The Household Response to Persistent Natural Disasters: Evidence from Bangladesh

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SUMMARY

Recent literatures examine the short-run effects of natural disasters on household welfare and health outcomes. However, less advancement has been observed in the use of self-reported data to capture the short-run disaster–development nexus in least developed countries' with high climatic risks. This self-identification in the questionnaire could be advantageous to capture the disaster impacts on households more precisely when compared to index-based identifications based on geographical exposure. In this paper, we ask: "what are the impacts on household income, expenditure, asset, and labor market outcomes of recurrent flooding in Bangladesh?" We examine the short-run economic impacts of recurrent flooding on Bangladeshi households surveyed in year 2010. In 2010 Household Income and Expenditure Survey (HIES), households answered a set of questions on whether they were affected by flood and its likely impacts. We identify treatment (affected) groups using two measures of disaster risk exposure; the self-reported flood hazard data, and historical rainfall data-based flood risk index. The paper directly compares the impacts of climatic disaster (i.e., recurrent flooding) on economic development. We further examine these impacts by pooling the data for the years' 2000, 2005, and 2010 and compare the results with our benchmark estimations. Overall, we find robust evidence of negative impacts on agricultural income and expenditure. Intriguingly, the self-reported treatment group experienced significant positive impacts on crop income.

1. Introduction

Bangladesh has a long history with natural disasters due to its geography and its location on the shores of the Bay of Bengal. Climate change models predict Bangladesh will be warmer and wetter in the future.[1] This changing climate induces flood risk associated with the monsoon season each year (Gosling et al., 2011). It is now widely understood that climate-induced increasingly repeated risks threaten to undo decades of development efforts and the costs would be mostly on developing countries impacting existing and future development (Beg et al., 2002; McGuigan, Reynolds, & Wiedmer, 2002; OECD, 2003). Recent literatures examine the short-run effects of natural disasters on household welfare and health outcomes (Arouri, Nguyen, & Youssef, 2015; Lohmann & Lechtenfeld, 2015; Lopez-Calva & Ortiz-Juarez, 2009; Rodriguez-Oreggia, de la Fuente, de la Torre, Moreno, & Rodriguez, 2013; Silbert & del Pilar Useche, 2012). However, less advancement has been observed in the use of self-reported data to capture the short-run disaster–development nexus in least developed countries

with high climatic risks.[2] In this paper, we ask: "what are the impacts on household income, expenditure, asset, and labor market outcomes of recurrent flooding in Bangladesh?"

We examine the short-run economic impacts of recurrent flooding on Bangladeshi households surveyed in year 2010. In 2010 Household Income and Expenditure Survey (HIES), households answered a set of questions on whether they were affected by flood and its likely impacts. This self-identification in the questionnaire could be advantageous to capture the disaster impacts on households more precisely when compared to index-based identifications based on geographical exposure. However, literatures have identified shortcomings in self-reporting and various determinants of flood risk perception.[3] Therefore, this paper contributes the following in the "disaster-development" literature: first, it identifies treatment (affected) groups using two measures of disaster risk exposure – the self-reported flood hazard data and historical rainfall

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[1] See Bandyopadhyay and Skoufias (2015).

[2] Poapongsakorn and Meethom (2013) looked at the household welfare impacts of 2011 floods in Thailand (an upper-middle-income country by World Bank definition) and Noy and Patel (2014) further extended this to look at spillover effects.

[3] Limitations of self-reported data have been detailed in Section 3(a).

data-based flood risk index; second, it directly compares the impacts of climate disaster (i.e., recurrent flooding) on four development dimensions i.e., income, expenditure, asset, and on labor market outcomes. Our novelty in this paper is the identification of flood treatment households using self-reported flood hazard data and historical rainfall-based flood risk index. The development responses of the climatic disasters may therefore depend on the novel approach i.e., accuracy in identifying the treatment groups using self- and non-self-reported data. In this paper, we show that there is inconsistency between self- and non-self-reported information-based estimates with literature outcomes questioning the designation of survey questions (related to natural shocks) and their usefulness to capture development impacts.

The paper is designed as follows: Section 2 describes the theoretical framework between social vulnerability and community resilience. Section 3 reviews the empirical evidences highlighting recent insights to explore the nexus between climatic disasters and economic development in both developed and developing countries. Section 4 portrays our identification strategy while Section 5 describes the data, provides detailed breakdown of our methodological framework, identifies the key variables, and justifies the choice of the covariates with added descriptive statistics. In Section 6, we present and analyze the estimation results comparing with previous literatures along with robustness checks in Section 7. Finally, in Section 8 we conclude with relevant policy implications and also some insight for further advancements.

2. Social vulnerability and community resilience: theoretical framework

Figure 1 displays the conventional way to consider disaster risk as a function of the following factors:

$$\text{Risk/Disaster Risk} = f(\text{Hazard}, \text{ Exposure}, \text{ Vulnerability})$$

where a country's pre-determined geo-physical and climatic characteristics are part of its hazard profile compared to exposure which is largely driven by poverty forcing people to live in more exposed and unsafe conditions (e.g., living in flood plains).[4] Poverty is both a driver and consequence of disaster risk particularly in countries with weak risk governance (Wisner, Blaikie, Cannon, & Davis, 2004). Vulnerability in the above functional form depicts disaster risk not only depends on the severity of hazards or exposure of urban living and human assets but also on the exposed population's capacities to withstand and reduce the socio-economic impacts of hazards.[5] Therefore, disaster risk can be viewed as the intersection of hazard, exposure, and vulnerability. Since resilience has often been defined as the flip-side of vulnerability[6], there seems to be a clear connection between disaster risk reduction efforts and enhancement of community resilience as occurrence and severity of natural hazards is uncontrollable. However, vulnerability is multi-dimensional and dynamic; hence it demands inter-disciplinary approaches to understand both the physical and socio-economic aspects. Literatures have attempted to put forth conceptual frameworks in various contexts and identify global and community-level indicators to quantify vulnerability. Among them; the Hazard-of-Place Model of Vulnerability (Cutter, Boruff, & Shirley, 2003), the Pressure and Release Model (Blaikie, Cannon, Davis, & Wisner, 1994:23), the Social Vulnerability Model (Dwyer, Zoppou, Nielsen, Day, & Roberts, 2004:5) and the framework to approach social vulnerability (Parker & Tapsell, 2009; Tapsell, McCarthy, Faulkner, & Alexander, 2010) could be par-
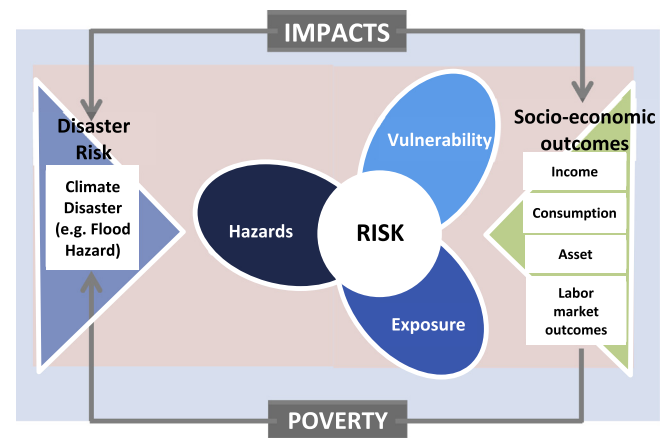

Figure 1. Author's elaboration of the theoretical framework based on Wisner et al. (2004) and IPCC (2014).

ticularly mentioned. In a study on community resilience to coastal hazards in the Lower Mississippi River Basin (LMRB) region in South-eastern Louisiana, the Resilience Inference Measurement (RIM) Model has been applied to assess the resilience of higher and lower resilient communities (Cai, Lam, Zou, Qiang, & Li, 2016). Interestingly, the authors identified the location of the lower resilient communities to be along the coastline and in lower elevation area (in the context of developed country here) that has also been argued in the context of developing countries (e.g., Karim & Noy, 2016a). Our aim in this paper is to understand this relationship among hazard, vulnerability, and exposure and look at the impacts of climate-induced disaster risks (e.g., flood hazards) on various socio-economic dimensions (i.e., income, consumption, asset, and labor market outcomes).

3. Climate disasters and development: empirical evidences

The last few years have seen a new wave of empirical research on the consequences of changes in precipitation patterns, temperature, and other climatic variables on economic development and household welfare. Climate-related natural disasters are expected to rise as the earth is getting warmer with prospect of significant negative economic growth mostly affecting the poor countries (Acevedo, 2014; Felbermayr & Gröschl, 2014). Vulnerable economies for example, the Pacific islands could expect a growth drop by 0.7 percentage points for damages equivalent to 1% of GDP in the year of the disaster (Cabezon, Hunter, Tumbarello, Washimi, & Wu, 2015). On the causality between catastrophic events and long-run economic growth using 6,700 cyclones, Hsiang and Jina (2014) find robust evidence that national incomes decline compared to pre-disaster trends and the recovery do not happen for twenty years for both poor and rich countries. This finding contrasts with the earlier work of Noy (2009) and Fomby, Ikeda, and Loayza (2013)[7] to some extent and carry profound implications as climate change-induced repeated disasters could lead to accumulation of income losses over time. Therefore, climate disasters have become a development concern with likelihood of rolling back years of development gains and exacerbate inequality.

Climate resilience has become integral in the post-2015 development framework and recent cross-country "micro" literatures explore the channels through which climate disasters impacted poverty.[8] Recent studies on rural Vietnam looked at the impacts

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[4] See Karim and Noy (2016a).

[5] See Noy and duPont IV (2016).

[6] See Crichton (1999) and Wilson (2012). However, Cutter, Ash, and Emrich (2014) found evidences that inherent resilience is not the opposite of social vulnerability using the Baseline Resilience Indicators for Communities (BRIC) metric.

[7] These studies focus on the short-run effects of natural disasters.

[8] Karim and Noy (2016a) provide a qualitative survey of the empirical literature on poverty and natural disasters.