theta_i, \beta_{g(i)}) + \upsilon_i. \qquad (2)$$

The key hypothesis to be investigated with (2) is whether a more favorable normative environment influences the growth rate of assets directly and by dampening the impacts of shocks. However, in order to estimate this equation, two tasks must be solved. First, norms must be measured, and second, we must find a way to account for their endogeneity so that credible inference concerning their impact on asset recovery and growth can be inferred.

3 Experimental Measurement of Altruism and Trust

This section reviews the experimental protocol devised to measure norms of altruism and trust in Honduran communities for which we have loss and recovery data from Hurricane Mitch. After presenting that experimental procedure and basic descriptive statistical results, the next section will consider how to model norms as a social and economic phenomena.

3.1 Experimental Procedures

Experiments were based on modified versions of the Dictator game (Forsythe et al., 1995) and the Trust game (Berg, Dickhaut, and McCabe, 1996). In the Dictator game, the proposer (or dictator) was endowed with an amount of cash that he had to decide to keep or share with an individual without an endowment. Each unit passed to the other was tripled before reaching the other person. In the Trust game, the proposer (the trustor) was also endowed with an amount of cash that he had to decide to keep or share with an individual without an endowment. The receiver of the tripled amount in the Trust game (the trustee) had the opportunity to send back none, part or all the amount received. Because amounts sent by both dictators and trustor was tripled, the effective cost of giving money was the same in both games and equal to one third.

Both dictator and trust games were played with complete anonymity. The games were also one-shot affairs, played with repetition and reputation. In their analysis of a similar experimental protocol in South Africa, Carter and Castillo (2003) argue that this game structure should permit the recovery of durable moral norms that characterize decisions that are not directly affected by considerations of punishment, reputation or future strategic advantage. Moreover, because the games were played in long-standing communities (as opposed to the temporary and somewhat artificial social environment of a university campus), they should pick up characteristics of real social interactions in those communities.

These experiments were implemented in 31 separate Honduran communities. These communities were originally selected at random from a sample of communities studied in 1994 and 2001. One in seven of our experimental subjects were recruited from the respondents to these surveys, while the others were selected from other families in the same communities. Not more than one participant per household was allowed. All the participants were of 18 years of age or more and they were not told about experimental payments at the time of recruitment. The average age of participants was 41 years old, with 3 out of 5 being male. 25% of the sample was at least 50 years of age and 25% was at most 31 years of age. Twenty five percent of participants had at most 5 years of education and 25% of them had at least 6 years of schooling. On average, there were 24 subjects per session. Two sessions were smaller (16 participants), and three sessions were larger (32 participants). All participants in each session belonged to the same community or neighborhood. On average, participants knew 88% of the people in the session by name. The average payment to a participant in the experiment was 90 Lempira (or around $5), which amounts to two-days wage in rural areas. Recruitment of participants was made with the help of local leaders. In particular, school principals, and, occasionally, the president of the local council (the *patronato*). They were asked to recruit adults among families of different backgrounds.

Before the experiment, participants were given numbers at random. These numbers were used to divide people into groups and to assign experimental treatments at random. Subjects were divided into 3 rooms. In most cases, we had three school classrooms at our disposal, and only in two occasions did we need to accommodate people in different areas. Two rooms contained a quarter of participants each and a third contained the remaining half of participants. The third group was further divided into two.

The rooms containing a quarter of participants each were labeled room A and room B. Room C contained the remaining 50% of subjects. In room A, people played the Dictator game first and the Trust game second. In room B, people played the trust game first and the dictator game second. The endowment for the Dictator game was 40 Lempiras ($2.5) and the endowment for the Trust game was 50 Lempiras ($3.1). Each Lempira sent to the other room was tripled in both games. In all rooms, instructions were read out loud, and then a series of questions were asked to make sure that the games were clear. In room B, participants were asked to make their decisions as dictators before the

trustees' decisions were revealed. In this way, we avoided influencing choices as dictator by trustees' actions. In rooms A and B, subjects were told that two different persons in room C were going to receive the first and second envelope sent by them. Moreover, it was made clear that a participant could be either a sender or a receiver, but not both. To make sure that different receivers did not receive envelopes from the same person, room C was divided in two sections. One section received the dictator's envelopes sent by room A and the trustor's envelopes sent by room B, and the other section received the dictator's envelopes sent by room B and the trustor's envelopes sent by room A. Sessions were run simultaneously. Finally, a post experiment questionnaire was applied to collect background information on participants and their social organizations and networks.

3.2 Experimental Results

Table 1 reports the summary statistics on the experiments. Participants sent around 40% of their endowment in the Dictator game, 50% in the Trust game, and returned around 40% as trustees. Note of course that the Nash equilibria for all these decisions–assuming purely selfish players–are zero budget shares. While obviously high compared to this selfish benchmark, these shares are also higher than those commonly found in experiments with college students (Forsythe et al, 1994; Eckel et al, 1996). The dictator share is especially remarkable given that amounts sent by dictators were tripled, meaning that dictators who sent 40% of their endowments ending up allocating 54 Lempiras to their receiver and keeping only 24 Lempiras for themselves. However, results from both games are consistent with previous results with non-college students (see Camilo Cardenas et al (2003) for a survey). All decisions presented a high degree of variability. This variability is present at the community level also; the lowest average share passed in the Dictator game was 22% and the highest was 69%, and the lowest average share passed in the Trust game was 26% and the highest was 67%.

Decisions across games are correlated at the individual level as well at the community level. For instance, the correlation between decisions made as dictator and as trustor equals 53%. Interestingly, this correlation is strongest in the Dictator-Trust sessions (63%) than in the Trust-Dictator sessions (44%). As found by Haurbaugh et al. (2000), the order in which decisions are made also seems to matter.

The fact that decisions are correlated across games points to the potential ambiguities in the interpretation of the results of these games. While the dictator game results stand as an easily defensible measure of an individual's willingness to unconditionally (or altruistically) share good fortune, Cox (2002), for example, has suggested that any measure of trust elicited from games like ours must consider the fact that people are willing to reach very unequal distributions even without expecting any money in return (as in our dictator games). In their analysis of similar experiments in South Africa, Carter and Castillo (2003) that amounts sent by trustors and trustees in the trust game will con-

Table 2
Descriptive Statistics for Shares Sent and Returned

	Dictator	Trustor	Trustee
N	389	389	369
Mean	42%	49%	42%
St. Deviation	29%	29%	30%
Correlations at the Individual Level			
Dictator vs. Trustor		0.53*	
Correlations at the Community Level			
Dictator vs. Trustor		0.77*	
Dictator vs. Trustee		0.37*	
Trustor vs. Trustee		0.30	

* significant at 10% level

flate the impact of both altruism and pure norms of trust and, or reciprocity. While Carter and Castillo go some distance in showing how norms of trust and reciprocity can be recovered by combining play in both dictator and trust games, we will here content ourselves to note that the gross trust measure (defined as budget shares sent in the trust game) is a noisy measure of the norm of interest. Later regression analysis will include both measures in an effort to control for the distinctive components of information captured by each.

In addition to correlation at the individual level, we also find significative correlations between decisions at the community level. Decisions as dictator and as trustor, and as dictator and trustee, are positively and significantly correlated at the community level. Dictator and trustees decisions were made independently and in separate rooms. Moreover, decisions by dictators and trustees are non-strategic, they face no responders and they cannot affect the behavior of future game partners. Since we find that behavior at the community level is correlated even when no interactions are permitted, this shows that experimental data must be capturing factors other than a game equilibrium. While the analysis in the next section will more deeply probe the existence of distinctive community normative environments, this descriptive evidence is consistent with the notion of a common set of norms and expectations that shape economic behavior and relations between community members.

4 A Social Interactions Model of Altruism and Trust

The economic experiments described in the prior section were designed to capture durable moral norms that shape and constrain real economic behavior. However, norms do not emerge from a vacuum, and are likely influenced by social and economic characteristics of both individuals and communities. Prior to estimating the impact of altruism and trust on economic recovery from Hur-

ricane Mitch, we must first account for the endogeneity of norms and devise an estimation strategy that identifies the structural impact of norms shorn of simultaneity and other biases. The approach put forward in this section follows Manski (1993, 1996), Durlauf (2002) and Graham and Hahn (2003) and relies on a linear social interactions model of norms. In addition to laying the foundation for testing the impact of norms on economic recovery, our approach permits us to test the degree to which norms are self-reinforcing within communities. Evidence of such a reenforcement effect would indicate that communities constitute distinctive normative environments such that it is meaningful to discuss more versus less altruistic communities.

4.1 Modeling Norms

Consider the following model of individual j's norm of altruism:[6]

$$\beta_j = [z_j b_1 + \varepsilon_j b_2] + \overline{z}'_{g(j)} d + \overline{\beta}_{g(j)} c + u_j, \tag{3}$$

where β_j measures the individual's altruism, and the $g(j)$ subscript denotes the social reference group or community of individual j. Four types of factors are hypothesized to influence j's norms. First, the terms in the square brackets capture individual characteristics and experiences that shape j's altruism. We partition these factors into two components. The first component, denoted z_j, includes factors that affect j's altruism and also *directly* affect the altruism of other community members because they may influence the other's gains from being altruistic. An example of such a factor might be the extent of i's economic connectedness (*e.g.*, ability to secure employment for others). Such connectedness may increase j's altruism as well as the incentives for others to be recognized as good, contributing altruistic community members. The second component in the square brackets, ε_j, captures private norm shocks that effect j's altruism, but do not directly affect the altruism of others. Symmetrically, private norm shocks experienced by other individuals do not directly influence the norms of j. Examples of ε_j include parental values and influences that shape j's morals, but do not directly affect others. The existence of such private norm shocks will be key to the econometric identification strategy developed here.

The second component in the model, $\overline{z}_{g(j)}$, measures average characteristics of the members of j's social group. Just as j's characteristics may shape incentives for others to act in more or less altruistic fashion, so group characteristics may shape j's norms. In Manski's (1993) language, the parameter d measures contextual, or exogenous social effects.

The third component in (3) is the average of typical level of altruism exhibited by members of j's community group, denoted $\overline{\beta}_{g(j)}$. A positive and significant influence of community norms on j's behavior ($c > 0$) would indicate that altruism is self-reenforcing within communities. A value of $c > 0$ implies that an individual matches or mimics the norms of other community members,

[6] A symmetric discussion applies to trust norms as well.

controlling for individual and contextual factors. In Manski's language, a positive value of c signals the presence of endogenous social effects. The fourth and final component in (3) is u_j, captures unobservable factors that affect j's altruism. While we scale u_j so that its unconditional expectation is zero, it may be correlated across individuals within the community.

The econometric difficulty confronting the analysis of norms can best be appreciated by considering the implications of (3) for the average or typical level of altruism in a community. Assuming that every community members' altruism is shaped by the analogue to (3), following Manski (1993) we can solve for the equilibrium expected community norm as:

$$\overline{\beta}_{g(j)} = \frac{b_1 + d}{1 - c}\overline{z}_{g(j)} + \frac{b_2}{1 - c}\overline{\varepsilon}_{g(j)} + \frac{\overline{u}_{g(j)}}{1 - c}. \tag{4}$$

As can be seen from (4), community norms of altruism will depend on both observed contextual factors, $\overline{z}_{g(j)}$, and any correlated unobservables measured by the $\overline{u}_{g(j)}$.[7] To the extent that any of these contextual factors directly influence economic recovery after a shock, simple inclusion of the community level norm in the recovery regression (2) will conflate the influence of these factors with the influence of the norm itself. Clearly this is most problematic in the case of correlated unobservables.

In addition, (4) makes clear that simply including community altruism, $\overline{\beta}_{g(j)}$,as an explanatory variable in an ordinary least squares regression of the individual altruism, β_j, will not identify the endogenous social effects parameter, c. As can be seen from (4), even if $c = 0$, β_j will be correlated with $\overline{\beta}_{g(j)}$. Like the effort to identify the impact of norms on economic recovery, identification of endogenous social effects and the presence of community norm reinforcement requires an estimation strategy that accounts for the endogeneity of norms.

4.2 Econometric Estimates of Community Norms and Endogenous Social Interactions

In an effort to resolve these econometric problems, this section implements a two-stage approach, first estimating the determinants of community norms, and then using the instrumented value of community norms to estimate parameters in equations (2) and (3). As Durlauf (2002) has shown, identification of the impact of social variables like norms on economic outcomes requires instrumental variables that affect individual behavior, but are not themselves contextual variables. Private norm shocks–the ε_j in equation (3)–compromise one type of valid instruments for this purpose. Community social characteristics, which are unrelated to the current context which shape economic interactions, are another.

Table 3 shows the first stage community norm regressions. Identical specifications were used for both altruism and trust, with the community average

[7] Note that if the unobservables were uncorrelated across individuals, then $\overline{u}_{g(j)}$ would equal zero in expectation.

Table 3
First Stage Community Norm Regressions (N=30)

	Altruism	*Trust*
	(Dictator Budget Share)	(Trustor Budget Share)
Private Norm Shocks		
Parents' Lands Wealth (Median)	0.008 (0.00)	0.003 (0.13)
Community Characteristics		
Std. Deviation of Parental Wealth	-0.0004 (0.02)	-0.0003 (0.04)
Average Age (Census 2001)	-0.05 (0.00)	-0.019 (0.17)
Percentage of Men (Census 2001)	-0.92 (0.14)	-1.63 (0.01)
Education Level (Census 2001)	0.28 (0.00)	0.19 (0.02)
1=Urban, 0=Rural	-0.15 (0.02)	-0.13 (0.02)
% of Households with Losses during Mitch	0.20 (0.07)	0.10 (0.28)
Constant	2.05 (0.00)	1.66 (0.00)
Adj-R^2	0.5536	0.4260

p-values in parentheses

amount sent in each game treated as the dependent variable. Parents' land wealth is included as a private norm shock variable on the grounds that parents' wealth and attitudes directly shape only the norms of their own children. Parent land wealth should also be uncorrelated with current economic outcomes. In addition to this private, norm-shaping variable, a number of community variables–also assumed to be unrelated to current economic outcomes–were included. The standard deviation of the parental wealth variable was included as a measure of the diversity of community backgrounds. In addition, three measures from the 2001 Honduran census (which took place a year before our experiments) were included: the average age of community members over 18 years of age; the proportion of men in the community; and, the average level of education. While the demographic characteristics of the people participating in our experiment are likely correlated with the current economic circumstances of the community, we expect that census data represents more permanent feature of the community. Finally, we include the percentage of households that suffered housing losses from Mitch to see if such environmental shocks themselves directly influence the evolution of norms.

The estimation results in Table 3 are sensible. Parental wealth is estimated to positively influences both altruism and trust, though only the former is statistically significant. Communities with older and more educated members tend to be more altruistic and trusting. Urban communities have a harder time building trust, perhaps due to the less personal nature of relationships. It is interesting to notice that behavior in the Dictator game seems to be more sensitive to factors affecting income. But trust and altruism are equally and negatively affected by the inequalities of community's member's backgrounds. The result on the proportion of males is more difficult to interpret. One possibility is that communities with larger proportion of men are more conflictive.

Another possibility is that communities with a larger proportion of men are communities with larger portion of new population. Heterogeneity in the population would explain the lower levels of trust. Indeed, regression analysis of census data at the community level indicates that communities with larger proportion of men tend to be communities with larger proportion of non-locally born people. Finally, note that proportion of households that suffered housing losses from Hurricane Mitch has a significant (at the 10% level) effect on altruism. While this shock is exogenous to the community, this impact of hurricane damage on norms threatens to create a (perhaps negative) spurious correlation between norms and economic recovery. This result suggests that it is important to try to unearth the norm levels that existed prior to Mitch. In the analysis of economic recovery in the next section, this Mitch loss variable will be eliminated from the set of instruments used to predict community norm levels for the recovery regression.

The first stage regressions reported in Table 3 could in principal used to create instrumental variables estimates of community norms, the $\overline{\beta}_{g(j)}$, to estimate (3) and identify endogenous social effects. However, to further increase confidence in our identification strategy, we exploited the fact that our experimental design implemented simultaneous experimental sessions, yielding two measures of altruism and trust for each community. In order to avoid spurious correlation between individual and group behavior that may be induced by unobserved session-level experiment effects, the analysis of endogenous social interactions will use an instrumented measure of expected behavior based on the behavior in the alternate experimental session in the same community. This procedure eliminates any impact due to the existence of session level correlated unobservables or endogenous social interactions at the experimental session level. Results of these regressions, which followed the same specification as shown in Table 3, are available from the authors.

To test for endogenous social effects, we then estimated (3), replacing the actual community norm with the instrumental variable estimate generated by this modified procedure. Table 4 presents the results from this second state regression. Measures for community characteristics are the same as in the first stage regression in Table 3. We cannot include the individual norm shock measure as that variable was available only for experimental participants who were also included in the income and expenditure survey.

As can be seen in Table 4, in both Dictator and Trust games, the behavior of others is estimated to strongly and significantly affect individual behavior.[8] While this result signals the presence of strong endogenous social effects and community norm reenforcement, a caveat is in order. Insufficient control for unobservable factors at the community level could imply that our measures of community norms might be capturing community level characteristics not asso-

[8] Using a panel data analogue method, Castillo and Carter (2003) show evidence consistent with the existence of endogenous social interactions at the session level in the experimental data used in this paper. The existence of social interactions at the session level indicates the possible mechanism giving origin to norms. Unfortunately, this methodology cannot identify effects at the community level, which is the purpose of this section.

Table 4
Second Stage Estimate of Social Interactions

	Altruism	*Trust*
Endogenous Social Effect		
Instrumented Community Norm	0.36 (0.00)	0.38 (0.01)
Individual Level Variables		
Socioeconomic Status		
Age	0.002 (0.16)	0.001 (0.37)
1=Men, 0=Woman	0.01 (0.77)	-0.03 (0.30)
Education Level	0.02 (0.32)	0.01 (0.67)
Market Dependency	-0.030 (0.12)	0.005 (0.77)
1=Evangelical, 0=Other	-0.030 (0.50)	0.015 (0.72)
Social Capital		
Familiarity With Participants	0.097 (0.20)	0.16 (0.03)
Trust in Others	0.026 (0.15)	0.06 (0.00)
Community Variables		
Age	-0.003 (0.43)	0.001 (0.67)
1=Men, 0=Woman	0.030 (0.24)	0.05 (0.07)
Education Level	-0.0001 (0.99)	0.004 (0.88)
Market Dependency	0.009 (0.77)	-0.07 (0.02)
1=Evangelical,0=Other	-0.14 (0.12)	0.013 (0.88)
Social Capital		
Familiarity With Participants	0.18 (0.26)	-0.03 (0.84)
Trust in Others	0.05 (0.20)	0.034 (0.36)
Experimental Treatment		
1=Dictator Game 1st, 0=otherwise	-0.02 (0.56)	-0.10 (0.02)
Constant	-0.09 (0.68)	0.03 (0.89)
Adj-R^2	0.08	0.09

p-values in parentheses

ciated to norms *per se*. Despite this caveat, it is remarkable that the predicted behavior of people in different experimental session but in the same community might be at all related to individual behavior. This indicates that experiments do capture important information about communities, even if we cannot precisely pin down its origin. In any event, our identification strategy and choice of instruments reduces the effect of contemporaneous shocks on norms. The next sections shows the impact of the strength of social norms on economic recovery.

5 The Impact of Norms on Recovery

The direct, experimental measurement of norm of altruism and trust, and the statistical confirmation that these measures capture systematic, self-reinforcing behavioral patterns within communities, permits us now to ask whether these

norms bolster the effectiveness of informal financial mechanisms that provide insurance and capital. Table 5 displays regression results for equation (2), the rate of post-Mitch asset growth and recovery. The growth rate has been specified to be a function of the asset and income-expenditure shocks, where each of these has been normalized by the pre-Mitch level of assets. Shocks are measured as positive values (larger loss implies a larger positive value). A negative coefficient on a shock variable would thus indicate that the household had been unable to neutralize or fully recover from the shock. External aid, again normalized by the size of pre-Mitch value of assets, is also included in the regression. While much of the aid received was simply short term consumption assistance, positive coefficients on aid would indicate that aid facilitated asset recovery (or perhaps prevented further asset alienation during the post-shock coping period).

Also included in the regressions is an instrumented community norm measure based on the analysis in the prior section. Table 5 presents results only using the dictator game budget share measure of altruism, instrumented with the pre-Mitch instrument set.[9] As discussed above, this measure is meant to capture the pre-Mitch level of community altruism. This norm measure was entered directly into the regression as a factor that shifts the growth rate. It was also interacted with the asset shock variables to see if altruism effectively dampens the impact of the shocks on asset recovery.

In addition, the regressions included as control variables household characteristics which might be expected to influence the post-Mitch asset growth rate. These variables included age and age-squared of the household head (to capture lifecycle patterns) as well as the education and sex of the household head. Department level dummy variables were also included to control for basic market access and agro-ecological possibilities. Table 5 does not report the estimates of these control variables to eliminate clutter. Exclusion or modification of the control variable has little impact on the estimated coefficients for the variables of interest.

The left-most column in Table 5 presents the ordinary least squares estimates of the full model with altruism entered directly and interacted with asset and income shocks. Asset and income shocks have the expected negative sign, but are not statistically significant at conventional levels. Altruism has an estimated positive and significant impact on post-Mitch asset growth, and is also estimated to dampen the impact of asset shocks on growth. Surprisingly, the interaction between altruism and income shocks has the opposite sign of that which was expected.

The strong collinearity between asset and income shocks, it is difficult to identify all the parameters in the full model. The second column in Table 5 reports a simplified OLS regression which eliminates the interaction between altruism and the shock variables. All the variables are statistically significant in the short regression. The variables are scaled such that an increase in the

[9] Given the strong corellation between trust and altruism in the experiments, repetition of the analysis with instrumented trust yielded similar results but with a loss statistical significance.

Table 5
Second Stage Asset Recovery Regressions

			Quantile Regressions		
	OLS	OLS	25^{th}	Median	75^{th}
Shocks and Aid					
Asset Shock	-.57 (.22)	-.85 (.00)	-1.2 (.00)	-1.2 (.00)	-1.6 (.00)
Income Shock	-.06 (.64)	.47 (.00)	.10 (.80)	.78 (.10)	.91 (.02)
External Aid	.81 (.00)	.74 (.00)	.20 (.68)	.91 (.00)	1.0 (.00)
*Community Norms**					
Altruism	.8 (.05)	1.1 (.00)	.01 (.96)	.23 (.17)	.86 (.00)
Altruism x Asset Shock	-2.3 (.12)	-	-	-	-
Altruism x Income Shock	2.6 (.00)				
Constant	.32 (.05)	.78 (.04)	.15 (.49)	.34 (.25)	1.3 (.00)
Control Variables			Included		
R^2	.32	.26	.10	.11	.21
Observations			323		

p-values in parentheses
*Instrumented and purged of the effects of Mitch

assets lost by 10 percentage points decreases the 30 month, post-Mitch growth and recovery rate by 8.5 percentage points, indicating minimal recovery absent offsetting influences. By itself, this estimate signals the weakness of financial market-based responses to the shock.

Several factors, however, are estimated to be able to countermand the lingering impact of the shock. Higher levels of community altruism significantly bolster the recovery rate as every 10 percentage point increase in the budget share boosts the asset recovery rate by a hefty 1.1 percentage points. It is worth reiterating that this estimate comes from a norm measure that has been instrumented using parental characteristics and pre-determined demographic features of communities. This estimated effect is striking evidence that when underwritten by pro-social norms, informal financial arrangements can play a large role in rebuilding stocks in the wake of a major environmental shock.

External aid flows also show a strong and positive effect on asset recovery. While total aid in-flows were modest compared to asset losses (see section 2 above), the estimated coefficient indicates that disaster assistance was very effective in protecting and rebuilding households' productive asset base. This finding is especially striking given that much of the aid inflow was packaged as short-term consumption aid. Surprisingly, the short OLS regression estimates that the income and expenditure shock positively affects asset recovery and growth. While thes shocks have been normalized by pre-Mitch assets, it may well be that the largest shocks occurred when households were specialized in high value plantation crops. Because these households might also enjoy best access to formal capital markets, it may be that the positive coefficient on income shock is picking up the positive impact of access to capital on asset recovery and growth. Future work will explore this issue further.

While these results confirm the importance of local social norms in assisting growth and recovery, in prior work (Carter and Castillo, 2003) we have argued that work on norms and social capital needs to pay more careful attention to the rules of inclusion and exclusion in social processes. To explore whether or not mutual insurance works better for some households than others, we ran a suite of quantile regressions for the short regression specification. The results, shown in Table 5 are striking. As expected, the constant term increases as we move up the regression quantile. The coefficient on asset shocks is also stable across the regression quantiles.

In contrast, the coefficient on community altruism is very unstable (and statistically different) across regression quantiles. As the quantile results demonstrate, the significance and magnitude of the coefficient on altruism is driven by the upper quantiles of the regression error distribution. In the regression for the 25^{th} quantile, community altruism has no impact of either economic or statistical significance. Even at the median regression, the altruism's effect is still small and insignificant at conventional levels. However, at the 75^{th} quantile, altruism's effect has become large and significant. These quantile results imply that norms are working very well for households that do better than expected (in a regression sense). By contrast, the access to resources that can be brokered by trust and altruism within a community appears not to work at all for the subset that fares poorly.

There are at least two possible explanations for this result, one at the community and one at the individual household level. At the community level, it may be that norms only become effective once they pass a critical threshold level. In this case, it may be that it is only when altruism is high enough that households are able to sustain relationships of mutual insurance and capitalization. The alternative explanation at the household level is that the quantile results signal that unequal access to mutual insurance is very much part of the story of disaster management and coping. While these quantile results are purely empiricist, future work will try to impose more structure on the problem in an effort to identify axes of inclusion and exclusion and, or threshold effects of altruism.

6 Conclusions

The damage wrought by Hurricane Mitch, which struck Honduras in late 1998, was substantial. Econometric results indicate that a households left in social isolation would have been unable to rebuild their asset stocks. This finding reflects both the lower overall wealth of the studied households as well as the weakness of financial markets. However, norm measures, derived from a set of economic experiments carried out in the communities on which we have asset loss and recovery data, indicate that when trust and altruism are high, the impact of shocks is significantly dampened. These results flow from a regression strategy that attempts to account for the endogeneity of norms, and thus should not be the result of a spurious relationship between norms and economic possibilities.

Moreover, analysis of norms through the lens of a social interactions model reveals the presence of endogenous social effects, meaning that community norm levels tend to self-reinforcing.

Finally, while these results offer evidence that moral norms can enhance the effectiveness of mutual insurance, they do not resolve the thorny question of inclusion and exclusion within communities. Quantile regressions offer a first look at this question and find that trust and altruism work best for only a subset of communities or individuals within communities. While further work is needed to tease apart this heterogeneous effect, the results presented here do indicate that while mutual insurance underwritten by altruistic norms offer the basis for substantial self-help even in the face of an environmental shock, social and market isolation, and ineffective risk coping, is a reality for many households.

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