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The household response to persistent natural disasters: Evidence from Bangladesh

Azreen Karim

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Further enquiries to:

The Administrator
School of Economics and Finance
Victoria University of Wellington
P O Box 600
Wellington 6140
New Zealand

Phone: +64 4 463 5353
Email: alice.fong@vuw.ac.nz

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THE HOUSEHOLD RESPONSE TO PERSISTENT NATURAL DISASTERS: EVIDENCE FROM BANGLADESH

Azreen Karim*

School of Economics and Finance
Victoria Business School
Victoria University of Wellington, New Zealand

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ABSTRACT

We examine the short-run economic impacts of recurrent flooding on Bangladeshi households surveyed in 2000, 2005 and 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 two treatment (affected) groups by using the self-reported data and historical rainfall data based flood risk index. We estimate a difference-in-difference (DID) model to quantify the impacts on income, expenditure, asset and labour market outcomes and further extend our analysis to different income and expenditure brackets. Overall, we find robust evidence of negative impacts on agricultural income and expenditure. Intriguingly, the extreme poor (i.e. the bottom 15th quintile) experience significant positive impacts on agricultural income in the self-reported treatment case.

JEL Codes: Q54, Q56, O12, I3, C31.

Key words: Development, Natural Disasters, Persistent, Difference-in-Difference.

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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 (OECD, 2003; McGuigan et al., 2002; Beg et al., 2002). Recent literatures examine the short-run effects of natural disasters on household welfare and health outcomes (Arouri et al., 2015; Lohmann and Lechtenfeld, 2015; Silbert and Pilar Useche, 2012; Rodriguez-Oreggia et al. 2013, Lopez-Calva and Juarez, 2009). 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 labour market outcomes of recurrent flooding in Bangladesh?'

We examine the short-run economic impacts of recurrent flooding on Bangladeshi households surveyed in 2000, 2005 and 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. Therefore, this paper makes two key contributions in the 'disaster-development' literature: First, we develop a difference-in-difference (DID) model and estimate the impacts of recurrent flooding through identification of two different treatment (affected) groups using self-reported information and historical rainfall data based flood risk index for Bangladesh. We further extend our analysis using a quantile regression and quantify the impacts on the 'ultra' (extreme) poor.[3] The development responses of the climatic disasters may therefore depend on the novel approach i.e. accuracy in identifying the

[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 spill over effects.

[3] The term 'ultra-poor' was coined in 1986 by Michael Lipton of the University of Sussex and is defined as 'a group of people who eat below 80% of their energy requirements despite spending at least 80% of income on food'. In this paper, we refer to the households who belong to the bottom 15thquintile of per capita income/expenditure brackets.

treatment groups using self- and non-self-reported data. Second, 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 reviews the 'new' macro-micro literature highlighting recent insights to explore the nexus between climate disasters and economic development. Section 3 portrays our identification strategy while Section 4 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 5, we present and analyse the estimation results with previous literature along with some robustness checks in Section 6. Finally, in Section 7 we conclude with relevant policy implications and also some insight for further advancements.

2. CLIMATE DISASTERS AND DEVELOPMENT: THE 'NEW' MACRO-MICRO LITERATURE

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 (Felbermayr and Gröschl, 2014; Acevedo, 2014). Vulnerable economies for example, the Pacific islands could expect a growth drop by 0.7 percentage points for damages equivalent to 1 percent of GDP in the year of the disaster (Cabezon et al., 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 (2009)[4] 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.

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

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.[5] Two recent studies on rural Vietnam looked at the impacts on climate disasters such as floods, storms and droughts on household resilience and health outcomes (Arouri, Nguyen and Youssef, 2015 and Lohmann and Lechtenfeld, 2015). Arouri et al. (2015) pointed out that micro-credit access, internal remittance and social allowances could strengthen household resilience to natural disasters. However, high resilience might not necessarily reflect low vulnerability as evident in a study conducted on tropical coastal communities in Bangladesh (Akter and Mallick, 2013). Moreover, another study on the Pacific island of Samoa by Le De, Gaillard and Friesen (2015) suggests that differential access to remittances could increase both inequality and vulnerability. Bandyopadhyay and Skoufias (2015) show that climate induced rainfall variability influence employment choices impacting lower consumption in flood-prone sub-districts in rural Bangladesh. Assessing relationship between household heterogeneity and vulnerability to consumption patterns to covariate shocks as floods and droughts, Kurosaki (2015) identified landownership to be a critical factor to cope with floods in Pakistan. A recent study on the Indian state of Tamil Nadu by Balasubramanian (2015) estimates the impact of climate variables (i.e. reduction in ground water availability at higher temperature than a threshold of 34.31^0 C) on agricultural income impacting small land owners to get low returns to agriculture. In one particular examination on occurrence and frequency of typhoons and/or floods in Pasay City, Metro Manila by Israel and Briones (2014) reveals significant and negative effects on household per capita income.

This growing 'Climate-Development' literature further explores empirical patterns in risk, shocks and risk management by using shock modules in questionnaire-based surveys to complement existing risk management tools. This usage of self-reported information on natural shocks motivated researchers to develop different dimension of identification strategies and compare impact findings using econometric models. Two recent studies by Noy and Patel (2014) and Poapongsakorn and Meethom (2013) investigate household welfare and spill over effects of the 2011 Thailand flood identifying self-reported affected (treatment) group in a difference-in-difference modelling framework. Nevertheless, evidences suggest

[5] Karim and Noy (2015a) provide a qualitative survey of the empirical literature on poverty and natural disasters.

careful use of self-reported data in identifying the true impacts which is also one of the highlights in this paper.[6]

3. IDENTIFICATION STRATEGY

Our objective in this paper is to analyse the short-run impacts of recurrent flooding on household income, expenditure, asset and labour market outcomes through identification of treatment (affected) groups using both self- and non-self-reported data (historical rainfall data based flood risk index). We use the term 'persistent natural disasters' to refer to repeated natural disasters (e.g. flood) that occurs almost every year and possess increase risks of occurrence due to rainfall variability.[7] Our estimation strategy compares households surveyed on and before year 2010 (in which shock module was introduced with questionnaire related to natural disasters). Therefore, we define year 2010 as post.

We identify two treatment groups using self- and non-self-reported data as a) shock module was introduced in the 2010 Household Income and Expenditure Survey (HIES) and no new surveys have been conducted at the national level since then[8] and b) self-reporting in terms of being affected could be subjective and might bring biased results due to sorting or selective reporting.[9] 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 module on shocks and coping responses was first introduced in HIES 2010 to identify households affected by various idiosyncratic and covariate shocks. As our focus in this paper is on covariate shocks i.e. flood, we identify households who have self-reported to be affected by floods only in 2010 survey. The earlier surveys – 2000 and 2005 did not have any shock module and hence identification of self-reported affected groups were not possible. However, Bangladesh as a disaster-prone country, disasters particularly flood is a repeated phenomenon every year. Therefore, a comparison control group could be those households who are not affected by specific natural disasters, if any, in the survey regions in that

[6] See Guiteras, Jina, and Mobarak (2015) and Heltberg, Oviedo and Talukdar (2015).
[7] See Bandyopadhyay and Skoufias (2015) and Gosling et al. (2011).
[8] The decision process of 2015 survey is currently underway according to the information provided by the current Project Director of HIES.
[9] See Heltberg, Oviedo and Talukdar (2015) for a discussion on how survey modules falls short of expectations in several ways.

particular year. Here, we took flood as persistent natural disaster due its repeated occurrence every year mostly during the monsoon period (May-October). Due to absence of shock modules in the dataset in years 2000 and 2005, we identify two 'treatment' groups – treatment group A and treatment group B.

To identify our first treatment group i.e. treatment group A, we use a rainfall-based flood risk probability index using historical rainfall dataset from the Bangladesh Meteorological Department (BMD) to identify upazilas/thanas (in particular, the survey areas) which are affected by excessive rainfall more than average rainfall over a long period (1948-2012).[10] The rule of thumb is the survey areas which experienced more than average rainfall compared to the benchmark of average rainfall of 64 years in the corresponding weather station in respective survey years (e.g. 2000, 2005 and 2010), the surveyed households' falls under treatment group A. The second treatment group i.e. treatment group B is identified through a combination of both self-reported and non-self-reported information due to absence of shock modules before 2010 and prevalence of flooding every year. From 2010 survey, the treatment group is the respondents who have said 'Yes' as being affected by natural disasters such as flood. The benefits of using a rainfall-based flood risk criterion are twofold. First, it justifies homogeneity among affected households in terms of a common natural shock i.e. flood. Second, we can compare the development impacts with two different treatment groups and the differences could refer to discrepancies in capturing the true impacts using shock modules. The control (not affected) group in first instance i.e. control group A are those households who resided in survey areas that did not experience excessive rainfall compared to the average rainfall of 64 years in the corresponding weather station in respective survey years (here, 2000, 2005 and 2010). The second control group i.e. control group B is also identified through a combination of both self-reported and non-self-reported information due to absence of shock modules in years 2000 and 2005. In 2010, the controls are those households who have responded 'No' to being affected by flood. We use the rainfall-based flood risk measure to identify the control households for 2000 and 2005 in control group B.

[10] See Karim and Noy (2015b) for a detailed breakdown of the index construction.

4. DATA AND METHODOLOGY

(a) Data description

We use Household Income and Expenditure Survey (HIES) of the Bangladesh economy spanning over a time period of 10 years and consists of three (3) waves: 2000, 2005 and 2010. The HIES is the nationally representative dataset conducted by the Bangladesh Bureau of Statistics (BBS) (in affiliation with the Ministry of Planning, Government of Bangladesh and technical and financial assistance from the World Bank) that records information regarding income, expenditure, consumption, education, health, employment and labour market, assets, measures of standard of living and poverty situation for different income brackets in urban and rural areas. The BBS conducts this survey every five (5) years. The latest HIES conducted in 2010 added four (4) additional modules in which one refers to 'Shocks and Coping' (Section 6B) in the questionnaire. The BBS HIES is a repeated cross-section dataset with randomly selected households in designated primary sampling units (PSUs). Therefore, the strength of the dataset is large sample size covering a broad range of households. However, limitations are there in capturing the impacts over time. The number of households in year 2000 is 7,440 with 10,080 and 12,240 in year 2005 and year 2010 respectively. We also use the Bangladesh Meteorological Department (BMD) rainfall dataset from 1948-2012 (i.e. 64 years) for 35 weather stations across the country to identify flood-affected treatment group in respective survey years under consideration.

(b) Methodological framework

We employ the difference-in-difference (DID) estimation framework to estimate the development impacts on affected households due to flood. We start with the following specification:

$$y_{it} = \beta_0 + \beta_1 \text{post}_{2010} + \beta_2 \text{treated}_i + \beta_3 \text{post}_{2010}.\text{treated}_i + \beta_4 X_{it} + \beta_5 \text{year}_{2005} + \beta_6 \text{year}_{2005}.\ \text{treated}_i + \text{u}_{it} \qquad (1)$$

Where post = 1 if the observation is from 2010, β_2 is the difference between treatment and control groups on the baseline, X_{it} denotes the covariates indicating household (*i*) and socio-economic characteristics and infrastructural features, β_5 is time fixed effect for year 2005, β_6 is the interaction term and u_{it} indicate the error term. The β_3 coefficient measures the difference-in-difference (DID) impact of a natural shock on outcome variables (development impact indicators), y_{it}. We use robust standard errors for our hypothesis tests.

We further conduct quantile regression (estimating five different quintiles e.g. 15th, 25th, 50th, 75th and 85th quintiles) using the same DID framework to compare our results for different income and expenditure brackets.[11]

$$Qy_{it} = \beta_{0(\alpha)} + \beta_{1(\alpha)}\text{post}_{2010} + \beta_{2(\alpha)}\text{treated}_i + \beta_{3(\alpha)}\text{post}_{2010}.\text{treated}_i + \beta_{4\,(\alpha)}X_{it} + \beta_{5(\alpha)}\text{year}_{2005} + \beta_{6(\alpha)}\text{year}_{2005}.\ \text{treated}_i + u_{it} \qquad (2)$$

Where Q refers to quantile regression, α denotes selected quintiles (0.15, 0.25, 0.50, 0.75 and 0.85) and all other variables are as previously defined. We also estimate the following semi-logarithmic regression model by log-transformation of the dependent and continuous independent variables as robustness checks for our main results:[12]

$$\log y_{it} = \alpha_0 + \alpha_1\text{post}_{2010} + \alpha_2\text{treated}_i + \alpha_3\text{post}_{2010}.\text{treated}_i + \alpha_4 X_{it} + \alpha_5\,\text{year}_{2005} + \alpha_6\text{year}_{2005}.\ \text{treated}_i + u_{it} \qquad (3)$$

(c) Outcome variables and choice of covariates

Appendix tables 1 and 2 show the list of key outcome variables and the covariates (continuous and categorical) and their descriptive statistics for two different sets of treatment and control groups. Our outcome variables of interest include four sets of development indicators. They are: income (income by category), expenditure (expenditure/consumption

[11] See Khandker, Bakht and Koolwal (2009).
[12] Since this type of transformation closely follows normal distribution. See Sugiyarto (2007) for more discussion.

by category), asset types and labour market outcomes. Income and expenditure are divided into various sub-groups with statistics shown in per capita household measures. Asset and labour market outcomes are also sub-divided into various categories (also described in appendix tables 1 and 2). The continuous (monetary) variables in each category are inflation-adjusted using consumer price index (CPI) data from the Bangladesh Bank to allow for comparisons across different years.

Alleviating poverty is a fundamental challenge for Bangladesh with the majority of the extreme poor living in rural areas with considerable flood risk bringing annual agricultural and losses to livelihoods (JBIC, 2007; Fadeeva, 2014; Ferdousi and Dehai, 2014). Hence, we control for 'rural' that takes the value 1 if the household resides in a rural area and 0 if otherwise reported. The male member as household head is generally considered as 'bread earner' and a good amount of literature also highlighted the positive association between female-headed households and poverty especially in developing countries (Mallick and Rafi, 2010; Aritomi et al., 2008; Buvinic and Rao Gupta, 1997). Therefore, a dummy variable has been created indicating 1 if the household head is male and 0, if reported otherwise. Household characteristics such as age structure and number of dependents is critical to analyse poverty status and one might expect larger number of dependents leads to greater poverty (Kotikula et al., 2010; Haughton and Khandker, 2009; Lanjouw and Ravallion, 1995). Education is also related with lower poverty (Kotikula et al., 2010). Community-level characteristic such as access to sanitation and access to safe drinking water is clearly associated with better health outcomes improving poverty status (World Bank, 2014; Duflo et al., 2012) of households with access to electricity also showing a positive trend in living standards (Kotikula et al., 2010). Therefore, three (3) binary variables are created indicating 1 to imply access to these services, 0 otherwise. Ownership status of households such as house and land has also been argued as important determinant of poverty with owners of a dwelling place are found to be less vulnerable to flood risk (e.g. Khatun, 2015; Tasneem and Shindaini, 2013; Gerstter et al., 2011; Meinzen-Dick, 2009; Rayhan, 2010). A description of these variables including summary statistics is also provided in appendix tables 1 and 2.

(d) Descriptive statistics

We provide two sets of descriptive statistics for two different treatment and control groups (treatment group A and treatment group B) in appendix tables 1 and 2 respectively. We present mean and standard deviation for various outcome categories and covariates for both rainfall-based and self-reported treatment (affected) and control (not affected) groups. Most of the income categories especially agricultural (crop and non-crop) income seems to be much higher for the control group compared to treatment for treatment group A with exception in 'other income' category. The total income per capita for the control group is on average, almost 80% higher compared to the treatment group. The other treatment group i.e. treatment group B intriguingly does not show too much variation in terms of mean income by categories. However, mean of 'other income' turns out to be almost 11% lower for the controls compared to treatment in treatment group B. The expenditure categories also show almost similar patterns i.e. larger variations between treatment and control groups for treatment group A compared to smaller variation for treatment group B. There are interesting parallel trends in the mean results of the covariates (independent variables) between the two treatment groups. The affected households in treatment group A have more working adults i.e. less dependents compared to treatment group B. However, the self-reported treatment group has more ownership of land compared to non-self-reported ones. Community characteristics such as access to sanitation, safe drinking water and electricity also show parallel trends in their mean outcomes in both treatment group – A and B.

5. ESTIMATION RESULTS

We start by estimating our benchmark difference-in-difference (DID) model with two treatment groups: treatment group A and treatment group B for four development outcomes: income, expenditure, asset and labour market. We compare the results for each category (in terms of aggregate and disaggregated outcome measures) and show the robustness under various income and expenditure brackets.

(a) Income

We report impacts of recurrent-flooding on different income categories i.e. crop, non-crop, business and other income for rainfall-based flood affected and self-reported treatment groups in tables 1 and 2 respectively. We find both treatment (affected) households experience negative impacts on total income being consistent with previous disaster literatures (e.g. Asiimwe and Mpuga, 2007; Thomas et al., 2010; De La Fuente, 2010). Our results indicates that income reduces by almost 11% more (estimated to be approximately BDT 17,807[13]) for treatment group A compared to the mean. A decline in crop income is higher for treatment group A (by BDT 7,428) whereas treatment group B observe comparatively greater reduction in non-crop income (by BDT 26,644) being consistent with evidences that show decline in agricultural income due to rainfall shocks (e.g. Skoufias et al., 2012; Baez and Mason, 2008; UNISDR, 2012). We do not observe any significant negative impacts on business income (non-agricultural enterprise) and other income in both treatment cases. These results could also be justified by previous works done by Attzs (2008) and Patnaik and Narayanan (2010). Among the covariates; male-headed households and formal education seems to have a stronger positive association with total income in addition to community variables such as access to sanitation and access to electricity. Ownership of land show moderate to strong impact on total income. Intriguingly, both average age of households and the number of dependents show a positive association with total income. This might be due to the fact that there exists a relationship between household head and household members who are over 65 years old.[14] It is more likely that the senior members are household heads and possess control over ownership of land and house.[15]

We also observe a contrast in terms of the impacts of repeated-flooding on the ultra-poor (i.e. the bottom 15%) between both treatment groups. Total income for the extreme poor are found to be negatively affected for self-reported treatment group (treatment group B) whereas income effect is much stronger for the middle 50% for treatment group A.[16]

[13] 1 US Dollar = 77.88 Bangladeshi Taka (BDT).
[14] We define household members who are less than 15 and greater than 65 years old as 'dependents'.
[15] See Zaman (1999).
[16] According to Tesliuc and Lindert (2002); the poor are disproportionately more exposed to natural disasters and agriculture related shocks and income inequality increased by 16% as a result of shocks. Yamamura (2013) also conclude an increase in income inequality in the short-term due to disasters in general.

However, the richer households are not found to be negatively affected in treatment group B compared to a significantly negative effect for richer households (i.e. the top 15%) for rainfall-based treatment group (treatment group A). Nevertheless, crop income show significantly negative impact (drop by BDT 3,198) on the bottom 15th quintile for treatment group A while treatment group B revealing a much stronger impact for the middle to higher income brackets (in per capita measures). We observe significant negative impacts (by BDT 319,522) on business income for the ultra-poor for self-reported treatment group (treatment group B). Households also experience significant negative impacts in other income category in both treatment cases.

(b) Consumption / Expenditure

We report impact estimates of various expenditure categories i.e. food, non-food, crop, non-crop, agricultural input, education and health for non-self- and self-reported treatment group in tables 3 and 4 consecutively. Our results show a significantly negative impact on total expenditure (i.e. drop by BDT 22,007) for treatment group A (non-self-reported) being consistent with previous literatures (e.g. Dercon, 2004; Auffret, 2003; Asiimwe and Mpuga, 2007; Jha, 2006; Shoji, 2010; Foltz et al. 2013). Interestingly, treatment group B (self-reported) reveal a positive impact on total expenditure due to flooding. This result could also be justified by coping strategies, safety net and micro-credit borrowing by households.[17] Our focal categories i.e. crop expenditure and agricultural input expenditure (as we assume these categories are directly related to rainfall shocks and flood) show negative impacts in both treatment cases. However, although both categories show sign consistencies, agricultural input expenditure is found statistically significant in treatment group A while treatment group B display statistical significance in crop expenditure. In accordance with income estimates for two treatment groups, the covariates in the expenditure categories also reveal almost similar types of relationship with expenditure outcome categories. In both treatment cases, in addition to male-headed households and formal education, all three community characteristics (e.g. access to electricity, sanitation and pure drinking water) demonstrate strong positive association with total expenditure. We also anticipate similar

[17] See Khandker (2007); Demont (2013); Vicarelli (2010).

reasoning for positive outcomes of average age and number of dependents for both treatment group – A and B.

We further extend our analysis by looking at these impacts at various quintiles. We observe a contrast in estimation results for different quintiles for non-self and self-reported treatment group. We find significant negative impacts for the bottom 15% with a much stronger impact for the middle 50% for treatment group A. Intriguingly, we find a significant positive outcome for the bottom 15% for treatment group B (also justified by previous work)[18] which however demonstrate significantly negative impact for the bottom 25% (by BDT 301,632) and for the top 15% (drop by BDT 47,967). Again, crop expenditure reveals significantly negative impact for the ultra-poor (i.e. the bottom 15th quintile) in treatment group A and B. However, although agricultural input expenditure show negative impacts for treatment group A, it reveals a positive outcome for treatment group B with statistical significance in both cases. We also observe a contrast in educational and health expenditure outcomes for non-self and self-reported treatment group as well.

(c) Asset

Tables 5 and 6 demonstrate the impacts of repeated-flooding on three asset categories: changes in agricultural and other business asset, agricultural input asset value and consumer durable asset value for both affected (treat) groups. We do not observe much contrast in these categories though. The rainfall-based flood affected treatment group (treatment group A) observe negative impacts (although not statistically significant) on change in agricultural and other business asset (by BDT 6,144) while self-reported treatment group (treatment group B) reveal significant negative impacts (by BDT 103,611) in similar category quite consistent with previous evidences on asset categories (e.g. Mogues, 2011; Anttila-Hughes and Hsiang, 2013). Nevertheless, treatment group B reveals significant positive impact on agricultural input asset value compared to a negative value for treatment group A in this category.

[18] Ibid.

(d) Labour market

We present impacts on labour market for both treatment group – A and B in tables 7 and 8 sequentially. Daily wages are not found to be severely affected in both treatment group (positive impact) with statistical significance for self-reported treatment case (by BDT 101). This somewhat been justified in some previous empirical researches (e.g. Shah and Steinberg, 2012; Banerjee, 2007).[19] Interestingly, salaried wage reveals significant positive outcome in treatment group B (by BDT 3,894) with negative impact for treatment group A (but without statistical significance). This result is also partially found consistent with the findings of Mueller and Quisumbing (2011). We also observe a contrast in estimates of yearly benefits for both treatment group.

6. ROBUSTNESS CHECKS

As robustness checks, we further examine these impacts by estimating a semi-logarithmic regression model (as specified in equation 3) and compare the results with our benchmark estimation. We do not observe too much variation in terms of the impacts compare to our base specification estimations. In the income category, we observe significantly negative impact in total income (drop by almost 22%) for both treatment group – A and B. Business income in both treatment groups reveals positive impact (with statistical significance in treatment group A) being consistent with our prior estimations. Crop and non-crop expenditure reveals significant reduction of almost 12% and 27% consecutively for both treatment groups. We also observe significantly negative decline in agricultural input expenditure for rainfall-based and self-reported treatment group by almost 32% and 27% respectively. The impacts on agricultural input asset value show significantly negative impacts (by almost 28% and 32% respectively) for both treatment cases. However, we observe positive impact in changes in agricultural and other business asset category for treatment group A (rainfall-based). In addition, we observe positive impacts for other income in both

[19] Banerjee (2007) find that floods have positive implications for wages in the long run. Interestingly, Mueller and Osgood (2009) reveal that droughts have significant negative impacts on rural wages in the long run. We are quite agnostic on the general implications of natural disasters on wages due to limitations in this study.

treatment cases contrasting with our benchmark specification results. The food and non-food expenditure categories displays significantly negative impacts for both rainfall based and self-reported treatment case. Households experience significant decline in food expenditure by almost 5.5% for treatment group A compared to a 3% decline for treatment group B. Both treatment group further reveals significant reduction of almost 7.5% in non-food expenditure.

7. CONCLUSION

Our objective in this paper is to estimate the impacts of recurrent flooding on income, expenditure, asset and labour market outcomes. We start with identification of the treatment (affected) groups with setting two benchmarks i.e. using self- and non-self-reported (historical rainfall data based flood risk index) information. We employ a difference-in-difference estimation model to understand the impacts of disaster on households surveyed on and before year 2010 (defined as post). Our results suggest a sharp decline in agricultural income (crop and non-crop) for both treatment group – A (rainfall-based) and B (self-reported). This significant decline in agricultural income, being consistent with previous literatures reveals a clear message on timely adoption of insurance in the context of increased climatic threat to achieve sustainable poverty goals for the ultra-poor especially in agriculture-based economy like Bangladesh. As per expenditure in concerned, we also observe a negative response to crop and agricultural input expenditure consistent with our theoretical prior in both treatment cases.

We extend our analysis for income and expenditure categories for households of various socio-economic backgrounds. We find a contrast in terms of impact for the ultra (bottom 15%) poor in total income and expenditure between treatment group – A and B. We also observe a contrast in educational and health expenditures for both non-self and self-reported treatment group. We further strengthen our results using semi-logarithmic regression model as robustness checks and observe consistencies in most cases with our benchmark estimation results.

The ‘disaster-development’ literature has made considerably less progress on the use of shock modules to empirically estimate the impacts of natural disasters on development outcomes. The recent addition of shock questionnaires in nationally representative

household income and expenditure surveys provides an ample scope to identify the self-reported affected groups in repeated natural disasters. However, questions' based on 'yes/no' responses (i.e. close-ended) might not be sufficient to identify the true development impacts. The selection of the respondents (sample) in this particular set of questionnaire (shock questions on natural disasters) is also questionable depending on criteria.[20] There is an obvious need to employ both qualitative and quantitative techniques to understand the degrees of experience in impact analysis.[21]

We do not rule out the fact that the dissimilarities in our results in two benchmark treatment cases might also be due to absence of shock modules in self-reported treatment group (treatment group B) in years' 2000 and 2005 in the household data that we use. One possible solution is of course, more respondents in addition to incorporating degrees of actual hazard awareness, experience and preparedness questions' to identify the real affected group in repeated natural shocks. However, the evidences and the novel approach that we adopt in this paper could justify future research in estimating welfare adaptation costs of climate-induced persistent natural events in developing countries.

[20] See Hawkes and Rowe (2008).
[21] See Bird (2009).

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TABLE 1: IMPACT ON HOUSEHOLD INCOME PER CAPITA (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	**TOTAL INCOME**	**CROP INCOME**	**NON-CROP INCOME**	**BUSINESS INCOME**	**OTHER INCOME**
POST (YEAR 2010)	173,513.18***	49,542.34***	60,365.63***	61,746.82***	-8,946.92***
	(11,755.80)	(3,754.90)	(5,937.03)	(8,236.91)	(3,243.78)
TREATMENT GROUP A	11,237.98**	3,334.38***	708.17	1,650.77**	5,431.69
	(4,902.10)	(508.65)	(1,565.30)	(791.68)	(4,618.95)
POST * TREATMENT GROUP A	-17,806.84	-7,427.99***	-11,700.08	4,882.17	-2,494.28
	(18,374.86)	(2,615.96)	(15,711.15)	(8,503.48)	(4,706.93)
RURAL	-1,630.66	2,627.40*	5,300.90	-7,793.94**	-3,571.06***
	(7,084.05)	(1,446.14)	(7,041.19)	(3,954.21)	(828.62)
MALE HOUSEHOLD HEAD	108,945.46***	5,148.74***	157,383.63***	1,519.88	-16,245.62***
	(16,197.13)	(582.16)	(20,503.23)	(2,706.72)	(2,505.51)
AVERAGE AGE	2,315.59***	283.44***	1,556.93***	824.99***	336.68**
	(180.45)	(26.78)	(119.46)	(63.94)	(147.27)
DEPENDENT	7,864.25***	1,256.42***	2,049.30***	4,570.11***	-10.29
	(122.40)	(39.53)	(55.94)	(89.85)	(17.64)
PROPORTION_FORMAL EDUCATION	20,985.31***	6,013.26***	-6,028.35	15,674.08***	13,960.31***
	(5,623.03)	(1,064.36)	(4,323.55)	(3,171.69)	(3,118.61)
ACCESS TO SANITATION	27,257.80***	3,278.84***	9,958.72*	5,823.20*	11,177.45***
	(6,113.44)	(1,145.45)	(5,794.88)	(3,353.51)	(525.85)
ACCESS TO DRINKING WATER	10,073.11	-2,377.53	3,013.07	11,685.06	1,266.68
	(14,602.87)	(3,066.21)	(14,685.96)	(7,606.62)	(1,013.41)
ACCESS TO ELECTRICITY	13,288.81**	2,802.05**	-3,369.29	4,512.12	10,477.40***
	(6,679.32)	(1,202.26)	(6,473.20)	(3,521.21)	(503.88)
HOUSE OWNERSHIP	9,691.26	1,710.23	7,507.14	-2,791.68	3,013.80
	(8,678.10)	(1,961.60)	(9,530.13)	(5,167.52)	(2,422.80)

LAND OWNERSHIP	67.66*	54.50***	-17.08	12.62	18.75***
	(37.87)	(8.81)	(30.92)	(19.14)	(3.39)
YEAR_2005	-869.04	822.97	3,848.34	8,108.52***	-3,604.57***
	(2,906.62)	(713.53)	(2,423.27)	(2,558.31)	(979.61)
YEAR2005 * TREATMENT GROUP A	-6,838.77	-2,268.54**	-530.05	-953.83	-4,519.26
	(5,382.66)	(884.05)	(2,106.37)	(3,073.81)	(4,774.07)
CONSTANT	-194,510.80***	-16,803.71***	-204,620.98***	-37,911.90***	5,233.63
	(24,052.42)	(3,899.24)	(27,747.18)	(9,572.22)	(4,233.48)
OBSERVATIONS	26,158	19,866	23,452	21,285	26,145
R-SQUARED	0.55	0.59	0.10	0.58	0.03
ADJUSTED R-SQUARED	0.547	0.586	0.102	0.575	0.0315

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2: IMPACT ON HOUSEHOLD INCOME PER CAPITA (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	TOTAL INCOME	CROP INCOME	NON-CROP INCOME	BUSINESS INCOME	OTHER INCOME
POST (YEAR 2010)	174,941.92***	48,880.68***	75,981.24***	49,576.85***	-9,530.30***
	(14,587.51)	(3,940.08)	(10,370.98)	(9,007.10)	(3,233.50)
TREATMENT GROUP B	11,227.45**	3,330.21***	666.64	1,683.56**	5,436.30
	(4,901.54)	(508.68)	(1,566.91)	(790.73)	(4,619.02)
POST * TREATMENT GROUP B	-14,430.78	-2,868.78*	-26,643.73**	18,588.52***	-4,091.70
	(12,744.96)	(1,738.30)	(10,800.95)	(4,875.60)	(4,737.34)
RURAL	-1,637.52	2,627.25*	5,157.57	-7,679.24*	-3,568.37***
	(7,082.60)	(1,446.77)	(7,034.98)	(3,951.35)	(829.35)
MALE HOUSEHOLD HEAD	109,047.11***	5,143.77***	158,160.77***	419.32	-16,289.08***

	(16,154.64)	(585.46)	(20,533.96)	(2,729.62)	(2,501.01)
AVERAGE AGE	2,316.81***	283.24***	1,567.22***	813.35***	336.16**
	(181.05)	(26.66)	(121.47)	(63.97)	(147.27)
DEPENDENT	7,861.43***	1,256.68***	2,023.99***	4,587.87***	-9.11
	(121.31)	(39.67)	(52.23)	(91.23)	(17.70)
PROPORTION_FORMAL EDUCATION	20,858.85***	5,932.07***	-6,276.88	15,849.03***	14,016.76***
	(5,608.17)	(1,063.73)	(4,299.89)	(3,169.94)	(3,120.47)
ACCESS TO SANITATION	27,358.48***	3,377.36***	10,005.34*	5,830.28*	11,131.83***
	(6,130.09)	(1,144.19)	(5,815.42)	(3,348.83)	(528.54)
ACCESS TO DRINKING WATER	10,479.83	-2,094.55	4,119.71	10,856.93	1,085.87
	(14,556.44)	(3,061.19)	(14,611.56)	(7,609.95)	(1,013.53)
ACCESS TO ELECTRICITY	13,363.78**	2,859.13**	-3,202.78	4,406.94	10,443.99***
	(6,650.47)	(1,201.57)	(6,431.59)	(3,520.37)	(505.49)
HOUSE OWNERSHIP	9,680.57	1,697.73	7,340.82	-2,688.16	3,018.32
	(8,676.43)	(1,963.13)	(9,521.82)	(5,159.27)	(2,422.85)
LAND OWNERSHIP	66.78*	54.02***	-18.89	13.75	19.14***
	(37.80)	(8.79)	(30.85)	(19.13)	(3.38)
YEAR_2005	-906.35	799.36	3,819.09	8,160.95***	-3,587.77***
	(2,901.95)	(713.60)	(2,421.78)	(2,557.57)	(979.19)
YEAR2005 * TREATMENT GROUP B	-6,832.13	-2,262.79**	-523.09	-972.75	-4,522.29
	(5,382.82)	(884.17)	(2,111.24)	(3,073.43)	(4,774.18)
CONSTANT	-195,001.90***	-17,061.08***	-206,287.26***	-36,064.98***	5,450.69
	(24,029.19)	(3,884.59)	(27,789.04)	(9,590.04)	(4,229.92)
OBSERVATIONS	26,158	19,866	23,452	21,285	26,145
R-SQUARED	0.55	0.59	0.10	0.58	0.03
ADJUSTED R-SQUARED	0.547	0.586	0.102	0.576	0.0315

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3: IMPACT ON HOUSEHOLD EXPENDITURE PER CAPITA (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	TOTAL EXPENDITURE	FOOD EXPENDITURE	NON-FOOD EXPENDITURE	CROP EXPENDITURE	NON-CROP EXPENDITURE	AGRICULTURAL INPUT EXPENDITURE	EDUCATIONAL EXPENDITURE	HEALTH EXPENDITURE
POST (YEAR 2010)	274,945.97***	13,723.54***	168,901.32***	8,831.07***	10,815.29***	38,703.29***	25,347.28***	2,010.88***
	(9,827.20)	(389.92)	(5,865.01)	(1,071.72)	(2,079.96)	(3,135.96)	(1,517.75)	(345.59)
TREATMENT GROUP A	6,165.10***	94.14**	1,803.31***	635.98***	291.67*	3,106.56***	105.73	-159.04***
	(1,207.62)	(42.83)	(677.01)	(211.81)	(172.12)	(693.20)	(157.85)	(40.28)
POST * TREATMENT GROUP A	-22,007.22**	-289.68	-8,490.77	-1,752.97	178.26	-10,526.75***	-665.00	310.01
	(9,094.54)	(316.69)	(5,635.41)	(1,227.00)	(1,373.07)	(3,398.52)	(1,522.67)	(411.21)
RURAL	-1,949.62	-198.61*	-4,002.73*	361.98	881.22*	1,601.51	-1,914.44***	276.28*
	(3,352.70)	(120.52)	(2,065.28)	(611.84)	(497.52)	(1,620.47)	(680.42)	(167.74)
MALE HOUSEHOLD HEAD	26,166.63***	499.81***	2,138.11***	7,083.41***	3,800.63***	38,681.53***	-660.34	278.42***
	(3,539.30)	(94.50)	(827.96)	(833.64)	(452.37)	(4,681.05)	(540.65)	(53.27)
AVERAGE AGE	1,845.25***	89.95***	893.38***	266.95***	176.28***	724.06***	305.86***	5.02***
	(52.56)	(2.08)	(29.28)	(11.23)	(7.53)	(33.91)	(21.01)	(1.87)
DEPENDENT	12,688.46***	796.89***	6,274.01***	1,016.79***	871.56***	2,648.68***	988.69***	100.23***
	(107.84)	(4.05)	(64.62)	(11.81)	(22.19)	(34.97)	(15.47)	(3.05)
PROPORTION_FORMAL EDUCATION	16,871.00***	457.77***	7,190.63***	2,306.37***	1,315.42***	3,955.60***	3,912.70***	455.79***
	(2,335.68)	(80.35)	(1,405.65)	(367.19)	(329.55)	(1,234.88)	(522.10)	(117.78)
ACCESS TO SANITATION	8,224.81***	-47.67	3,611.59*	547.09	1,006.50**	4,259.28***	377.89	-212.31
	(3,122.89)	(110.91)	(1,930.99)	(498.22)	(459.51)	(1,371.73)	(616.26)	(155.74)
ACCESS TO DRINKING WATER	5,722.34	214.29	2,291.20	1,717.08	846.83	1,289.88	251.93	182.42
	(7,594.16)	(254.14)	(4,612.08)	(1,236.52)	(1,325.04)	(3,519.14)	(1,709.64)	(362.02)
ACCESS TO ELECTRICITY	11,716.31***	560.80***	8,965.72***	834.00	560.64	-68.49	1,186.30*	271.41
	(3,235.46)	(113.91)	(1,991.60)	(509.83)	(472.92)	(1,456.61)	(640.86)	(169.44)
HOUSE OWNERSHIP	2,671.88	-177.80	319.42	1,435.57	1,082.48	1,441.48	-1,649.23*	204.32

	(4,251.99)	(152.74)	(2,620.99)	(890.82)	(729.28)	(2,231.17)	(913.79)	(190.37)
LAND OWNERSHIP	127.82***	1.71**	27.22**	20.42***	12.02***	59.18***	8.14**	-0.41
	(22.30)	(0.70)	(12.58)	(3.40)	(2.86)	(9.81)	(3.65)	(0.70)
YEAR_2005	-9,626.51***	104.27**	-5,853.02***	-319.65	-1,174.67***	319.81	-258.10	85.16
	(1,355.62)	(50.62)	(774.13)	(239.07)	(197.42)	(694.19)	(269.39)	(70.70)
YEAR2005 * TREATMENT GROUP A	-3,380.24**	-5.19	-1,037.81	200.92	124.81	-1,844.22**	180.94	121.66**
	(1,411.98)	(50.63)	(785.47)	(291.83)	(198.90)	(940.37)	(259.55)	(57.30)
CONSTANT	-99,469.00***	-4,260.60***	-35,948.64***	-16,407.09***	-11,178.54***	-64,072.25***	-7,028.34***	-1,069.70***
	(9,386.58)	(311.19)	(5,257.11)	(1,731.98)	(1,532.03)	(6,379.58)	(2,025.19)	(378.96)
OBSERVATIONS	26,162	26,162	26,148	19,866	23,452	20,757	21,226	20,041
R-SQUARED	0.93	0.97	0.90	0.74	0.71	0.74	0.70	0.26
ADJUSTED R-SQUARED	0.925	0.973	0.897	0.743	0.714	0.740	0.705	0.259

Source: Author's calculations.

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 4: IMPACT ON HOUSEHOLD EXPENDITURE PER CAPITA (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	TOTAL EXPENDITURE	FOOD EXPENDITURE	NON-FOOD EXPENDITURE	CROP EXPENDITURE	NON-CROP EXPENDITURE	AGRICULTURAL INPUT EXPENDITURE	EDUCATIONAL EXPENDITURE	HEALTH EXPENDITURE
POST (YEAR 2010)	265,149.75***	12,637.44***	162,053.02***	10,003.20***	10,786.41***	36,939.44***	23,847.92***	2,559.69***
	(10,287.16)	(417.44)	(6,296.24)	(1,088.48)	(2,351.64)	(3,175.90)	(1,549.01)	(476.22)
TREATMENT GROUP B	6,162.48***	95.77**	1,806.87***	632.16***	292.28*	3,101.46***	108.78	-159.86***
	(1,207.95)	(42.82)	(677.07)	(212.11)	(172.09)	(693.26)	(157.63)	(40.29)
POST * TREATMENT GROUP B	7,067.58	1,594.94***	8,071.29**	-2,613.12***	-182.37	-1,391.21	2,188.68**	-688.81***
	(5,639.15)	(201.67)	(3,465.59)	(747.09)	(810.32)	(2,153.44)	(923.48)	(250.67)
RURAL	-1,870.25	-190.64	-3,949.59*	346.87	881.98*	1,612.92	-1,900.75***	271.18

	(3,351.87)	(120.17)	(2,064.57)	(611.54)	(497.68)	(1,620.78)	(680.22)	(167.43)
MALE HOUSEHOLD HEAD	25,931.90***	462.00***	1,940.77**	7,203.63***	3,795.67***	38,651.50***	-740.45	313.26***
	(3,498.89)	(90.09)	(813.89)	(846.47)	(450.76)	(4,660.32)	(538.91)	(55.56)
AVERAGE AGE	1,841.81***	89.44***	890.61***	268.15***	176.22***	723.23***	303.71***	5.52***
	(52.47)	(2.07)	(29.27)	(11.31)	(7.46)	(33.84)	(20.84)	(1.81)
DEPENDENT	12,700.11***	798.38***	6,282.70***	1,014.71***	871.69***	2,650.21***	990.70***	99.49***
	(108.19)	(4.06)	(65.07)	(11.69)	(22.52)	(34.67)	(15.47)	(3.20)
PROPORTION_FORMAL EDUCATION	16,597.94***	456.73***	7,081.84***	2,280.32***	1,324.83***	3,805.64***	3,916.31***	457.03***
	(2,334.34)	(80.10)	(1,404.56)	(367.27)	(328.89)	(1,233.69)	(521.59)	(117.23)
ACCESS TO SANITATION	8,598.21***	-33.53	3,796.13**	557.36	997.88**	4,441.13***	407.43	-222.41
	(3,120.44)	(110.69)	(1,929.82)	(498.05)	(459.72)	(1,368.23)	(617.60)	(156.36)
ACCESS TO DRINKING WATER	6,400.27	200.67	2,516.40	1,834.14	816.03	1,776.98	249.89	187.42
	(7,612.35)	(254.92)	(4,618.95)	(1,229.70)	(1,318.13)	(3,515.07)	(1,704.85)	(358.61)
ACCESS TO ELECTRICITY	11,874.90***	561.13***	9,028.13***	853.13*	554.82	28.58	1,190.76*	270.61
	(3,235.28)	(113.54)	(1,990.29)	(509.07)	(473.13)	(1,458.04)	(639.65)	(168.84)
HOUSE OWNERSHIP	2,713.47	-172.36	350.82	1,418.25	1,084.03	1,427.99	-1,639.97*	200.78
	(4,249.44)	(151.95)	(2,618.89)	(890.65)	(729.03)	(2,232.07)	(913.25)	(190.11)
LAND OWNERSHIP	126.08***	1.72**	26.57**	20.25***	12.08***	58.31***	8.11**	-0.41
	(22.25)	(0.70)	(12.55)	(3.38)	(2.86)	(9.78)	(3.63)	(0.71)
YEAR_2005	-9,733.49***	101.69**	-5,901.85***	-325.81	-1,172.06***	281.37	-265.81	87.59
	(1,355.64)	(50.48)	(774.08)	(239.50)	(197.35)	(694.14)	(269.26)	(70.70)
YEAR2005 * TREATMENT GROUP B	-3,359.16**	-4.54	-1,027.83	203.14	123.96	-1,832.19*	183.14	121.27**
	(1,412.45)	(50.58)	(785.56)	(292.32)	(198.89)	(940.46)	(259.36)	(57.34)
CONSTANT	-99,987.94***	-4,218.69***	-36,032.43***	-16,625.41***	-11,145.19***	-64,508.80***	-6,938.28***	-1,107.85***
	(9,382.26)	(310.27)	(5,257.48)	(1,735.95)	(1,528.49)	(6,360.11)	(2,021.18)	(380.21)
OBSERVATIONS	26,162	26,162	26,148	19,866	23,452	20,757	21,226	20,041
R-SQUARED	0.93	0.97	0.90	0.74	0.71	0.74	0.70	0.26
ADJUSTED R-SQUARED	0.925	0.973	0.897	0.743	0.714	0.740	0.705	0.260

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 5: IMPACT ON TOTAL ASSET OUTCOMES (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)
VARIABLES	TOTAL CHANGE IN AGRICULTURAL AND OTHER BUSINESS ASSET	TOTAL AGRICULTURAL INPUT ASSET VALUE	TOTAL CONSUMER DURABLE ASSET VALUE
POST (YEAR 2010)	-24,575.16**	-21,782.69***	699,645.49***
	(11,627.68)	(5,580.80)	(30,193.69)
TREATMENT GROUP A	2,215.49	2,906.11**	28,004.98***
	(1,418.26)	(1,305.49)	(3,783.79)
POST * TREATMENT GROUP A	-6,144.23	-9,866.73	-29,369.54
	(14,637.09)	(6,665.00)	(37,593.50)
RURAL	-15,002.08**	-6.50	-41,995.48***
	(6,998.56)	(3,678.55)	(14,171.84)
MALE HOUSEHOLD HEAD	3,328.83***	10,817.53***	33,480.03***
	(1,098.97)	(1,057.23)	(5,701.04)
AVERAGE AGE	628.46***	234.00***	3,330.81***
	(128.51)	(58.88)	(166.11)
DEPENDENT	2,278.04***	2,734.02***	25,258.75***
	(136.91)	(64.66)	(332.34)
PROPORTION_FORMAL EDUCATION	4,585.75	13,888.43***	34,540.15***
	(4,537.68)	(2,927.93)	(9,267.88)
ACCESS TO SANITATION	3,762.83	1,756.99	36,735.69***
	(5,968.49)	(3,250.93)	(12,854.83)
ACCESS TO DRINKING WATER	-23,795.35	2,442.58	-58,753.10
	(17,890.77)	(7,733.67)	(36,325.16)
ACCESS TO ELECTRICITY	-4,866.77	2,751.39	23,898.82*
	(6,187.89)	(3,362.34)	(13,536.43)
HOUSE OWNERSHIP	8,119.07	11,029.83**	-10,849.16

	(9,297.59)	(4,703.64)	(18,309.79)
LAND OWNERSHIP	42.35	43.48**	141.18
	(45.96)	(20.11)	(106.11)
YEAR_2005	-898.89	3,254.94*	-23,834.66***
	(2,155.10)	(1,884.39)	(5,031.14)
YEAR2005 * TREATMENT GROUP A	1,842.43	-3,476.79	-20,159.09***
	(2,718.88)	(2,389.55)	(4,336.77)
CONSTANT	3,360.49	-35,550.45***	-76,309.11*
	(19,755.20)	(9,047.27)	(40,505.33)
OBSERVATIONS	21,285	19,455	26,077
R-SQUARED	0.06	0.29	0.76
ADJUSTED R-SQUARED	0.0636	0.288	0.758

Source: Author's calculations.

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 6: IMPACT ON TOTAL ASSET OUTCOMES (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)
VARIABLES	TOTAL CHANGE IN AGRICULTURAL AND OTHER BUSINESS ASSET	TOTAL AGRICULTURAL INPUT ASSET VALUE	TOTAL CONSUMER DURABLE ASSET VALUE
POST (YEAR 2010)	39,014.03***	-33,118.44***	787,048.50***
	(12,312.88)	(6,703.46)	(34,962.38)
TREATMENT GROUP B	2,081.67	2,921.69**	27,852.68***
	(1,417.51)	(1,305.09)	(3,782.49)
POST * TREATMENT GROUP B	-103,610.87***	14,088.17***	-166,368.01***
	(9,714.95)	(4,442.57)	(24,776.12)
RURAL	-15,610.62**	111.53	-42,629.63***
	(6,967.65)	(3,677.45)	(14,154.10)
MALE HOUSEHOLD HEAD	8,650.43***	9,773.22***	36,666.23***

	(1,219.68)	(1,045.37)	(6,043.68)
AVERAGE AGE	686.10***	222.15***	3,373.24***
	(129.49)	(58.88)	(168.01)
DEPENDENT	2,188.95***	2,748.97***	25,136.90***
	(132.69)	(66.11)	(331.52)
PROPORTION_FORMAL EDUCATION	4,307.66	13,763.97***	34,304.66***
	(4,502.87)	(2,925.55)	(9,251.67)
ACCESS TO SANITATION	3,078.17	2,066.00	35,895.94***
	(5,925.03)	(3,248.69)	(12,832.96)
ACCESS TO DRINKING WATER	-21,705.88	2,644.13	-56,673.77
	(17,853.99)	(7,720.74)	(36,201.54)
ACCESS TO ELECTRICITY	-4,711.43	2,830.98	24,060.10*
	(6,148.60)	(3,359.83)	(13,502.97)
HOUSE OWNERSHIP	7,645.44	11,098.94**	-11,298.19
	(9,234.67)	(4,704.59)	(18,277.88)
LAND OWNERSHIP	40.21	42.91**	138.46
	(45.35)	(20.09)	(105.46)
YEAR_2005	-914.85	3,203.97*	-23,729.38***
	(2,141.20)	(1,883.95)	(5,025.26)
YEAR2005 * TREATMENT GROUP B	1,837.03	-3,445.14	-20,191.93***
	(2,717.59)	(2,389.22)	(4,336.69)
CONSTANT	-3,683.68	-34,717.65***	-80,797.96**
	(19,741.35)	(9,031.38)	(40,441.53)
OBSERVATIONS	21,285	19,455	26,077
R-SQUARED	0.07	0.29	0.76
ADJUSTED R-SQUARED	0.0731	0.289	0.758

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 7: IMPACT ON LABOUR MARKET OUTCOMES (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	TOTAL MONTH PER YEAR	TOTAL DAYS PER MONTH	TOTAL HOURS PER DAY	DAILY WAGE	SALARIED WAGE	YEARLY BENEFITS
POST (YEAR 2010)	70.51***	156.70***	58.07***	392.73***	1,290.62	-15,437.51***
	(3.01)	(6.83)	(2.30)	(25.95)	(1,095.69)	(2,004.09)
TREATMENT GROUP A	3.05***	4.92***	0.72*	6.36	-19.79	-243.70
	(0.53)	(1.22)	(0.41)	(5.22)	(216.62)	(462.62)
POST * TREATMENT GROUP A	-2.55	0.52	-0.75	10.58	-202.77	-2,360.76
	(2.99)	(7.05)	(2.30)	(29.80)	(1,191.00)	(2,416.49)
RURAL	0.17	1.29	0.52	5.92	-722.84	-1,789.51
	(1.13)	(2.62)	(0.85)	(13.16)	(542.63)	(1,107.53)
MALE HOUSEHOLD HEAD	9.47***	25.85***	9.82***	-92.65***	4,641.64***	11,768.02***
	(1.34)	(3.54)	(1.27)	(17.11)	(652.69)	(1,569.76)
AVERAGE AGE	0.96***	2.14***	0.68***	4.23***	259.70***	416.91***
	(0.02)	(0.06)	(0.02)	(0.27)	(10.72)	(23.64)
DEPENDENT	8.04***	17.91***	6.16***	39.57***	1,100.74***	1,561.88***
	(0.03)	(0.08)	(0.03)	(0.29)	(13.03)	(22.50)
PROPORTION_FORMAL EDUCATION	6.47***	13.54***	3.16***	-62.23***	5,274.34***	8,855.72***
	(0.79)	(1.85)	(0.61)	(9.57)	(410.27)	(1,034.96)
ACCESS TO SANITATION	-3.51***	-6.20***	-2.10***	-35.81***	-45.96	-1,902.14*
	(1.03)	(2.40)	(0.78)	(12.19)	(502.32)	(1,021.62)
ACCESS TO DRINKING WATER	-0.33	3.37	-0.01	-19.56	2,298.36*	2,528.27
	(2.47)	(5.76)	(1.91)	(29.27)	(1,181.80)	(2,439.49)
ACCESS TO ELECTRICITY	3.07***	6.62***	1.81**	15.04	2,393.12***	4,787.14***
	(1.07)	(2.49)	(0.81)	(12.89)	(533.11)	(1,080.23)
HOUSE OWNERSHIP	-3.20**	-8.67***	-2.96***	3.29	-2,399.71***	-3,239.89**
	(1.39)	(3.24)	(1.05)	(15.27)	(642.38)	(1,315.69)
LAND OWNERSHIP	0.01*	0.03	0.01	-0.20***	2.12	1.69

	(0.01)	(0.02)	(0.01)	(0.07)	(2.66)	(5.33)
YEAR_2005	-1.18**	-6.03***	-2.16***	18.30***	231.32	308.97
	(0.55)	(1.26)	(0.43)	(5.87)	(234.58)	(473.71)
YEAR2005 * TREATMENT GROUP A	-1.70***	0.18	1.26***	-9.21	-459.43*	255.78
	(0.62)	(1.42)	(0.48)	(6.33)	(275.44)	(625.41)
CONSTANT	-32.24***	-76.49***	-24.10***	36.96	-13,198.95***	-24,023.06***
	(3.15)	(7.57)	(2.55)	(36.80)	(1,485.32)	(3,146.37)
OBSERVATIONS	25,506	25,506	25,506	20,738	20,738	20,738
R-SQUARED	0.97	0.97	0.97	0.88	0.76	0.56
ADJUSTED R-SQUARED	0.974	0.971	0.975	0.882	0.763	0.559

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 8: IMPACT ON LABOUR MARKET OUTCOMES (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	TOTAL MONTH PER YEAR	TOTAL DAYS PER MONTH	TOTAL HOURS PER DAY	DAILY WAGE	SALARIED WAGE	YEARLY BENEFITS
POST (YEAR 2010)	53.46***	120.79***	46.35***	326.20***	-1,180.90	-20,950.37***
	(3.12)	(7.10)	(2.34)	(27.18)	(1,192.58)	(2,283.23)
TREATMENT GROUP B	3.08***	4.99***	0.74*	6.57	-13.67	-234.27
	(0.53)	(1.22)	(0.41)	(5.22)	(216.03)	(461.40)
POST * TREATMENT GROUP B	23.98***	52.64***	17.81***	101.13***	3,894.18***	8,591.28***
	(1.81)	(4.22)	(1.38)	(17.90)	(751.68)	(1,531.00)
RURAL	0.30	1.57	0.61	6.56	-698.51	-1,734.03
	(1.11)	(2.60)	(0.85)	(13.14)	(542.03)	(1,105.34)
MALE HOUSEHOLD HEAD	8.59***	23.94***	9.22***	-97.71***	4,464.26***	11,398.44***
	(1.25)	(3.33)	(1.20)	(17.59)	(633.19)	(1,526.12)

AVERAGE AGE	0.95***	2.12***	0.67***	4.15***	256.92***	411.11***
	(0.02)	(0.06)	(0.02)	(0.27)	(10.67)	(23.34)
DEPENDENT	8.06***	17.96***	6.17***	39.66***	1,104.15***	1,569.22***
	(0.03)	(0.08)	(0.03)	(0.29)	(13.10)	(22.68)
PROPORTION_FORMAL EDUCATION	6.54***	13.77***	3.20***	-61.36***	5,285.01***	8,826.31***
	(0.79)	(1.84)	(0.60)	(9.55)	(409.22)	(1,032.20)
ACCESS TO SANITATION	-3.34***	-5.92**	-1.98**	-35.36***	-10.41	-1,776.53*
	(1.03)	(2.38)	(0.77)	(12.17)	(501.07)	(1,018.73)
ACCESS TO DRINKING WATER	-0.75	2.22	-0.28	-22.73	2,243.35*	2,559.98
	(2.45)	(5.73)	(1.90)	(29.26)	(1,179.10)	(2,430.87)
ACCESS TO ELECTRICITY	3.05***	6.51***	1.80**	14.72	2,392.89***	4,815.43***
	(1.06)	(2.47)	(0.80)	(12.87)	(532.37)	(1,078.38)
HOUSE OWNERSHIP	-3.11**	-8.47***	-2.89***	3.74	-2,383.17***	-3,203.86**
	(1.37)	(3.21)	(1.04)	(15.25)	(640.81)	(1,312.54)
LAND OWNERSHIP	0.01**	0.03*	0.01	-0.19***	2.15	1.51
	(0.01)	(0.02)	(0.01)	(0.07)	(2.64)	(5.28)
YEAR_2005	-1.19**	-6.03***	-2.17***	18.29***	224.58	278.09
	(0.55)	(1.25)	(0.43)	(5.88)	(233.82)	(471.71)
YEAR2005 * TREATMENT GROUP B	-1.68***	0.20	1.27***	-9.22	-457.70*	265.41
	(0.62)	(1.41)	(0.48)	(6.34)	(274.69)	(623.88)
CONSTANT	-31.06***	-73.70***	-23.31***	45.22	-12,965.60***	-23,684.80***
	(3.08)	(7.41)	(2.50)	(37.04)	(1,473.13)	(3,116.12)
OBSERVATIONS	25,506	25,506	25,506	20,738	20,738	20,738
R-SQUARED	0.97	0.97	0.97	0.88	0.76	0.56
ADJUSTED R-SQUARED	0.974	0.972	0.975	0.882	0.764	0.560

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 9: IMPACT ON VARIOUS INCOME AND EXPENDITURE BRACKETS PER CAPITA (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

VARIABLES	I 15TH	II 25TH	III 50TH	IV 75TH	V 85TH
INCOME					
TOTAL INCOME	152,021.83***	-572.46	-7,895.24***	-15,835.66*	-40,390.71***
	(2,043.65)	(1,311.80)	(2,131.86)	(9,262.68)	(4,060.23)
CROP INCOME	-3,198.41***	-3,795.53***	-3,308.52***	-6,388.10***	-5,593.55***
	(383.72)	(360.21)	(619.48)	(1,167.21)	(1,935.75)
NON-CROP INCOME	445,555.98***	200.23	-2,709.12***	-7,398.63***	-9,205.69***
	(370.68)	(227.58)	(264.23)	(473.76)	(821.47)
BUSINESS INCOME	-555.30	4,047.79***	635.15	-2,855.96	-3.86
	(805.42)	(833.85)	(1,134.40)	(1,898.68)	(3,298.74)
OTHER INCOME	-33.74***	133.20*	1,542.76***	2,857.56***	3,360.76***
	(0.66)	(78.39)	(224.47)	(660.63)	(1,175.64)
EXPENDITURE					
TOTAL EXPENDITURE	-19,911.78***	-40,648.91***	-49,033.41***	-25,161.09***	-40,409.66***
	(2,297.79)	(2,125.93)	(1,905.56)	(2,127.35)	(2,638.77)
FOOD EXPENDITURE	-473.48***	-225.12*	-382.37***	-590.81***	-205.07***
	(151.18)	(117.37)	(92.81)	(89.38)	(74.68)
NON-FOOD EXPENDITURE	-1,220.43	-4,921.23***	-6,813.76***	-3,414.29***	-8,147.88***
	(995.42)	(940.39)	(964.61)	(929.63)	(1,257.81)
CROP EXPENDITURE	-870.66***	-1,594.03***	-2,603.85***	-2,163.09***	-671.60
	(331.19)	(329.33)	(468.92)	(556.44)	(795.72)
NON-CROP EXPENDITURE	-940.27***	-1,118.04***	-603.65***	-324.51	-2,049.00***
	(178.68)	(161.28)	(195.40)	(296.19)	(496.29)
AGRICULTURAL INPUT	-6,964.92***	-7,551.65***	-9,123.63***	-6,533.64***	-8,872.74***

EXPENDITURE					
	(578.74)	(604.57)	(606.67)	(1,021.10)	(1,345.61)
EDUCATIONAL EXPENDITURE	-185.82	-596.55**	249.69	-1,100.02***	-2,981.39***
	(222.97)	(264.17)	(287.57)	(375.79)	(438.90)
HEALTH EXPENDITURE	9.08	-22.91	-14.16	-111.10**	132.58
	(23.49)	(25.78)	(25.06)	(54.97)	(88.96)

Source: Author's calculations.

Notes: [a] This table only presents the coefficient estimates for the Post*Treatment group A variable, our main estimated parameter. All other controls were included in these regressions, however, and are not presented because of space constraints. Full results are available upon request.

[b] Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE 10: IMPACT ON VARIOUS INCOME AND EXPENDITURE BRACKETS PER CAPITA (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

VARIABLES	I 15TH	II 25TH	III 50TH	IV 75TH	V 85TH
INCOME					
TOTAL INCOME	-10,148.74***	-13,463.04***	15,987.59***	47,715.77***	89,658.70***
	(1,180.19)	(1,135.27)	(1,751.44)	(2,402.18)	(3,301.30)
CROP INCOME	3,259.10***	4,919.58***	-4,849.77***	-14,434.85***	-21,142.78***
	(261.13)	(288.23)	(546.27)	(923.53)	(1,589.63)
NON-CROP INCOME	10,858.02***	3,373.86***	2,681.22***	-75,458.03***	62,379.60***
	(178.22)	(192.40)	(219.15)	(693.16)	(705.25)
BUSINESS INCOME	-319,521.66***	-30,000.50***	-26,655.15***	-50.36	30,561.53***
	(77,899.91)	(741.29)	(957.84)	(1,557.96)	(2,487.58)
OTHER INCOME	-28.61***	-150.94***	-351.81*	-87.66	-1,098.86
	(0.44)	(54.19)	(213.86)	(521.90)	(1,020.38)
EXPENDITURE					

TOTAL EXPENDITURE	65,126.04***	-301,631.73***	326,400.32***	-44,274.31***	-47,967.13***
	(1,685.49)	(1,939.23)	(1,657.72)	(1,673.07)	(2,174.96)
FOOD EXPENDITURE	2,352.46***	2,162.76***	815.03***	754.29***	1,974.11***
	(105.58)	(101.78)	(82.08)	(70.99)	(67.29)
NON-FOOD EXPENDITURE	28,503.82***	17,501.96***	-34,523.00***	5,224.30***	-27,610.97***
	(861.22)	(803.72)	(857.43)	(755.39)	(962.25)
CROP EXPENDITURE	-3,521.57***	-182.49	478.49	118.26	-3,564.41***
	(266.82)	(271.01)	(411.19)	(499.72)	(653.23)
NON-CROP EXPENDITURE	-4,133.14***	-3,969.57***	2,655.39***	3,909.25***	9,722.32***
	(142.20)	(132.51)	(165.48)	(243.52)	(407.32)
AGRICULTURAL INPUT EXPENDITURE	13,327.75***	8,584.68***	2,249.37***	-9,722.74***	-45,470.77***
	(447.95)	(519.94)	(537.37)	(871.71)	(1,127.26)
EDUCATIONAL EXPENDITURE	3,521.72***	-214.33	-2,261.07***	2,731.51***	7,693.01***
	(195.74)	(227.59)	(234.07)	(329.83)	(384.41)
HEALTH EXPENDITURE	372.00***	358.85***	126.77***	318.98***	1,843.89***
	(15.82)	(19.33)	(22.56)	(42.09)	(78.80)

Source: Author's calculations.

Notes: [a] This table only presents the coefficient estimates for the Post*Treatment group B variable, our main estimated parameter. All other controls were included in these regressions, however, and are not presented because of space constraints. Full results are available upon request.

[b] Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX TABLE 1: KEY VARIABLES WITH DESCRIPTIVE STATISTICS (TREATMENT AND CONTROL GROUP A: RAINFALL-BASED IDENTIFICATIONS)

VARIABLES	TYPE	MEAN		STANDARD DEVIATION		DESCRIPTION OF VARIABLES
OUTCOME VARIABLES		TREATMENT	CONTROL	TREATMENT	CONTROL	
PER CAPITA TOTAL INCOME	Continuous	122609.3	585579.1	350281.8	670960.9	Sum of per capita crop, non-crop, business and other incomes.
PER CAPITA CROP INCOME	Continuous	42914.52	134535.2	80916.75	109717	Per capita income earned through selling of crops.
PER CAPITA NON-CROP INCOME	Continuous	39591.31	175023.1	217985.1	470222.2	Per capita income earned through selling of livestock and poultry, livestock products, fish farming and fish capture and farm forestry.
PER CAPITA BUSINESS INCOME	Continuous	95109.46	362796.5	225754.1	329750.4	Per capita net revenues earned from non-agricultural enterprises and rental income from agricultural assets.
PER CAPITA OTHER INCOME	Continuous	15599.26	15401.97	84804.43	45366.48	Per capita income earned from other assets (e.g. stocks, bonds, jewellery etc.), rent, insurance, charity, gift, remittances, bank interest and social safety net.
PER CAPITA TOTAL EXPENDITURE	Continuous	163587.6	902204.4	451583.2	772266.5	Sum of per capita food, non-food, crop, non-crop, agricultural input, education and health expenditures.
PER CAPITA FOOD EXPENDITURE	Continuous	9428.717	53264.84	26657.94	44630.27	Per capita daily and weekly food consumption.
PER CAPITA NON-FOOD EXPENDITURE	Continuous	84195.85	464748.6	235125.7	404613.2	Per capita monthly and annual non-food consumption.
PER CAPITA CROP EXPENDITURE	Continuous	27164.83	82950.47	47425.52	59216.15	Per capita crop consumption by household.
PER CAPITA NON-CROP EXPENDITURE	Continuous	16060.38	64966.32	38283.58	56794.33	Per capita consumption of livestock and poultry, livestock products, fish farming and fish capture and farm forestry products by household.
PER CAPITA AGRICULTURAL INPUT EXPENDITURE	Continuous	59887.13	216886.8	123287.5	165543.5	Per capita expenses on agricultural inputs.
PER CAPITA EDUCATIONAL EXPENDITURE	Continuous	20565.26	85667.89	47419.52	70960.43	Per capita expenditure for educational services.
PER CAPITA HEALTH EXPENDITURE	Continuous	2226.591	8581.544	7182.878	11793.97	Per capita expenditure for health services.
TOTAL CHANGE IN AGRICULTURAL AND OTHER BUSINESS ASSET (IN REAL TERMS)	Continuous	34085.83	137203.9	223634.9	435505.3	Sum of agricultural assets households bought in the last 12 months and expenditure in capital goods (in non-agricultural enterprises) in the last 12 months.

TOTAL AGRICULTURAL INPUT ASSET VALUE (IN REAL TERMS)	Continuous	58562.68	188197.2	147132	241979.5	Value of owned equipment and asset used in agriculture.
TOTAL CONSUMER DURABLE ASSET VALUE (IN REAL TERMS)	Continuous	351885.9	1888812	1016351	1830325	Total asset value of consumer durable goods.
TOTAL MONTH PER YEAR WORKED	Continuous	103.9289	517.5979	255.4481	417.7093	Total number of months per year worked.
TOTAL DAYS PER MONTH WORKED	Continuous	233.9744	1155.402	571.3488	932.6239	Total number of days per month worked.
TOTAL HOURS PER DAY WORKED	Continuous	80.24236	398.9724	196.6285	321.3238	Total number of hours per day worked.
DAILY WAGE (IN REAL TERMS)	Continuous	696.1671	2873.078	1489.233	2067.039	Daily wage in cash (if paid daily).
SALARIED WAGE (IN REAL TERMS)	Continuous	18725.12	77322.4	41691.76	61527.92	Total net take-home monthly remuneration after all deduction at source.
YEARLY BENEFITS (IN REAL TERMS)	Continuous	24275.35	98172.85	59626.65	95530.79	Total value of yearly in-kind or other benefits (tips, bonuses or transport) from employment.
COVARIATES						
RURAL	Binary	0.6362126	0.655756	0.4811085	0.475134	Whether living in a rural area = 1, otherwise 0.
HEAD OF HOUSEHOLD IS MALE	Binary	0.9127907	0.965463	0.2833284	0.196886	Whether head of the household is male = 1, otherwise 0.
AVERAGE AGE	Continuous	26.50556	26.54462	10.01851	6.61305	Average age of household members.
DEPENDENT	Continuous	11.15075	57.09819	28.11758	46.92759	Age of the household member is <15 and >=65.
PROPORTION OF FORMAL EDUCATION	Continuous	0.4785376	0.777077	0.3603159	0.34971	Proportion of household members attended school, college, university or madrasa.
ACCESS TO SANITATION	Binary	0.4536468	0.510949	0.4978674	0.499894	Whether the household use sanitary or pacca latrines (water seal and pit) = 1, otherwise 0.
ACCESS TO SAFE DRINKING WATER	Binary	0.9683555	0.965628	0.1750591	0.182188	Whether the household has access to supply water or tube well water = 1, otherwise 0.
ACCESS TO ELECTRICITY	Binary	0.4669435	0.505446	0.4989268	0.499984	Whether the household has got electricity connection = 1, otherwise 0.
HOUSE OWNERSHIP	Binary	0.8113631	0.833399	0.3912362	0.37263	Whether the household own a house = 1, otherwise 0.
LAND OWNERSHIP (IN REAL TERMS)	Continuous	12.07561	40.88366	67.71542	104.1996	Amount of total operating land (in acres).

Source: Author's elaborations.

APPENDIX TABLE 2: KEY VARIABLES WITH DESCRIPTIVE STATISTICS (TREATMENT AND CONTROL GROUP B: SELF-REPORTED IDENTIFICATIONS)

VARIABLES	TYPE	MEAN		STANDARD DEVIATION		DESCRIPTION OF VARIABLES
OUTCOME VARIABLES		TREATMENT	CONTROL	TREATMENT	CONTROL	
PER CAPITA TOTAL INCOME	Continuous	373423.5	434201.8	536564	696302	Sum of per capita crop, non-crop, business and other incomes.
PER CAPITA CROP INCOME	Continuous	106895.8	110779.8	108175.3	113151.7	Per capita income earned through selling of crops.
PER CAPITA NON-CROP INCOME	Continuous	119383.3	142421.5	234059.7	561244.2	Per capita income earned through selling of livestock and poultry, livestock products, fish farming and fish capture and farm forestry.
PER CAPITA BUSINESS INCOME	Continuous	262397.1	285835.9	343133.1	295508.2	Per capita net revenues earned from non-agricultural enterprises and rental income from agricultural assets.
PER CAPITA OTHER INCOME	Continuous	16123.11	14555.04	78380.95	35069.85	Per capita income earned from other assets (e.g. stocks, bonds, jewellery etc.), rent, insurance, charity, gift, remittances, bank interest and social safety net.
PER CAPITA TOTAL EXPENDITURE	Continuous	565384	658288.1	743532.6	766395.6	Sum of per capita food, non-food, crop, non-crop, agricultural input, education and health expenditures.
PER CAPITA FOOD EXPENDITURE	Continuous	33397.13	38612.06	43509.96	44531.1	Per capita daily and weekly food consumption.
PER CAPITA NON-FOOD EXPENDITURE	Continuous	291933.9	338133.9	388660.5	398508.1	Per capita monthly and annual non-food consumption.
PER CAPITA CROP EXPENDITURE	Continuous	65298.17	69545.04	60440.5	62756.02	Per capita crop consumption by household.
PER CAPITA NON-CROP EXPENDITURE	Continuous	46754.38	50691.94	54652.11	58273.61	Per capita consumption of livestock and poultry, livestock products, fish farming and fish capture and farm forestry products by household.
PER CAPITA AGRICULTURAL INPUT EXPENDITURE	Continuous	164668.1	175283.9	167023.6	173735.7	Per capita expenses on agricultural inputs.
PER CAPITA EDUCATIONAL EXPENDITURE	Continuous	60773.71	66948.93	71753.8	69686.33	Per capita expenditure for educational services.
PER CAPITA HEALTH EXPENDITURE	Continuous	5945.219	7229.639	7618.373	14244.29	Per capita expenditure for health services.
TOTAL CHANGE IN AGRICULTURAL AND OTHER BUSINESS ASSET (IN REAL TERMS)	Continuous	73565	142607.6	214724	529612.6	Sum of agricultural assets households bought in the last 12 months and expenditure in capital goods (in non-agricultural enterprises) in the last 12 months.

TOTAL AGRICULTURAL INPUT ASSET VALUE (IN REAL TERMS)	Continuous	151046.5	151352	246957.3	197233.6	Value of owned equipment and asset used in agriculture.
TOTAL CONSUMER DURABLE ASSET VALUE (IN REAL TERMS)	Continuous	1163556	1420042	1565000	1927552	Total asset value of consumer durable goods.
TOTAL MONTH PER YEAR WORKED	Continuous	334.5448	379.3605	414.1053	414.2008	Total number of months per year worked.
TOTAL DAYS PER MONTH WORKED	Continuous	747.2892	848.02	923.1851	926.0869	Total number of days per month worked.
TOTAL HOURS PER DAY WORKED	Continuous	257.5589	292.9975	318.1137	319.5673	Total number of hours per day worked.
DAILY WAGE (IN REAL TERMS)	Continuous	2019.562	2256.998	2177.093	2109.863	Daily wage in cash (if paid daily).
SALARIED WAGE (IN REAL TERMS)	Continuous	54633.38	60337.16	61341.99	62946.09	Total net take-home monthly remuneration after all deduction at source.
YEARLY BENEFITS (IN REAL TERMS)	Continuous	70386.54	75589.07	91639.38	91995.92	Total value of yearly in-kind or other benefits (tips, bonuses or transport) from employment.
COVARIATES						
RURAL	Binary	0.6320787	0.670638	0.4822535	0.470001	Whether living in a rural area = 1, otherwise 0.
HEAD OF HOUSEHOLD IS MALE	Binary	0.9431431	0.945613	0.2440097	0.226789	Whether head of the household is male = 1, otherwise 0.
AVERAGE AGE	Continuous	26.58561	26.44676	8.317239	7.935949	Average age of household members.
DEPENDENT	Continuous	35.85337	42.34686	45.34921	47.27546	Age of the household member is <15 and >=65.
PROPORTION OF FORMAL EDUCATION	Continuous	0.6430289	0.675469	0.3841798	0.380877	Proportion of household members attended school, college, university or madrasa.
ACCESS TO SANITATION	Binary	0.4828272	0.494906	0.4997192	0.499995	Whether the household use sanitary or pacca latrines (water seal and pit) = 1, otherwise 0.
ACCESS TO SAFE DRINKING WATER	Binary	0.9708324	0.960805	0.1682809	0.194066	Whether the household has access to supply water or tube well water = 1, otherwise 0.
ACCESS TO ELECTRICITY	Binary	0.5085285	0.462904	0.4999415	0.498642	Whether the household has got electricity connection = 1, otherwise 0.
HOUSE OWNERSHIP	Binary	0.8086086	0.847424	0.3934076	0.359593	Whether the household own a house = 1, otherwise 0.
LAND OWNERSHIP (IN REAL TERMS)	Continuous	28.40776	32.68995	91.94583	95.34276	Amount of total operating land (in acres).

Source: Author's elaborations.

APPENDIX TABLE 3: IMPACT ON LOG OF HOUSEHOLD INCOME PER CAPITA (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	LOG OF TOTAL INCOME	LOG OF CROP INCOME	LOG OF NON-CROP INCOME	LOG OF BUSINESS INCOME	LOG OF OTHER INCOME
POST (YEAR 2010)	1.569***	1.822***	2.402***	1.890***	-1.002***
	(0.0519)	(0.0756)	(0.0881)	(0.0699)	(0.0859)
TREATMENT GROUP A	0.254***	0.491***	0.135*	-0.0955	-0.0650
	(0.0422)	(0.0583)	(0.0784)	(0.0780)	(0.0587)
POST * TREATMENT GROUP A	-0.229***	-0.527***	-0.166**	0.137*	0.325***
	(0.0455)	(0.0619)	(0.0825)	(0.0796)	(0.0787)
RURAL	-0.0706***	-0.0388**	-0.0132	-0.0465***	-0.234***
	(0.0170)	(0.0190)	(0.0236)	(0.0143)	(0.0276)
MALE HOUSEHOLD HEAD	-0.353***	0.289***	0.359***	0.206***	-0.915***
	(0.0440)	(0.0809)	(0.0784)	(0.0794)	(0.0508)
AVERAGE AGE	0.0161***	0.0145***	0.0248***	0.00596***	0.0187***
	(0.00109)	(0.00207)	(0.00199)	(0.00200)	(0.00126)
DEPENDENT	0.0147***	0.0143***	0.0195***	0.0139***	-0.000778
	(0.000367)	(0.000510)	(0.000525)	(0.000291)	(0.000755)
PROPORTION_FORMAL EDUCATION	1.316***	0.982***	0.344***	0.825***	0.768***
	(0.0381)	(0.0630)	(0.0685)	(0.0596)	(0.0447)
ACCESS TO SANITATION	0.185***	-0.00214	-0.00889	0.0928***	0.697***
	(0.0143)	(0.0157)	(0.0205)	(0.0124)	(0.0248)
ACCESS TO DRINKING WATER	0.0140	-0.0249	-0.121**	0.0671*	-0.108*
	(0.0330)	(0.0395)	(0.0526)	(0.0389)	(0.0549)
ACCESS TO ELECTRICITY	0.257***	0.0702***	-0.0253	0.0932***	0.785***
	(0.0151)	(0.0168)	(0.0221)	(0.0134)	(0.0260)
HOUSE OWNERSHIP	0.0633***	-0.0506**	-0.0155	-0.0291*	0.211***
	(0.0234)	(0.0222)	(0.0289)	(0.0169)	(0.0369)
LOG OF LAND OWNERSHIP	0.116***	0.136***	0.0905***	-0.0321***	0.152***
	(0.00425)	(0.00515)	(0.00574)	(0.00369)	(0.00693)

YEAR_2005	-0.0680*	0.136**	-0.258***	0.108	-0.0230
	(0.0398)	(0.0603)	(0.0690)	(0.0679)	(0.0505)
YEAR2005 * TREATMENT GROUP A	-0.304***	-0.306***	-0.228**	0.191**	-0.121*
	(0.0508)	(0.0785)	(0.0929)	(0.0910)	(0.0659)
CONSTANT	8.696***	6.794***	6.301***	8.570***	8.260***
	(0.0759)	(0.115)	(0.128)	(0.116)	(0.104)
OBSERVATIONS	23,749	16,823	18,601	15,186	19,359
R-SQUARED	0.816	0.785	0.780	0.807	0.228
ADJUSTED R-SQUARED	0.816	0.785	0.779	0.807	0.228

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX TABLE 4: IMPACT ON LOG OF HOUSEHOLD INCOME PER CAPITA (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	LOG OF TOTAL INCOME	LOG OF CROP INCOME	LOG OF NON-CROP INCOME	LOG OF BUSINESS INCOME	LOG OF OTHER INCOME
POST (YEAR 2010)	1.547***	1.815***	2.312***	1.902***	-0.967***
	(0.0533)	(0.0767)	(0.0884)	(0.0704)	(0.0878)
TREATMENT GROUP B	0.254***	0.491***	0.135*	-0.0956	-0.0648
	(0.0422)	(0.0583)	(0.0784)	(0.0780)	(0.0587)
POST * TREATMENT GROUP B	-0.216***	-0.487***	-0.000951	0.0821	0.0573
	(0.0435)	(0.0595)	(0.0801)	(0.0786)	(0.0685)
RURAL	-0.0702***	-0.0391**	-0.0123	-0.0464***	-0.234***
	(0.0170)	(0.0190)	(0.0236)	(0.0143)	(0.0276)
MALE HOUSEHOLD HEAD	-0.354***	0.288***	0.353***	0.207***	-0.917***
	(0.0440)	(0.0810)	(0.0780)	(0.0795)	(0.0508)
AVERAGE AGE	0.0161***	0.0145***	0.0247***	0.00597***	0.0187***
	(0.00109)	(0.00207)	(0.00199)	(0.00200)	(0.00126)
DEPENDENT	0.0148***	0.0143***	0.0196***	0.0139***	-0.000791

	(0.000369)	(0.000511)	(0.000523)	(0.000292)	(0.000755)
PROPORTION_FORMAL EDUCATION	1.316***	0.981***	0.343***	0.826***	0.775***
	(0.0380)	(0.0630)	(0.0685)	(0.0596)	(0.0447)
ACCESS TO SANITATION	0.185***	-0.00140	-0.00701	0.0917***	0.691***
	(0.0143)	(0.0156)	(0.0204)	(0.0124)	(0.0248)
ACCESS TO DRINKING WATER	0.0115	-0.0212	-0.121**	0.0625	-0.128**
	(0.0330)	(0.0393)	(0.0524)	(0.0388)	(0.0549)
ACCESS TO ELECTRICITY	0.257***	0.0709***	-0.0245	0.0924***	0.779***
	(0.0151)	(0.0168)	(0.0221)	(0.0134)	(0.0260)
HOUSE OWNERSHIP	0.0635***	-0.0507**	-0.0144	-0.0292*	0.211***
	(0.0234)	(0.0222)	(0.0288)	(0.0169)	(0.0369)
LOG OF LAND OWNERSHIP	0.116***	0.136***	0.0905***	-0.0320***	0.152***
	(0.00425)	(0.00516)	(0.00574)	(0.00369)	(0.00694)
YEAR_2005	-0.0679*	0.136**	-0.259***	0.109	-0.0194
	(0.0398)	(0.0604)	(0.0690)	(0.0679)	(0.0505)
YEAR2005 * TREATMENT GROUP B	-0.304***	-0.306***	-0.228**	0.191**	-0.121*
	(0.0508)	(0.0786)	(0.0929)	(0.0910)	(0.0659)
CONSTANT	8.699***	6.791***	6.306***	8.573***	8.282***
	(0.0759)	(0.115)	(0.128)	(0.116)	(0.104)
OBSERVATIONS	23,749	16,823	18,601	15,186	19,359
R-SQUARED	0.816	0.785	0.780	0.807	0.227
ADJUSTED R-SQUARED	0.816	0.785	0.780	0.807	0.227

Source: Author's calculations.

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX TABLE 5: IMPACT ON LOG OF HOUSEHOLD EXPENDITURE PER CAPITA (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	LOG OF TOTAL EXPENDITURE	LOG OF FOOD EXPENDITURE	LOG OF NON-FOOD EXPENDITURE	LOG OF CROP EXPENDITURE	LOG OF NON-CROP EXPENDITURE	LOG OF AGRICULTURAL INPUT EXPENDITURE	LOG OF EDUCATIONAL EXPENDITURE	LOG OF HEALTH EXPENDITURE
POST (YEAR 2010)	1.997***	3.329***	2.734***	1.246***	1.895***	1.873***	2.241***	2.617***
	(0.0347)	(0.0245)	(0.0358)	(0.0548)	(0.0678)	(0.0684)	(0.0563)	(0.0712)
TREATMENT GROUP A	0.137***	0.0602***	0.0936***	0.107***	0.276***	0.286***	-0.0935	-0.260***
	(0.0218)	(0.0128)	(0.0241)	(0.0393)	(0.0612)	(0.0420)	(0.0570)	(0.0658)
POST * TREATMENT GROUP A	-0.144***	-0.0546***	-0.0750***	-0.127***	-0.268***	-0.315***	0.126**	0.273***
	(0.0256)	(0.0152)	(0.0269)	(0.0426)	(0.0633)	(0.0463)	(0.0588)	(0.0681)
RURAL	-0.0305***	-0.00729	-0.0510***	-0.0124	0.0326*	0.00573	-0.0804***	0.0571***
	(0.0101)	(0.00518)	(0.0109)	(0.0160)	(0.0170)	(0.0199)	(0.0151)	(0.0178)
MALE HOUSEHOLD HEAD	0.122***	0.0383***	-0.0696**	0.258***	0.237***	0.484***	-0.370***	-0.0190
	(0.0249)	(0.0138)	(0.0279)	(0.0629)	(0.0496)	(0.0773)	(0.0504)	(0.0605)
AVERAGE AGE	0.00562***	0.00597***	0.00632***	0.0113***	0.0168***	0.0199***	0.0258***	0.0113***
	(0.000736)	(0.000393)	(0.000763)	(0.00146)	(0.00141)	(0.00173)	(0.00214)	(0.00171)
DEPENDENT	0.0138***	0.0141***	0.0132***	0.0163***	0.0173***	0.0175***	0.0143***	0.0164***
	(0.000294)	(0.000230)	(0.000285)	(0.000380)	(0.000429)	(0.000527)	(0.000344)	(0.000387)
PROPORTION_FORMAL EDUCATION	1.055***	0.407***	1.084***	0.501***	0.650***	0.656***	2.776***	0.558***
	(0.0223)	(0.0110)	(0.0247)	(0.0460)	(0.0480)	(0.0558)	(0.0465)	(0.0569)
ACCESS TO SANITATION	0.0530***	0.0567***	0.111***	-0.0246*	-0.0155	-0.00304	0.155***	0.0755***
	(0.00853)	(0.00437)	(0.00897)	(0.0130)	(0.0149)	(0.0158)	(0.0135)	(0.0154)
ACCESS TO DRINKING WATER	0.146***	-0.00973	0.161***	-0.0231	0.0259	0.162***	0.0495	-0.0774*
	(0.0215)	(0.0101)	(0.0210)	(0.0310)	(0.0385)	(0.0394)	(0.0332)	(0.0396)
ACCESS TO ELECTRICITY	0.132***	0.0914***	0.171***	0.0520***	0.0304*	0.0747***	0.145***	0.0829***
	(0.00903)	(0.00472)	(0.00956)	(0.0135)	(0.0158)	(0.0170)	(0.0146)	(0.0166)
HOUSE OWNERSHIP	-0.0341**	-0.0459***	-0.0570***	-0.114***	-0.00544	-0.134***	-0.118***	-0.0352

	(0.0135)	(0.00720)	(0.0145)	(0.0195)	(0.0207)	(0.0227)	(0.0199)	(0.0234)
LOG OF LAND OWNERSHIP	0.157***	0.0194***	0.0323***	0.177***	0.111***	0.201***	0.0135***	-0.00416
	(0.00283)	(0.00128)	(0.00268)	(0.00511)	(0.00415)	(0.00564)	(0.00382)	(0.00442)
YEAR_2005	-0.525***	0.133***	-0.616***	-0.216***	-0.237***	-0.488***	0.199***	-0.0827
	(0.0212)	(0.0112)	(0.0238)	(0.0423)	(0.0532)	(0.0492)	(0.0467)	(0.0585)
YEAR2005 * TREATMENT GROUP A	-0.121***	-0.105***	-0.173***	0.162***	-0.195***	-0.00682	0.0534	0.228***
	(0.0273)	(0.0150)	(0.0305)	(0.0544)	(0.0697)	(0.0642)	(0.0656)	(0.0778)
CONSTANT	8.903***	6.007***	8.011***	7.285***	6.125***	6.636***	4.842***	4.171***
	(0.0435)	(0.0222)	(0.0471)	(0.0859)	(0.0897)	(0.103)	(0.0865)	(0.0997)
OBSERVATIONS	24,107	24,107	24,093	18,475	19,951	18,594	19,557	18,425
R-SQUARED	0.943	0.984	0.942	0.826	0.834	0.841	0.892	0.833
ADJUSTED R-SQUARED	0.943	0.984	0.942	0.826	0.834	0.840	0.892	0.833

Source: Author's calculations.

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX TABLE 6: IMPACT ON LOG OF HOUSEHOLD EXPENDITURE PER CAPITA (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	LOG OF TOTAL EXPENDITURE	LOG OF FOOD EXPENDITURE	LOG OF NON-FOOD EXPENDITURE	LOG OF CROP EXPENDITURE	LOG OF NON-CROP EXPENDITURE	LOG OF AGRICULTURAL INPUT EXPENDITURE	LOG OF EDUCATIONAL EXPENDITURE	LOG OF HEALTH EXPENDITURE
POST (YEAR 2010)	1.988***	3.311***	2.723***	1.258***	1.897***	1.861***	2.243***	2.601***
	(0.0358)	(0.0257)	(0.0368)	(0.0549)	(0.0684)	(0.0686)	(0.0564)	(0.0723)
TREATMENT GROUP B	0.137***	0.0602***	0.0936***	0.107***	0.276***	0.286***	-0.0934	-0.260***
	(0.0218)	(0.0128)	(0.0241)	(0.0394)	(0.0612)	(0.0420)	(0.0570)	(0.0658)
POST * TREATMENT GROUP B	-0.124***	-0.0300**	-0.0740***	-0.129***	-0.278***	-0.271***	0.0943	0.288***
	(0.0231)	(0.0136)	(0.0250)	(0.0406)	(0.0620)	(0.0436)	(0.0576)	(0.0668)
RURAL	-0.0304***	-0.00708	-0.0508***	-0.0127	0.0326*	0.00564	-0.0802***	0.0574***

	(0.0101)	(0.00518)	(0.0109)	(0.0160)	(0.0171)	(0.0200)	(0.0152)	(0.0178)
MALE HOUSEHOLD HEAD	0.122***	0.0376***	-0.0701**	0.260***	0.237***	0.483***	-0.370***	-0.0203
	(0.0249)	(0.0138)	(0.0279)	(0.0630)	(0.0496)	(0.0773)	(0.0504)	(0.0605)
AVERAGE AGE	0.00561***	0.00596***	0.00632***	0.0113***	0.0168***	0.0199***	0.0258***	0.0113***
	(0.000736)	(0.000393)	(0.000763)	(0.00146)	(0.00141)	(0.00173)	(0.00215)	(0.00171)
DEPENDENT	0.0138***	0.0141***	0.0132***	0.0162***	0.0173***	0.0175***	0.0143***	0.0164***
	(0.000295)	(0.000231)	(0.000286)	(0.000380)	(0.000430)	(0.000527)	(0.000344)	(0.000389)
PROPORTION_FORMAL EDUCATION	1.055***	0.407***	1.084***	0.501***	0.650***	0.655***	2.777***	0.558***
	(0.0223)	(0.0110)	(0.0247)	(0.0460)	(0.0480)	(0.0558)	(0.0465)	(0.0569)
ACCESS TO SANITATION	0.0532***	0.0569***	0.111***	-0.0244*	-0.0156	-0.00239	0.155***	0.0756***
	(0.00854)	(0.00437)	(0.00897)	(0.0130)	(0.0149)	(0.0158)	(0.0135)	(0.0154)
ACCESS TO DRINKING WATER	0.146***	-0.0107	0.159***	-0.0207	0.0251	0.165***	0.0465	-0.0794**
	(0.0215)	(0.0100)	(0.0210)	(0.0309)	(0.0384)	(0.0393)	(0.0331)	(0.0394)
ACCESS TO ELECTRICITY	0.132***	0.0914***	0.170***	0.0523***	0.0303*	0.0752***	0.144***	0.0827***
	(0.00903)	(0.00471)	(0.00955)	(0.0135)	(0.0158)	(0.0170)	(0.0146)	(0.0166)
HOUSE OWNERSHIP	-0.0340**	-0.0457***	-0.0570***	-0.115***	-0.00544	-0.134***	-0.118***	-0.0350
	(0.0135)	(0.00719)	(0.0145)	(0.0195)	(0.0207)	(0.0227)	(0.0199)	(0.0234)
LOG OF LAND OWNERSHIP	0.157***	0.0194***	0.0323***	0.177***	0.111***	0.201***	0.0135***	-0.00414
	(0.00283)	(0.00128)	(0.00268)	(0.00511)	(0.00415)	(0.00564)	(0.00382)	(0.00442)
YEAR_2005	-0.525***	0.133***	-0.616***	-0.216***	-0.237***	-0.488***	0.200***	-0.0826
	(0.0212)	(0.0112)	(0.0238)	(0.0423)	(0.0532)	(0.0492)	(0.0467)	(0.0585)
YEAR2005 * TREATMENT GROUP B	-0.121***	-0.105***	-0.173***	0.162***	-0.195***	-0.00678	0.0534	0.228***
	(0.0273)	(0.0150)	(0.0305)	(0.0544)	(0.0697)	(0.0642)	(0.0656)	(0.0778)
CONSTANT	8.903***	6.009***	8.013***	7.282***	6.126***	6.635***	4.845***	4.174***
	(0.0434)	(0.0221)	(0.0470)	(0.0859)	(0.0896)	(0.103)	(0.0865)	(0.0997)
OBSERVATIONS	24,107	24,107	24,093	18,475	19,951	18,594	19,557	18,425
R-SQUARED	0.943	0.984	0.942	0.826	0.834	0.841	0.892	0.833
ADJUSTED R-SQUARED	0.943	0.984	0.942	0.826	0.834	0.840	0.892	0.833

Source: Author's calculations.

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX TABLE 7: IMPACT ON LOG OF TOTAL ASSET OUTCOMES (TREATMENT GROUP A: RAINFALL-BASED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)
VARIABLES	LOG OF TOTAL CHANGE IN AGRICULTURAL AND OTHER BUSINESS ASSET	LOG OF TOTAL AGRICULTURAL INPUT ASSET VALUE	LOG OF TOTAL CONSUMER DURABLE ASSET VALUE
POST (YEAR 2010)	0.384***	1.162***	2.639***
	(0.133)	(0.0862)	(0.0471)
TREATMENT GROUP A	-0.202	0.295***	0.521***
	(0.129)	(0.0732)	(0.0390)
POST * TREATMENT GROUP A	0.212	-0.275***	-0.455***
	(0.137)	(0.0786)	(0.0423)
RURAL	-0.0724**	0.000385	-0.137***
	(0.0349)	(0.0234)	(0.0149)
MALE HOUSEHOLD HEAD	0.706***	0.750***	0.116***
	(0.123)	(0.0946)	(0.0394)
AVERAGE AGE	0.0155***	0.00282	-0.00328***
	(0.00506)	(0.00253)	(0.00101)
DEPENDENT	0.0233***	0.0203***	0.0141***
	(0.000596)	(0.000502)	(0.000327)
PROPORTION_FORMAL EDUCATION	1.292***	1.117***	1.795***
	(0.139)	(0.0795)	(0.0338)
ACCESS TO SANITATION	0.0620**	0.0625***	0.197***
	(0.0296)	(0.0204)	(0.0124)
ACCESS TO DRINKING WATER	-0.0698	-0.0142	0.138***
	(0.0795)	(0.0517)	(0.0355)
ACCESS TO ELECTRICITY	0.0828***	0.0691***	0.447***
	(0.0314)	(0.0214)	(0.0133)
HOUSE OWNERSHIP	-0.00918	-0.0542**	0.0699***
	(0.0437)	(0.0274)	(0.0199)

LOG OF LAND OWNERSHIP	0.00984	0.0973***	0.0691***
	(0.00848)	(0.00591)	(0.00377)
YEAR_2005	-0.460***	-0.582***	-0.442***
	(0.121)	(0.0728)	(0.0357)
YEAR2005 * TREATMENT GROUP A	0.346**	-0.341***	-0.452***
	(0.167)	(0.0968)	(0.0463)
CONSTANT	6.030***	6.714***	8.404***
	(0.212)	(0.139)	(0.0696)
OBSERVATIONS	13,217	15,941	23,807
R-SQUARED	0.436	0.751	0.910
ADJUSTED R-SQUARED	0.436	0.751	0.910

Source: Author's calculations.

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX TABLE 8: IMPACT ON LOG OF TOTAL ASSET OUTCOMES (TREATMENT GROUP B: SELF-REPORTED FLOOD AFFECTED GROUP)

	(1)	(2)	(3)
VARIABLES	LOG OF TOTAL CHANGE IN AGRICULTURAL AND OTHER BUSINESS ASSET	LOG OF TOTAL AGRICULTURAL INPUT ASSET VALUE	LOG OF TOTAL CONSUMER DURABLE ASSET VALUE
POST (YEAR 2010)	0.599***	1.177***	2.636***
	(0.134)	(0.0868)	(0.0482)
TREATMENT GROUP B	-0.202	0.295***	0.521***
	(0.129)	(0.0732)	(0.0390)
POST * TREATMENT GROUP B	-0.139	-0.316***	-0.507***
	(0.132)	(0.0753)	(0.0402)
RURAL	-0.0767**	0.000315	-0.136***
	(0.0347)	(0.0234)	(0.0149)
MALE HOUSEHOLD HEAD	0.776***	0.752***	0.116***
	(0.126)	(0.0946)	(0.0394)

AVERAGE AGE	0.0164***	0.00284	-0.00328***
	(0.00507)	(0.00253)	(0.00101)
DEPENDENT	0.0230***	0.0203***	0.0142***
	(0.000594)	(0.000503)	(0.000328)
PROPORTION_FORMAL EDUCATION	1.290***	1.117***	1.797***
	(0.139)	(0.0795)	(0.0338)
ACCESS TO SANITATION	0.0571*	0.0619***	0.197***
	(0.0294)	(0.0204)	(0.0124)
ACCESS TO DRINKING WATER	-0.0605	-0.0160	0.133***
	(0.0788)	(0.0515)	(0.0355)
ACCESS TO ELECTRICITY	0.0811***	0.0687***	0.446***
	(0.0313)	(0.0214)	(0.0133)
HOUSE OWNERSHIP	-0.0135	-0.0543**	0.0698***
	(0.0433)	(0.0274)	(0.0199)
LOG OF LAND OWNERSHIP	0.00983	0.0974***	0.0692***
	(0.00844)	(0.00591)	(0.00377)
YEAR_2005	-0.459***	-0.581***	-0.442***
	(0.121)	(0.0728)	(0.0357)
YEAR2005 * TREATMENT GROUP B	0.345**	-0.341***	-0.452***
	(0.167)	(0.0968)	(0.0463)
CONSTANT	5.944***	6.714***	8.410***
	(0.214)	(0.139)	(0.0696)
OBSERVATIONS	13,217	15,941	23,807
R-SQUARED	0.442	0.751	0.910
ADJUSTED R-SQUARED	0.441	0.751	0.910

Source: Author's calculations.
Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.


TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON