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World Development Vol. xx, pp. xxx–xxx, 2017

http://dx.doi.org/10.1016/j.worlddev.2016.12.039

Household-Level Recovery after Floods in a Tribal and Conflict-Ridden Society

TAKASHI KUROSAKI*
Hitotsubashi University, Kunitachi, Japan

Summary. — Based on a panel survey conducted in Khyber Pakhtunkhwa, Pakistan, this study analyzes the extent to which households recovered from damage due to floods that hit the country in 2010. With regard to the initial recovery of productive assets, households that experienced heavier damage to their assets had recovered to a lesser extent. After one year, recovery had continued, but households whose houses were damaged by the floods experienced a deceleration in the recovery speed. The recovery dynamics suggests the importance of the interaction of productive assets and unproductive, non-liquidatable assets in conflict-ridden situations.

Key words — natural disaster, recovery, productive assets, house reconstruction, Asia, Pakistan

1. INTRODUCTION

Households throughout the world face a wide variety of risks arising from natural disasters, such as floods, droughts, and earthquakes. For instance, Pakistan, from which the household data analyzed in this study were taken, experienced in 2010 the worst floods in its history, which affected 84 districts out of a total 121 districts, killing more than 1,700 people (United Nations, 2010). Households in low-income developing countries are particularly vulnerable, since their initial welfare levels are already close to the poverty line, institutional arrangements used to cope with disasters are lacking, and early warning systems are absent. To compound issues, the number of natural disasters reported appears to be increasing globally—from fewer than 100 per year in the mid-1970s to approximately 400 per year during the 2000s, according to the emergency events database (EM-DAT). [1]

As summarized by Cavallo and Noy (2011) and Sawada (2007), much research in both the social and natural sciences has been devoted to enhancing our ability to predict disasters, while economic research on natural disasters and their consequences, including the recovery process, has been fairly limited. In the limited economics literature, several authors have investigated macroeconomic impacts, both direct and indirect. For instance, using cross-country panel data, Noy (2009) shows that developing countries face much larger declines in output following disasters of similar relative magnitude than do developed countries or bigger economies, suggesting the importance of a greater ability to mobilize resources for reconstruction. Using similar cross-country panel data, Sawada, Bhattacharyay, and Kotera (2011) demonstrate that natural disasters positively impact welfare (measured by per-capita GDP) in the long run, although they exert a substantial negative impact on welfare in the short run. Coffman and Noy (2012) use a synthetic control methodology to estimate the long-term impacts of a 1992 hurricane on the island economy of Kauai, Hawaii, showing that Kauai's economy was yet to recover after 18 years of the event. These macroeconomic studies have tended to treat disasters as economy-wide covariant shocks, not focusing on within-country or within-village heterogeneity.

However, in terms of the microeconomic impacts of exogenous shocks, there has been an accumulation of theoretical and empirical studies in development economics focusing on households' ability to cope with such shocks. These studies have shown that poor households are likely to suffer not only from low levels of welfare on average but also from fluctuations in their welfare due to their limited coping ability (Dercon, 2005; Fafchamps, 2003). The inability to avoid declines in welfare when hit by exogenous shocks can be called vulnerability. Regarding the measurement of vulnerability, a substantial literature has developed (Dercon, 2005; Dutta, Foster, & Mishra, 2011; Kurosaki, 2006; Ligon & Schechter, 2003). These studies tend to focus on how idiosyncratic shocks impact welfare. This is unsatisfactory, as Ligon and Schechter (2003) demonstrate that aggregate risk is much more important than idiosyncratic sources of risk. Furthermore, the influence of aggregate shocks on the welfare of households is growing in the process of globalization and with global warming.

To respond to the need for further research, recent years have seen an increasing number of micro-level studies on the impact of natural disasters. For instance, Carter, Little, Mogues, and Negatu (2007) analyze the asset dynamics associated with post-disaster recovery at the household level in Honduras (after Hurricane Mitch) and Ethiopia (after prolonged droughts). They show that the poorest households struggled most with shocks and had to adopt costly strategies such as asset smoothing. Mogues (2011) expands the analysis of Ethiopian droughts to demonstrate the importance of precautionary motives for holding wealth. Regarding the impact of droughts on asset dynamics in Africa, Giesbert and Schindler (2012) add evidence from Mozambique. They show that even food-insecure households are able to sustain productive assets when they have unproductive, liquidatable assets and better access to income-generating opportunities. These studies are motivated by the asset poverty trap hypothesis

* I thank anonymous reviewers of this journal, Yasu Sawada, Yoshito Takasaki, and participants at the Asian Meetings of the Econometric Society, the KDME seminar, the IDE workshop, and the PRIMCED conferences at Hitotsubashi University for their useful comments on earlier versions of this paper. Funding from a JSPS Grant-in-Aid for Scientific Research-S (22223003) is gratefully acknowledged.

(Carter & Barrett, 2006), regarding which the empirical evidence is mixed (Kraay & McKenzie, 2014; McKay & Perge, 2013). Other studies that have assessed different aspects of disaster impacts include, for instance, de Mel, McKenzie, and Woodruff (2012), who examine the business recovery of microenterprises in Sri Lanka, Rodriguez-Oreggia, De La Fuente, De La Torre, and Moreno (2013), who investigate the effects of floods and droughts on municipality-level poverty and human development indicators in Mexico, and Cameron and Shah (2015), who show that floods or earthquakes made rural residents in Indonesia more risk-averse.

Nevertheless, empirical studies on household-level asset recovery from natural disasters remain limited. Regional studies on South Asian economies have been few, although poverty and exposure to natural disasters are serious problems in the region. In terms of characteristics of the economy, mixed farming economies under tribal codes are not studied in detail. Economies facing conflicts such as civil war or insurgencies are rarely analyzed. Finally, the interaction of productive assets and unproductive, non-liquidatable assets has not been analyzed in the literature.

This study attempts to fill these gaps in the literature by investigating household-level asset recovery from floods in a tribal and conflict-ridden society with a focus on unproductive, non-liquidatable assets. Which types of households are quicker to recover from nation-wide flood damage? Is there any heterogeneity in recovery attributable to the variation in damage extent and social status? Do recovery patterns differ between the period immediately after floods and a year after? How are the dynamic recovery patterns related with the social structure in such an economy? To examine these questions, I employ a panel dataset collected in the province of Khyber Pakhtunkhwa,[2] Pakistan, in December 2010–February 2011 and one year after. The survey area was severely hit by nation-wide, unprecedented floods in Pakistan that occurred in July–August 2010. The province of Khyber Pakhtunkhwa is populated by the Pakhtuns whose social behavior is governed by tribal codes known as *Pakhtunwali* (Ahmed, 1980). One of the key elements of *Pakhtunwali* is the preservation of the honor of the family, especially of women members. In the 2000s, law and order in the region deteriorated, making the region difficult for outside researchers to conduct detailed surveys.

Since the recovery process is dynamic in nature, a single "snapshot" survey after a disaster cannot comprehensively provide detailed information. Utilizing the panel dataset, I show that households that initially had fewer assets and were hit by greater flood damage had more difficulty in recovering; after one year, their recovery had improved, but there remained substantial variation across households regarding the extent of recovery; and households whose houses were damaged by the floods experienced a deceleration in the speed of recovery. The recovery of productive assets was thus affected by concerns regarding the reconstruction of houses, which are unproductive and non-liquidatable in the survey area. Given the scarcity of analysis of similar societies in the literature, the evidence shown in this study is expected to shed light on the recovery process after natural disasters, despite the small sample size involved.

The remainder of this paper is organized as follows. Following this introductory section, Section 2 puts forward a conceptual framework for the empirical analysis. Section 3 describes the study area, survey design, and the dataset. Section 4 explains the empirical strategy, followed by regression results in Section 5. Section 6 concludes the paper.

2. ASSET RECOVERY FROM NATURAL DISASTERS

The empirical models in this paper are motivated by the literature on consumption smoothing (Dercon, 2005; Fafchamps, 2003), which refers to the use of assets as a buffer to smooth consumption, and the literature on asset poverty traps, which indicates that there are situations in which assets are smoothed and consumption sacrificed to avoid poverty traps (Carter & Barrett, 2006; Carter *et al.*, 2007). In this section, I briefly explain the conceptual framework underlying the empirical investigation.

A household makes a living using its productive, liquidatable assets, whose value is denoted by a scaler A_t. Its expected value in the next period, A_{t+1}, is an increasing function of A_t, i.e., $E_t[A_{t+1}] = f(A_t)$ with $f'(.) > 0$. If $f(.)$ is S-shaped with three intersections with a 45-degree line, there could be multiple equilibriums with the lower one corresponding to the asset poverty trap.

Now assume that a shock due to a natural disaster occurs, which destroys the productive asset. Let Z_p be the amount of damage that occurs between period t and $t+1$. By definition, the productive asset value is reduced by Z_p immediately after the shock.

However, the expected value of A_{t+1} given the productive asset shock may not equal $f(A_t) - Z_p$ for two reasons. First, the household may rebuild the asset to compensate for the damage caused by the natural disaster. The household can use its own savings, mutual help inside the community, or aid from outside[3] to replenish the asset. How much of Z_p is transferred to the realized value of A_{t+1} is thus a measure of resilience of the productive asset against the natural disaster.

Second, the household may sell productive assets to cope with other shocks that occur between period t and $t+1$. When a natural disaster occurs, not only productive assets but also unproductive assets (such as houses, household durables, etc.) may be damaged. Household income may also be reduced (for example, standing crops may be destroyed). Let Z_n be the amount of damage to unproductive, non-liquidatable assets and Z_y be the unexpected reduction in income. Even when the household does not sell productive assets to cope with these shocks, these shocks constrain the household's liquidity positions so that it becomes difficult for the household to replenish productive assets. As a net effect, it is expected that the realized value of the productive assets in period $t+1$ is a non-increasing function of Z_n and Z_y.

Assuming the absence of natural disasters between $t+1$ and $t+2$, the recovery process is expected to continue. It may be a reversion to the initial path of $f(.)$ or permanent divergence from the initial path. If a sufficiently long panel dataset with a large number of observations is available, we may be able to distinguish the two different dynamics. However, as the dataset available for this study is a small-size panel dataset with two post-disaster periods, this is not attempted. Instead, I propose several hypothesis tests using the following model for g_i, the asset change for household i. The model is similar to the one adopted by Carter *et al.* (2007):

$$g_i \equiv A_{i,t+1} - A_{it} = h(A_{it}) + \gamma_{1i} Z_{pi} + \gamma_{2i} Z_{ni} + \gamma_{3i} Z_{yi} + X_i \beta + u_i, \quad (1)$$

where $h(A_{it}) \equiv f(A_{it}) - A_{it}$, γ_{1i}, γ_{2i}, and γ_{3i} are parameters to be estimated, X_i is a vector of household and village characteristics, β is a vector of parameters to be estimated, and u_i is an error term. Parameters γ_{1i}, γ_{2i}, and γ_{3i} may shift depending on the characteristics of household i, which are associated with