The Household Response to Persistent Natural Disasters: Evidence from Bangladesh

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SUMMARY

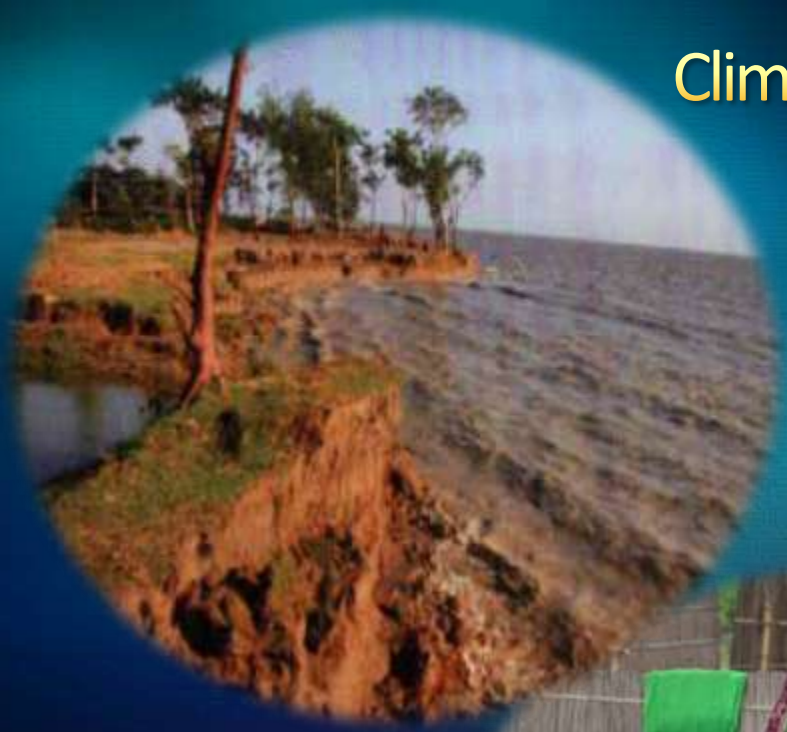
Recent literatures examine the short-run effects of natural disasters on household welfare and health outcomes. However, less advancement has been observed in the use of self-reported data to capture the short-run disaster–development nexus in least developed countries' with high climatic risks. This 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.

HIGHLIGHTS

- The paper identifies flood treatment households' surveyed in HIES 2010 in Bangladesh using two measures of disaster risk exposure.
- It directly compares the impacts of climatic disaster on economic development.
- 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.
- The inconsistencies in the robust findings needs to be thoroughly analysed based on the shortcomings identified in the literature.

Climate Disasters and Economic Development

Why should we care?



- Why Important?

- Why Complex?

Social Vulnerability and Community Resilience

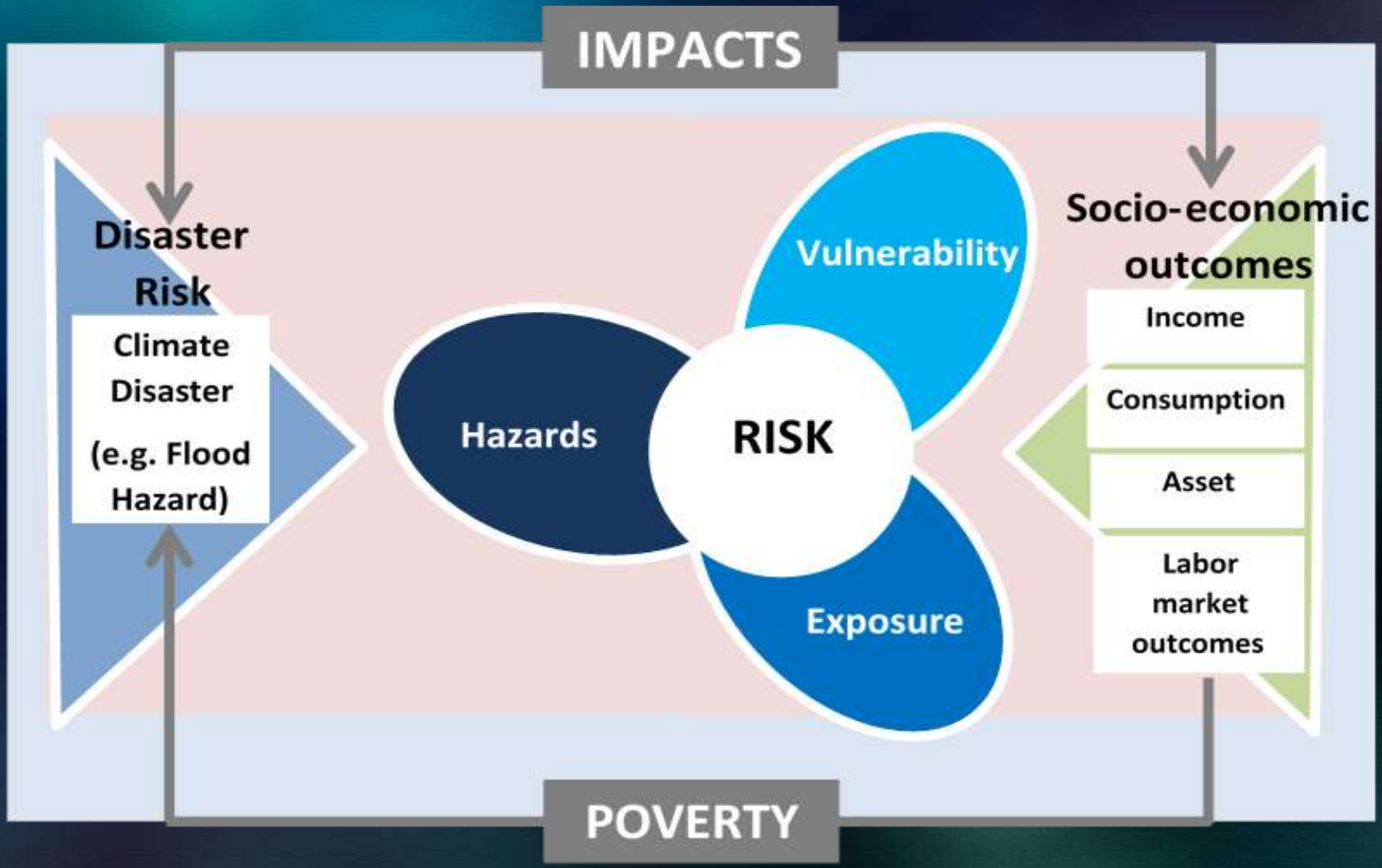


FIG 1: Author's elaboration of the theoretical framework based on Wisner et al. (2004) and IPCC (2014).

Empirical Evidences

Developing countries

Short-run

- *Climate disasters on household resilience and health outcomes (Arouri et al. 2015 and Lohmann and Lechtenfeld, 2015).*
- *Rainfall variability and consumption (Bandyopadhyay and Skoufias, 2015).*

Long-run

- *Catastrophic events and long-run economic growth (Hsiang and Jina, 2014).*

Developed countries

- *Masozera et al. (2007)*
- *Bergstrand et al. (2015)*

The Gaps in this Literature

- Questionnaire on Shocks and Coping in the Household Income and Expenditure Surveys (HIES)

- Self-identifications vs. disaster risk index-based identifications

- 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.

Limitations of Self-reported data

- *O'Neill et al. (2016); Trumbo et al. (2016)*

- Self-reporting in terms of being affected could be subjective and might bring biased results due to sorting or selective reporting (*Heltberg, Oviedo and Talukdar, 2015*).

- Self-reported data could not only be a subject of recall error, but also to other forms of cognitive bias like reference dependence (*Guiteras, Jina and Mobarak, 2015*).

The Question we ask

'What are the impacts on household income, expenditure, asset and labor market outcomes of recurrent flooding in Bangladesh?'

Data and Measures of Disaster Risk Exposure

Treatment group A

Household Data

- HIES (self-reported flood hazard data)

PRIMARY FOCUS	ROBUSTNESS CHECKS
Year 2010 (12,240 HH)	Y 2000 (7,440 HH) Y 2005 (10,080 HH) Y 2010 (12,240 HH)

Treatment group B

Rainfall Data

- BMD (rainfall-based flood risk index)
- *Karim and Noy (2015)*

The Identification Strategy

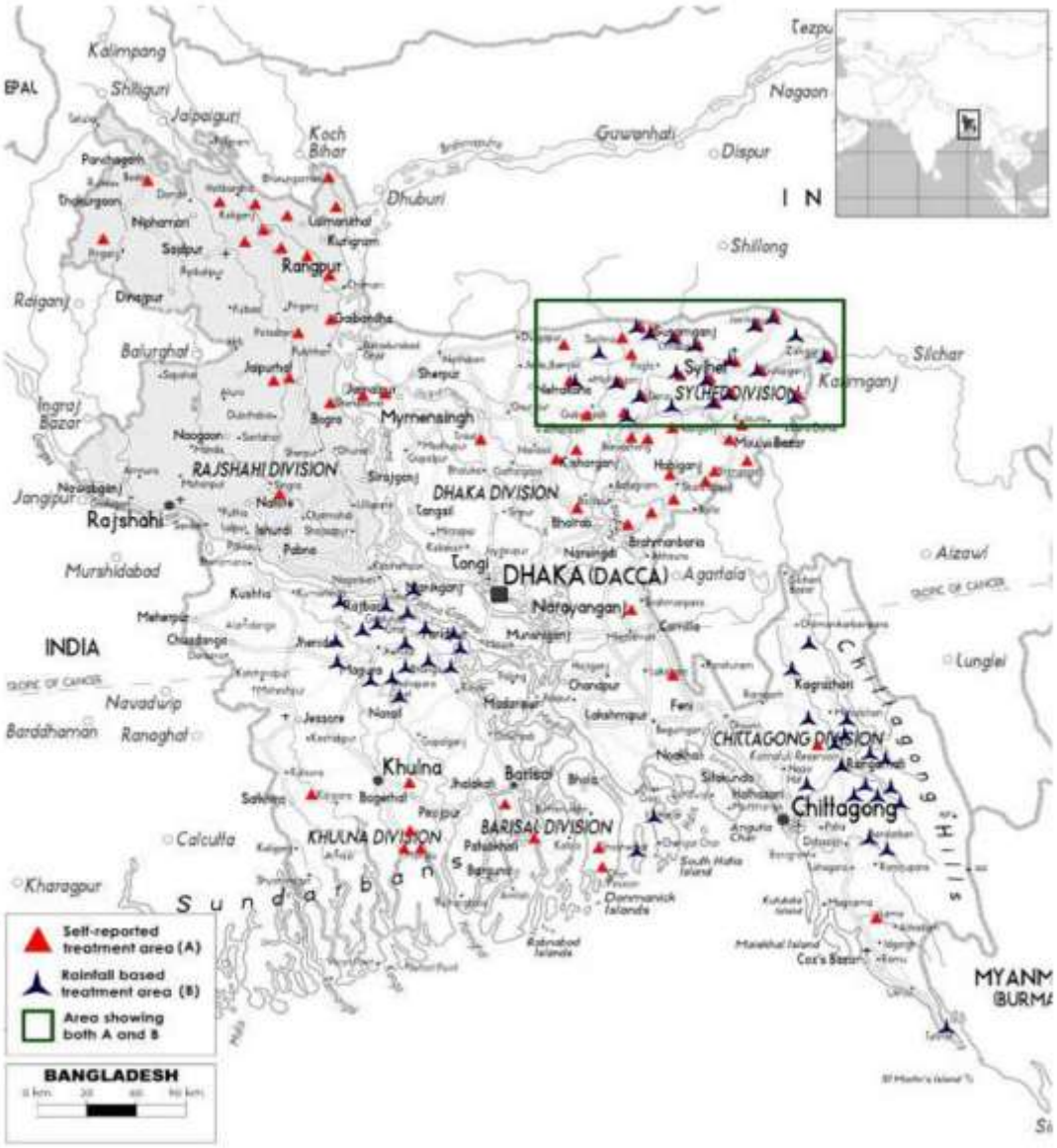


Figure 2. Map showing the treatment areas (sub-districts) in the study.

Methodological framework

We start by examining the most parsimonious specification:

$$y_{ij} = \alpha + \beta_1 A_{ij} + \beta_2 B_{ij} + \beta_3 C_{ij} + \gamma (X_{ij}) + u_{ij} \qquad (1)$$

Where y_{ij} is the outcome variable for household (i) in sub-district (j) (i.e. income, expenditure, asset and labor market outcomes), β_1 represents the coefficient for treatment group A (self-reported flood impacts only), β_2 represents the coefficient for treatment group B (flood-risk index based shocks only), β_3 represents the coefficient for both self-reported disaster (flood) impact and index-based identifications (C), X_{ij} denotes the control variables indicating households' socio-economic characteristics and infrastructural features, and u_{ij} indicate the error term. We use robust standard errors for our hypothesis tests.

To further investigate whether household-level characteristics (e.g. rural, landownership and more education) has impacts on disaster-risk identifications, we further estimate the following equation:

$$y_{ij} = \alpha + \beta_1 A_{ij} + \beta_2 B_{ij} + \beta_3 C_{ij} + \gamma^1 (X_{ij}{}^1) + \gamma^2 (X_{ij}{}^2) + \delta^1 (A_{ij}. X_{ij}{}^2) + \delta^2 (B_{ij}. X_{ij}{}^2) + \delta^3 (C_{ij}. X_{ij}{}^2) + u_{ij} \qquad (2)$$

Descriptive Statistics

Variables	Type	Mean standard deviation			
Outcome variables		Treatment A	Control A	Treatment B	Control B
Per capita total income	Continuous	911940.4	926187.1	910175.2	928971.5
		606662.3	641924.1	581756.4	652139.9
Per capita crop income	Continuous	194200.9	172257.1	169420	173286.1
		120641.9	94183.72	91191.19	95445.03
Per capita non-crop income	Continuous	233546.5	248931.6	230389.3	252173
		537408.4	543124.3	456983.5	558031.4
Per capita business income	Continuous	468905.9	488696	493480	487336.6
		255953.5	296302.3	303387.3	294090.6
Per capita other income	Continuous	15287.03	16796.23	18149.76	16501.34
		31811.08	51837.51	66344.03	48152.93
Per capita total expenditure	Continuous	1454900	1441364	1426657	1444506
		431931.9	434467.7	431057.4	435013.9
Per capita food expenditure	Continuous	85007.71	85364.12	85224.26	85383.35
		23346.4	22095.96	22023.35	22137.98
Per capita non-food expenditure	Continuous	737893.7	742763.1	736179.2	743929.7
		236691.1	242337.5	243034.8	242061.4
Per capita crop expenditure	Continuous	107859.9	106216.5	105621.7	106367.3
		41673.97	46624.14	47004.28	46447.4
Per capita non-crop expenditure	Continuous	96695	92351.51	92745.11	92370.86
		62587.95	46292.79	48930.08	46192.2
Per capita agricultural input expenditure	Continuous	292600.7	285233.4	278433.5	286710.1
		132586.7	129633	126025.8	130345.6

The Covariates

Covariates					
Rural	Binary	0.675556	0.63976	0.626008	0.643205
		0.469211	0.48009	0.483984	0.479077
Head of household is male	Binary	1.004444	1.003994	1.00252	1.004289
		0.066667	0.066918	0.067322	0.066831
Average age	Continuous	26.4378	26.67	26.63367	26.67193
		1.347331	1.386957	1.643582	1.331109
Dependent	Continuous	90.41333	90.62736	90.70716	90.60723
		24.58355	24.16744	24.26731	24.15725
Proportion of formal education	Continuous	76.81407	76.97305	76.95353	76.97334
		19.83074	19.25972	19.29904	19.26478
Access to sanitation	Binary	0.488889	0.528168	0.524194	0.528076
		0.500991	0.499227	0.49954	0.499236
Access to safe drinking water	Binary	0.991111	0.963968	0.970262	0.963346
		0.09407	0.186378	0.169906	0.187921
Access to electricity	Binary	0.608889	0.575934	0.571573	0.577501
		0.489087	0.494221	0.494976	0.493981
House ownership	Binary	0.857778	0.809603	0.806452	0.811269
		0.350057	0.392631	0.395179	0.391314
Land ownership (in real terms)	Continuous	69.48	62.74894	61.85938	63.06863
		128.0451	128.9109	121.0524	130.3597

Estimation results

	INCOME			CONSUMPTION			
	TOTAL	CROP	NON-CROP		TOTAL	CROP	AGRIINP
TREATMENT A	↓			TREATMENT A	↑		
TREATMENT B	↓	↓		TREATMENT B	↓	↓	↓
BOTH (C)			↓				

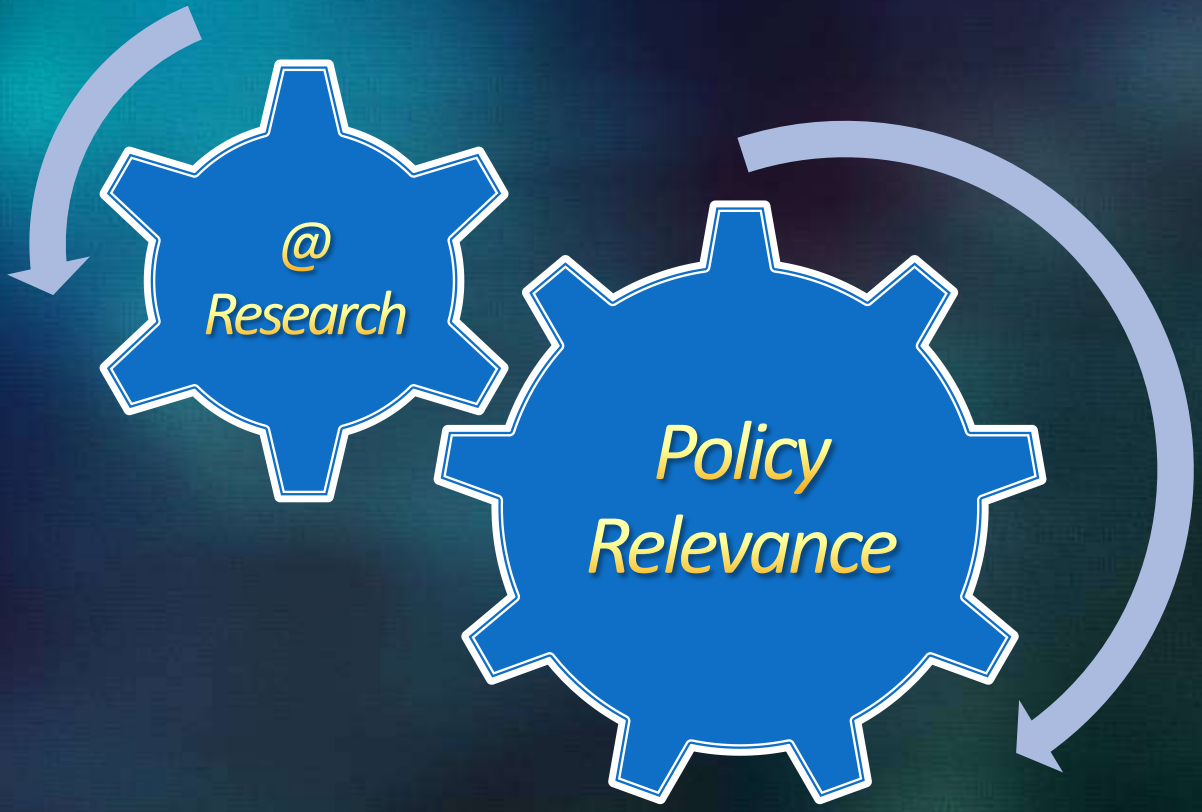
ASSET			LABOR MARKET	
	CABA	AIAV		DAILY WAGE
TREATMENT A		↑	TREATMENT A	
TREATMENT B			TREATMENT B	↑
BOTH (C)	↓			

Interaction terms

Table 6
Coefficients of the interaction terms of main outcome variables of interest

Variables	(1) Total income	(2) Total exp
Treatment group A*Education	−3,426.55***	−1,586.93*
	(1,277.09)	(843.68)
Treatment group B*Education	377.46	147.16
	(474.31)	(318.76)
Treatment group A*Landownership	−1.33	111.22
	(142.78)	(155.19)
Treatment group B*Landownership	153.40*	131.33***
	(88.02)	(48.84)
Treatment group A*Rural	−105,290.92	36,706.85
	(103,140.17)	(42,104.29)
Treatment group B*Rural	−28,266.56	−6,592.90
	(26,892.41)	(13,508.65)
Both treatment C*Education	13.84	−307.93
	(3,046.68)	(2,278.24)
Both treatment C*Landownership	216.98	177.94
	(475.39)	(205.67)
Both treatment C*Rural	−285,759.28*	−124,226.08
	(154,600.41)	(95,121.54)
Constant	−3909442.31***	−1117883.19***
	(151,012.71)	(55,285.22)
Observations	12,242	12,242
R-squared	0.20	0.63

Research 2 Policy



Thank you for your attention!

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Questions, Comments and/or Criticisms