Limitation of Quasi-Credit as Mutual Insurance:

Coping Strategies for Covariate Shocks in Bangladesh[i]

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Abstract

This paper investigates the difference in risk coping strategies between aggregate and idiosyncratic shocks. Previous studies focus on quasi-credit—the credit among community members—as a major strategy for consumption smoothing. However, quasi-credit is not helpful to overcome the community-level aggregate shocks. This paper aims to clarify the coping strategy for aggregate shocks using evidence from the huge historical flood in Bangladesh in 1998. The empirical analysis shows that under severe aggregate shocks, people borrow from informal money lenders or surrender livestock assets, while quasi-credit is available only for idiosyncratic shocks.

JEL classification: E21; E26; O12; O16; O53

Keywords: Risk coping strategy; Covariate shocks; Quasi-credit; Bangladesh

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1. Introduction

People face various risks in their lives (World Bank 2001). Natural disasters, in particular, are the most terrible ones. The great historic hurricane "Katrina," for example, hit the United States in 2005. The huge tidal wave—"Tsunami"—that was caused by an earthquake affected the Asians in 2004; it killed 165,230 people worldwide (Asian Development Bank, United Nations, and World Bank 2005)[iii]. Bangladesh is also a country of natural disaster; the flood in 1988, 1998 and 2004 affected the economy of country (Ninno et al. 2001).

Although natural disasters occur worldwide, the impact on the livelihood of people varies in each country according to the accessibility to the credit and insurance markets. People in the developing world have a limited access to formal credit and insurance markets.

Therefore, people from the Third World resort to various risk coping strategies in order to ensure sustainable livelihood[iv]. Within the context of risk coping strategies, loan contracts among geographical or blood-relationship community members without collateral or interest, referred to as quasi-credit or reciprocal credit, occupy a major part of the literature (Platteau and Abraham 1987; Udry 1994; Fafchamps and Lund 2003). Quasi-credit functions as an informal mutual insurance. However, the credit within the geographical community is available only for idiosyncratic shocks (Fafchamps and Lund 2003). Natural disasters affect most of the community members, and the characteristic makes it difficult for people to cope with calamities by using quasi-credit.

[iii] The information is as of January 9, 2005. Sample countries include Sri Lanka, Indonesia, Maldives, Thailand, India, Malaysia, Myanmar, and Bangladesh.

[iv] There exist a number of literature accumulations (Morduch 1995; Townsend 1995; Besley 1995; Hoogeveen 2001; Dercon 2002; Fafchamps 2003).

The first motivation of this paper is related to the limited availability of quasi-credit. Most of the previous studies investigate the impact of idiosyncratic income fluctuation. However, it is essential to understand the impact of idiosyncratic and covariate shocks separately (Skoufias 2003).

The second motivation of this study concerns the risk coping strategy choice. People living in rural areas do not necessarily utilize a single consumption smoothing mechanism. Instead, they combine multiple strategies depending on the household and shock characteristics. However, as Rosenzweig (2001) points out, few researchers conduct studies from this viewpoint.

Following these motivations, this paper aims to clarify the difference in risk coping strategies between idiosyncratic and covariate shocks. In particular, we are interested in credit source choice. People in developing countries borrow from a broad range of sources. Each credit donor offers a different credit contract[v]. Therefore, a study targeting the credit source choice is fruitful in understanding the saving behavior in rural areas.

This paper focuses on the case study of the huge historic flood in Bangladesh. Bangladesh is a flood-prone country. The flood in 1998 particularly covered 68% of the entire area in Bangladesh and affected the household income, assets, health conditions as well as infrastructure (International Food Policy Research Institute 2004). In order to

[v] For example, money lenders request high interest rates. Collateral and bribe payment are required in order to borrow from government banks. Although microcredit requires neither collateral nor high interest, the members have to repay every week (Kandkher 1998; Morduch 1999; Aghion and Morduch 2005). Although they can borrow from relatives and neighbors without interest, the neighborhood network is not useful to cope with geographical covariate shocks (Fafchamps and Lund 2003). In contrast, people can avail of credits from their network of remote relatives under the situation (Rosenzweig 1988).

achieve this purpose, this paper employs the longitudinal data set collected by the International Food Policy Research Institute (IFPRI). A distinctive property of this data set is the abundant information on the severity of the flood and risk coping strategies. The other property is that the sample data pertains to more than one hundred villages surveyed from widely scattered areas. These characteristics enable us to capture the effect of aggregate shock and achieve the purpose of the study.

The empirical analysis based on the case study shows that under severe aggregate shocks, people borrow from informal money lenders or surrender livestock assets, while quasi-credit is available only for idiosyncratic shocks. The decline of livestock implies the loss of future agricultural income, and the dependency on the money lenders causes the people to bear the burden of repayment. Such strategies burden their future livelihood. Therefore, the government needs to provide emergency programs, particularly for the severely affected communities. A series of findings support the policy implementation through geographical targeting.

Our concern is similar to that of Park (2006), which uses Bangladeshi evidence to investigate the risk-sharing and risk coping strategies when risk sharing is not sufficient. Park approaches the issue from the aspect of difference in community characteristics, called *"bari"*[vi]. Park shows that a bari network is helpful in pooling idiosyncratic economic hardships. This paper, in contrast, evaluates the role of a community in consumption smoothing by comparing covariate and idiosyncratic shocks.

The remainder of this paper is divided as follows: Section 2 introduces theoretical frameworks under the context of permanent income hypothesis with durable goods in

[vi] Bari is a network of a few households. A Bari usually consists of close relatives, and its members own interior garden with the joint ownership. Foster (2004) also implies that bari is an important concept for the Bangladeshis to pool risks.

order to reflect the impact on loss of housing due to natural disasters. Section 3 summarizes the impact of the flood in 1998 and reports data issues. Section 4 presents the empirical methodology based on the previous sections, and section 5 includes major findings. Finally, Section 6 concludes this paper by discussing the policy implications.

2. Theoretical frameworks

This section introduces the permanent income hypothesis with durable goods in order to reflect the impact of the loss of durables that is caused by disasters. This section aims to establish a benchmark of empirical analysis in this section. The framework considers the following optimization problem. Each individual maximizes his expected value of time-separable lifetime utility;

$$\max E_0 \sum_{t=0}^{\infty} \beta^t u(c_t, K_t), \tag{1}$$

where, E denotes the expectation operator; c, the non-durables; and K, the stock of durables. Households solve this maximization problem subject to the budget constraint represented by equation (2) and accumulation of durables with stochastic depreciation represented by equation (3):

$$A_{t+1} = (1 + r_t)A_t + y_t - c_t - pI_t, \tag{2}$$

$$K_{t+1} = (1 - \delta_t)K_t + I_t, \tag{3}$$

where, A indicates the financial and physical assets with stochastic interest rate, r. Also, I denotes the investment in durables and p denotes the relative price between durables and non-durables. The empirical section of this paper considers the stock of house assets as the durables, which depreciates exogenously and stochastically because of natural disasters. Hence, the investment in durables can be interpreted as the repairment of houses.

The first order conditions for the problem are as follows:

$$\lambda_t = \partial u / \partial c_t \,, \tag{4}$$

$$\lambda_t = \beta E_t (1 + r_{t+1}) \lambda_{t+1} \,, \tag{5}$$

$$\lambda_t p = \beta E_t [\partial u / \partial K_{t+1} + \lambda_{t+1} p (1 - \delta_{t+1})]. \tag{6}$$

In order to utilize the abovementioned equations for empirical analysis, we specify the shape of the utility function as $u(c_t, K_t) = c_t^{\alpha_1} K_t^{\alpha_2}$, where $\alpha_1 + \alpha_2 < 1$. Further, we assume that the expected marginal utility of non-durables and interest rate at period *t+1* follow a joint log-normal distribution in analogy with the previous studies (Hansen and Singleton 1983; Flavin 1991, 1999; Kochar 2004). Under these additional specifications, we rearrange the first order conditions into the following saving equation.

$$\begin{aligned} E_t \Delta s_{t+1} &= E_t \Delta y_{t+1} - \bar{c}(1-\alpha_1)^{-1}(\log\beta + E\log(1+r_{t+1})) \\ &\quad - \bar{c}(1-\alpha_1)^{-1}\left(\frac{\mathrm{var}(\log(1+r_{t+1})) + \mathrm{var}(\log\lambda_{t+1})}{2} + \mathrm{cov}(\log(1+r_{t+1}), \log\lambda_{t+1})\right) \\ &\quad - \bar{c}\alpha_2(1-\alpha_1)^{-1}\overline{K}(I_t - \delta_t K_t) - pE_t \Delta I_{t+1} \end{aligned} \tag{7}$$

Here, *s* denotes saving, which is the gap between income and consumption. $\bar{c}$ and $\overline{K}$ indicate the points of Taylor expansion. Flavin (1991; 1999) introduces a detailed derivation of the equation.

Based on equation (7), we discuss how covariate shock and interest rate affect the credit source choice. This paper considers two types of credit sources: quasi-credits among community members and professional money lenders for credit source beyond the community. Interest rate in equation (7) reflects the aggregate resource constraint and access to credit outside the community; the interest rate is exogenously determined for households. Under a pure exchange economy with no credit source outside the community, the upper bound of *r* does not exist. Suppose an alternative situation—other sources outside the community, such as money lenders, are available. Further, suppose that the interest rate requested by money lenders is exogenously determined, and it is higher than the opportunity cost because of asymmetric information (Stiglitz and Weiss 1981; Carter 1988). Assume that people can not deposit money with money lenders; households can only borrow from them. The support of the interest rate is then denoted by $r \in [r^L, r^H]$, where r^L and r^H indicate the opportunity cost and the interest rate for money lenders, respectively.

The equilibrium interest rate is a non-decreasing function of the expected difference in aggregate resources between periods *t* and *t+1*. The covariate negative shock at period *t* and/or the positive shock at period *t+1* should increase the demand for credit, leading to an increase in the interest rate. If the expected change in community resources is sufficiently low, then the interest rate that satisfies the market clear condition should be lower than its upper bound. The demand for money lenders should become zero, and all credit transactions should be conducted between community members. Consider an alternative case: the community faces a severe aggregate shock, and the expected change in community resources is high. The equilibrium interest rate binds the upper bound under the situation; the severer the aggregate shock, the higher is the demand for money lenders.

3. The Flood in 1998 and Data

The Flood in 1998

Bangladesh is a flood-prone country (World Bank 2005). Three world-class rivers—Ganges, Brahmaputra, and Meghna—drain into the Bay of Bengal through Bangladesh. The geographical location, deforestation upstream, and sub-tropical monsoon climatic characteristics with huge rainfall cause floods in Bangladesh every year.

The flood in 1998, however, was particularly severe in terms of both its depth and duration. It began in the first week of July and continued till the middle of September covering 68% of the total area. Since the flood began in the planting season, most of the standing crop was affected; 2.04 million tons of rice production was destroyed (Ninno, et al. 2001). The damage to agriculture induced a decline in the wage rates, and people lost their working opportunities during the crop season. People suffered from various secondary diseases, such as cholera, dysentery, and diarrhea, caused by the limited access to pure drinking water and also from fever, malaria, and respiratory diseases. The further damages to houses, roads, communication systems, and other infrastructure made people more vulnerable.

Data

IFPRI collected the household survey data to investigate the flood damage, risk coping strategies, and efficiency of government intervention. It covers three waves—in December 1998, June 1999, and November 1999—and each wave includes 757 households. This paper, however, employs the first and third waves of the data to eliminate seasonal effects. In agricultural areas like rural Bangladesh, household preference toward consumption and saving varies according to seasons (Paxson 1993). It is, therefore, essential to eliminate the seasonality effect.

This data set follows the multistage stratified random sampling methodology for seven districts (Zila in Bengali) that are selected depending on their economic status and the severity of the damage caused by the flood; these seven districts include Chadpur, Manikganj, Magura, Barisal, Sunamganj, Narsingdi, and Madaripur. The data includes one randomly selected Thana (or Upazila) from each district, and three Unions from each Thana. “Thana” and “Union” are administration units; a Union consists of some villages, and each Thana includes multiple unions. This data further includes 6 villages (Gram) from each union, 2 clusters (Para) from each village, and finally 3 households (Kana) from each cluster (Ninno et al. 2001). Hence, each district contains an average of 108 samples.

This data set enables us to measure the impact of covariate shock on the decisions regarding saving. An appropriate estimation of covariate shock impacts requires rich community samples and their variation of community damage. To that extent, our data set that includes more than one hundred villages sampled from widely scattered areas has an advantage with regard to achieving our purpose.

Summary Statistics and Credit in Rural Bangladesh

Table 1 lists the used variables and summarizes the descriptive statistics during the flood and one year after the flood. Seasonal consumption includes food and non-food consumption. Seasonal labor income includes agricultural and non-agricultural business incomes and wage labor incomes, and the transfer incomes from relief, gift, remittance, and other non-labor sources are excluded from our target. Livestock saving indicates the net of purchase, consumption, and sales of livestock[vii]. Wall material is a dummy variable, which takes unity if the wall material of the house is tin or concrete, and zero otherwise[viii]. In rural Bangladesh, only 21.0% of the households possessed houses made

[vii] Livestock includes bullocks, cows, goats, and sheep.

[viii] The homestead made of tin or concrete is known as *pucca basha* in Bengali, while the homestead made of poorer materials is called *kucha basha*.

of tin or concrete, while the remaining households lived in coarse houses made of jute, bamboo, or clay.

The first and second rows in table 1 indicate that the seasonal consumption and seasonal labor income during the flood are slightly higher than those after the flood[ix]. This puzzle is supposed to stem from the date of interview and crop calendar in Bangladesh. The first wave began in December 1998, while the third wave began in November 1999. December is the harvest season of *Aman* rice, and the livelihood increased temporarily. November is before the harvest, and the demand for agricultural workers, in contrast, declined. This seasonal effect is controlled econometrically in the analysis.

The third to eighth rows show information on the credit amount. Table 1 reveals that the dependency on credit during the flood was high. In particular, a large proportion of households utilized quasi-credit—31.8% from neighbors and 22.0% from relatives. Formal credit institutions such as banks and NGOs did not work as major credit donors from the viewpoint of credit frequency. Only 16.8% during the flood and 10.0% after the flood borrowed from formal sources. A notable point is the change in the dependency on money lenders, who are known *Mohajons*. A total of 10.5% of the people contracted with money lenders during the flood, whereas only 4.7% contracted during the non-flood season. This indicates that the demand for money lenders increased during the flood.

4. Empirical Strategies

[ix] IFPRI gathered the information on total consumption for one month before the interview in analogy with other surveys. Hence, we multiply the monthly consumption with the amount of months to generate seasonal consumption.

This section develops our estimation methodology. Equation (7) provides us with hints to specify the estimation strategy. First, the equation implies that the change in saving can be explained by the linear function of expected change in income and the depreciation of and investment in durables. As noted above, this paper considers house assets as durables. However, since households in developing countries build their houses on their own, it is difficult to capture the appropriate value of the investment. Hence, we rearrange equation (7) into the following specification.

$$\Delta s_{t+1} = \alpha_0 + \alpha_1 \Delta Y_{t+1} + \alpha_2 \delta_t K_t + Z_t \alpha_3 + X_t \alpha_4 + \varepsilon_{t+1} \quad (8)$$

Here, *Z* includes the determinants of the investment in houses: the wall material and the size of the houses. This formulation assumes that the value of repairs to the houses is linearly explained by *Z*. *X* includes the preference shifters and the other variables to control the access to formal credit markets: the number of the household members and the size of the agricultural fields. A series of explanatory variables control the effect of precautionary saving as well. Note that this specification eliminates the possibility of bias caused by time-invariant unobservable factors. As discussed earlier, our data includes the seasonality effect to a small extent. However, the constant term can control it in this specification since the seasonality effect is same across households.

Second, the regression of the change in saving with the change in observed income induces our estimation biased. Due to the structure of equation (7), the residual in equation (8) includes the expectation error of saving and income at period *t+1* as of period *t*. The correlation between the observed income and the residual gives rise to a need for the instruments[x]

[x] The stock of durables at period t depends on the decision at period t-1. Hence, we consider residence damage to be exogenous.

Third, the model suggests the candidates of instruments as well. Under rational expectation, any variable included in information set at period *t* is orthogonal with the expectation error. Hence, the instruments are required to be included in the information set at period *t* and to correlate income fluctuation. This paper utilizes the value of livestock loss and the duration for which the flood covered their agricultural fields in 1998 as the instruments. A significant number of studies have followed the idea suggested by Paxson (1992)—using weather information as instruments. It basically stems from the idea that although weather conditions affect the value of expected income, households can not control these conditions. We note that the instruments function to eliminate the possibility of bias caused by the measurement error of income.

This paper closes this section by mentioning the manner in which community-level shocks can be distinguished from individual-level shocks. There mainly exist two strategies. The first strategy is based on Fafchamps and Lund (2003) and Udry (1994). They utilize a unique data set that includes information on credit donors. However, our data does not include such information. Hence, this study does not employ their methodology.

Ravallion and Chaudhuri (1997) and Campbell et al. (2001) utilize another methodology. These studies decompose shock variables into idiosyncratic and aggregate components. Our study follows their methodology and divides the income fluctuation and damage to houses into three components—union-level average (covariate) component, village-level average (semi-covariate) component, and household-level individual (idiosyncratic) component. Thus, equation (8) is rewritten as the following formulation.

$$\Delta s_{t+1} = \pi_0 + \pi_1 E\Delta Y_{t+1}^{u} + \pi_2 E\Delta Y_{t+1}^{v} + \pi_3 E\Delta Y_{t+1}^{h} + \pi_4 \left(\delta_t K_t\right)^{u} + \pi_5 \left(\delta_t K_t\right)^{v} + \pi_6 \left(\delta_t K_t\right)^{h} + Z_t \pi_7 + X_t \pi_8 + e_{t+1} \quad (9)$$

$$\begin{aligned} \Delta Y_{t+1}^{u} &= \left(\text{Average income fluctuation within the Union}\right) \\ \Delta Y_{t+1}^{v} &= \left(\text{Average income fluctuation within the village}\right) - \Delta Y_{t+1}^{u} \\ \Delta Y_{t+1}^{h} &= \Delta Y_{t+1} - \Delta Y_{t+1}^{v} \end{aligned} \quad (10)$$

The decomposition procedure of housing loss also follows the same strategy as equation (10). Here, E denotes the expectation operator as of period t. Since our instruments consist of information at period t, the fitted value of income fluctuation can be interpreted as expected income fluctuation.

5. Results

This section summarizes the major findings. This paper estimates five credit sources to show how the choice of credit source varies between idiosyncratic and covariate shocks; the following are the five credit sources: neighbors, relatives, banks, NGOs, and money lenders. We also examine the change in livestock saving and seasonal consumption. Investigating consumption is helpful in measuring the effects on the aggregate saving decision. This paper considers credit from neighbors and relatives as reciprocal credit or quasi-credit, while credits from banks, NGOs, and money lenders are considered as non-reciprocal credit.

Benchmark Estimation

Before estimating equation (9), we estimate a simple specification, similar to Ravallion and Chaudhuri (1997).

$$\Delta s_{t+1} = \beta_0 + \beta_1 E\Delta Y_{t+1}^{u} + \beta_2 E\Delta Y_{t+1}^{v} + \beta_3 E\Delta Y_{t+1}^{h} + Z_t \beta_4 + X_t \beta_5 + u_{t+1} \quad (11)$$

Table 2 provides us with various implications as the benchmark analysis. First, the second column indicates that credits from neighbors are available to pool idiosyncratic income fluctuation, while households do not utilize the strategy under the severe Union-community-level damage. This is consistent with the result of Fafchamps and Lund (2003). On the other hand, the third column shows that they do not avail of the credit from relatives for any type of shocks. This reveals that the credit network among relatives is less developed than that among neighbors. Second, we find from the sixth and seventh column at Table 2 that the demand for livestock dissaving and credits from money lenders increases under severe covariate shock. Households cope with 40% of the covariate damage by using these strategies.

Extended Estimation

Table 3 shows the estimation result based on equation (9). Basically, it reveals a similar picture as the benchmark estimation. First, the second and third columns show that people borrow from neighbors in the event of idiosyncratic income loss, while the network among relatives does not work as a consumption smoothing device. This contrasts the results of the case study in India (Rosenzweig 1988). Quasi-credits among neighbors can pool 15% of the household-level income fluctuation and 25% of the village-level shock[xi].

Second, although people avail of quasi-credit to pool the idiosyncratic income shock, it still affects the consumption path. If an insurance mechanism works completely, any idiosyncratic shock should not affect consumption. This result shows that the insurance

[xi] This gap between the two coefficients is significant but slightly different from zero. The P-value for the null hypothesis is 9.27%. The test in the specification based on equation (11) shows that the difference between the two coefficients is not significant; the corresponding P-value is 15.6%.

mechanism is not complete. Surprisingly, high proportions of idiosyncratic income change as well as a covariate one affect their consumption. This result is similar to those of a series of related studies (Cochrane 1991; Mace 1991; Townsend 1994; Ravallion and Chaudhuri 1997).

Third, we find from the sixth and seventh column at Table 2 that rural people depend on livestock transaction and credit from money lenders under severe community-wide damage[xii]. The credit from money lenders is characterized by its high interest rate. Those who surrender their livestock will suffer from a decline in their future agricultural income. The community-level covariate damage causes people to resort to more burdensome strategies than the idiosyncratic one.

Fourth, our estimation can be interpreted from the viewpoint of permanent income hypothesis as well. Recall that the instruments are included in the information set at period *t*. Thus, the fitted value of income fluctuation can be considered as an anticipated shock. Any anticipated shock should not affect the consumption path under the permanent income hypothesis with sufficient access to the credit market. Despite this, anticipated shocks may correlate consumption if people face credit constraints. Our empirical result reconfirms that both the access to insurance and credit market are insufficient for rural people.

Finally, the equations for Bank and NGO credit indicate that villagers borrow from formal sources such as banks and NGOs in the event of damages to their houses, while

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[xii] Readers may suppose the inverse causality between credit from money lenders and covariate shock; credit from money lenders is frequent in flood-prone areas. In that case, people in such areas should borrow from them even in the absence of covariate shocks. However, note that table 1 indicates that people depend on them only during floods. This is evidence that rejects the inverse causality.

they do not borrow from these sources even in the event of income fluctuation. This reflects that formal credit institutions prefer investment loans to consumption loans.

A series of results provide us with the implication that the damage to community limits the choice between the available risk coping strategies. The coping strategies to deal with covariate shocks burden their future livelihood.

Robustness Check (Type I Tobit Model)

Our theoretical framework predicts that the demand for credit from money lenders should be zero if the community does not face severe covariate shocks. In fact, only 10.5% of the households borrowed from money lenders even during the flood. Hence, we reexamine the equation for credit from money lenders using the Type I Tobit model (Amemiya 1985).

Table 4 shows us results that are similar to our previous estimations. Under the severe covariate shock environment, people depend on money lenders to ensure their livelihood.

6. Concluding Remarks with Policy Implications

This study clarifies that risk coping strategies vary between idiosyncratic and covariate shocks. Households pool the idiosyncratic income fluctuation by using the credit network within the community. In contrast, they can not utilize this network under severe covariate damage. In such a situation, they have to either depend on money lenders or surrender their livestock assets. If a household sells its livestock assets, its future income may decline. Credit from money lenders has a high interest rate, while the community members generally do not request any interest. Hence, community-wide shocks limit the set of available risk coping strategies. Such strategies lay a burden on their future livelihood.

A series of findings support the policy implementation through geographical targeting to prevent people from resorting to burdensome strategies. Geographical targeting is a popular methodology because of its low implementation cost (Coady et al. 2004). We believe that the government interventions through geographical targeting can mitigate the burden of repayment to money lenders.

Finally, there remain certain issues to be addressed in future studies. We assume the behavior of money lenders to be exogenous. A refined theoretical framework may deepen our analysis.

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Table 1. Summary Statistics and Risk Coping Strategy Choice

	Variable	Unit	During Flood (July to December 1998)			One Year After Flood (July to November 1999)		
			Mean	S. D.	Prob(>0)	Mean	S. D.	Prob(>0)
(1)	Seasonal consumption	Tk	19822	(13543)	100.0	16422	(10371)	100.0
(2)	Seasonal Labor income	Tk	7716	(11293)	91.8	7381	(10175)	92.5
(3)	Credit (NGO)	Tk	525.8	(2175.4)	8.3	395.4	(1716.0)	7.0
(4)	Credit (Bank)	Tk	609.4	(2567.0)	8.5	186.0	(1326.4)	3.0
(5)	Credit (Neighbors)	Tk	857.5	(2272.9)	31.8	436.4	(1858.3)	16.8
(6)	Credit (Relatives)	Tk	622.6	(2026.2)	22.0	1202.7	(8664.4)	18.1
(7)	Credit (Money lender)	Tk	473.4	(2794.3)	10.5	204.3	(2102.9)	4.7
(8)	Credit (Others)	Tk	137.9	(1030.5)	3.3	156.6	(1032.6)	3.6
(9)	Livestock saving	Tk	-78.4	(1929.9)	9.6	-105.0	(1725.9)	12.7
(10)	Damage to residence	Tk	208953	(543050)	47.2	3.17	(75.1)	0.3
(11)	Household size	#	5.59	(2.11)	100.0			
(12)	Land holding	Decimal	89.46	(165.28)	90.5			
(13)	Residence size	m^2	279.27	(155.00)	99.9			
(14)	Wall material	Dummy	0.21	(0.41)	21.3			
(15)	Livestock loss	Tk	189.03	(862.85)	19.8			
(16)	Flood magnitude	Days	5.90	5.03	90.3			

Table 2. Coping Strategies for Income Fluctuation

	Δ Consumption	Δ Credit from					Δ Livestock
		Neighbor	Relatives	Bank	NGO	Lender	Save
Δ Income	0.492*	-0.109	0.162	-0.173*	-0.006	-0.220*	0.193**
(Union)	(0.273)	(0.097)	(0.315)	(0.101)	(0.087)	(0.125)	(0.091)
Δ Income	0.458**	-0.254***	-0.036	0.039	-0.035	-0.166*	0.042
(Village)	(0.207)	(0.073)	(0.236)	(0.076)	(0.065)	(0.094)	(0.069)
Δ Income	0.720***	-0.171***	0.022	0.014	-0.017	-0.078	0.060
(Household)	(0.166)	(0.058)	(0.189)	(0.061)	(0.052)	(0.075)	(0.055)
# Household	-21.4	-199***	273	-64.8	2.785	-64.4	162***
member	(170)	(60)	(195)	(62.7)	(54.1)	(77.5)	(56.7)
Land holding	8.483**	-7.370***	-2.659	-0.101	-0.021	-2.711	0.541
	(4.223)	(1.491)	(4.857)	(1.560)	(1.346)	(1.927)	(1.411)
Residence size	-2.537	2.671***	3.582	-2.202***	-0.504	-0.324	-0.173
	(2.217)	(0.789)	(2.569)	(0.825)	(0.712)	(1.019)	(0.746)
Wall material	-1666**	107	-285	-287	16.9	-159	-386
	(813)	(289)	(941)	(302)	(261)	(373)	(273)
Constant	-2879***	529	-1559	504	0.677	322	-739**
	(1094)	(386)	(1256)	(404)	(348)	(498)	(365)
N	708	734	734	734	734	734	734

Standard errors are in parentheses. *** 1% significant, ** 5% significant, * 10% significant, respectively

Table 3. Coping Strategies for Income and Housing Damage

	Δ Consumption	Δ Credit from					Δ Livestock
		Neighbor	Relatives	Bank	NGO	Lender	Save
Δ Income	0.433*	-0.080	0.141	-0.130	-0.002	-0.215*	0.199**
(Union)	(0.256)	(0.090)	(0.295)	(0.094)	(0.081)	(0.117)	(0.085)
Δ Income	0.346*	-0.248***	0.006	0.049	-0.085	-0.150	0.058
(Village)	(0.206)	(0.072)	(0.234)	(0.075)	(0.064)	(0.093)	(0.068)
Δ Income	0.641***	-0.147***	0.042	0.022	-0.024	-0.053	0.068
(Household)	(0.158)	(0.055)	(0.181)	(0.058)	(0.049)	(0.072)	(0.052)
Housing loss	0.001	-0.0005	0.001	-0.0016*	0.0012	-0.0011	0.0001
(Union)	(0.003)	(0.0009)	(0.003)	(0.0010)	(0.0008)	(0.0012)	(0.0009)
Housing loss	-0.002	-0.0002	0.0001	0.0001	-0.0011**	0.0004	0.0000
(Village)	(0.001)	(0.0005)	(0.002)	(0.0005)	(0.0004)	(0.0006)	(0.0005)
Housing loss	0.0004	0.0003	-0.0002	-0.0004*	-0.0005**	0.0001	-0.0003
(Household)	(0.001)	(0.0002)	(0.001)	(0.0002)	(0.0002)	(0.0003)	(0.0002)
N	708	734	734	734	734	734	734

Standard errors are in parentheses. *** 1% significant, ** 5% significant, * 10% significant, respectively

Table 4. Coping Strategies for Income and Housing Damage: Type I Tobit model

	Credit from money lenders during the flood	
Δ Income (Union)	1.695***	1.446***
	(0.624)	(0.497)
Δ Income (Village)	1.251**	1.206**
	(0.575)	(0.565)
Δ Income (Household)	0.587	0.450
	(0.381)	(0.373)
Housing loss (Union)	0.001	-
	(0.007)	-
Housing loss (Village)	-0.011**	-
	(0.005)	-
Housing loss (Household)	-0.003	-
	(0.003)	-
N	734	734

Standard errors are in parentheses. *** 1% significant, ** 5% significant, * 10% significant, respectively