

Report on the Effects of Natural Disasters on Cambodian Households’ Financial Condition

1. Data and key variables

1.1. Dependent variables: Financial condition indicators for the household

The dependent variables include the indicators for the household financial condition in Cambodia, including income, expenditure, having debt, total borrowings, borrowings from formal financial institutions, and vulnerability indicators. We find these indicators from the Cambodian socio-economic surveys (CSES). In addition to total income, we separately consider income from crop cultivation, livestock, and employment. For expenditure also, we include food and non-food expenditure, expenditure related to crop cultivation and livestock rearing separately, and total expenditure. We converted all the income and expenditure data to annual data for consistency and comparison purposes although several of them are weekly, monthly, and bi-annually.

Food expenditure, for example, originally includes the values of consumption of food, beverages, and tobacco items in Riel, during the last 7 days before the interview. These food items include those purchased in cash or imputed values for own production, wages in kind, gifts, and free collections. The non-food expenditure also includes both purchased in cash and in-kind expenditure or gifts, however, the period ranges from the last 1 month to 12 months before the interview.

Moreover, for communication, transport, medical expenses, and personal care, the data covers the last 1 month’s consumption before the interview. However, for clothing and footwear spending, the data is for the last 6 months. For the rest of non-food expenditures, including furniture, education, recreation, accommodation, purchasing vehicles, special occasions, taxes, and etc..., the values are for the last 12 months.

Having debt is a binary variable indicating whether the household has outstanding debts to

other households or institutions. Total borrowings include the total amount borrowed by the household in Riel terms from other households or institutions. Further, borrowings from formal financial institutions will be constructed as a dummy (binary variable) if the household borrows from banks, non-governmental organizations (NGOs) (non-profit and profit), and microfinance institutions (MFIs).

For the purpose of simplicity in the interpretation, we take the logarithms of income, expenditure, and total borrowings in the main analysis for the effect of natural disasters on household financial condition. Table 1.1 presents the summary statistics for the logarithm of income, expenditure, and borrowing variables, and vulnerability indicators for the past 7 days and 30 days before the survey.

Vulnerability, in this context, refers to the lack of food or money to buy it. To measure the degree of vulnerability, we use the data from CSES reporting the households' several strategies to cope with this problem. The strategies include relying on less preferred and less expensive food, borrowing food or relying on help from friends or relatives, reducing the number of meals eaten per day, and reducing the portion size of meals during the last 7 days before the interview.

Moreover, we consider more indicators for a longer time span, including whether there was ever no food to eat, sold household goods, and sold productive assets, spent savings and sold house or land during the past 30 days. We construct dummies for each strategy indicating that the household uses the strategy at least for 1 day during the last 7 days and 30 days before the interview.

Table 1.1: Summary statistics for income, expenditure, and borrowing, and vulnerability indicators.

	Std.		
Variable	Mean	Dev.	Obs
<i>Income</i>			
Log of total income	16.084	1.217	27,251
Log of income from employment	16.353	0.815	19,968
Log of income from crop	14.578	1.213	16,335
Log of income from livestock	13.212	1.758	10,055
<i>Expenditure</i>			
Log of total expenditure	16.767	0.684	30,851
Log of food expenditure	16.148	0.625	30,848
Log of non-food expenditure	15.689	0.958	30,851
Log of crop expenditure	13.799	1.142	16,351
Log of livestock expenditure	12.324	1.464	16,271
<i>Borrowing</i>			
Having debt = 1	0.333	0.471	30,851
Log of total borrowing	15.545	1.428	10,287
Formal financial institution = 1	0.273	0.446	30,851
<i>Vulnerability (past 7 days)</i>			
Used cheap food = 1	0.061	0.240	30,851
Borrowed food = 1	0.016	0.125	30,851
Reduced meal number = 1	0.007	0.081	30,851
Reduced meal size = 1	0.010	0.098	30,851
<i>Vulnerability (past 30 days)</i>			
Ever no food = 1	0.308	0.462	30,851
Sold household goods = 1	0.001	0.038	30,851
Sold productive assets = 1	0.001	0.033	30,851
Spent savings = 1	0.011	0.106	30,851
Sold house or land = 1	0.001	0.029	30,851

Notes: Total income is the sum of income from employment, crop cultivation and livestock rearing. Similarly, total expenditure is the sum of food and non-food expenditure, and expenditures related to crop cultivation and livestock rearing.

1.2. Natural disaster indicators

For natural disasters in Cambodia, we focus on the three common disasters, including drought, flood, and storm. For this purpose, we collect these indicators from the Cambodian community database (CDB). Drought, flood, and storm indicate the number of families affected by heavy drought, flood, and storm, at the village level. For the analysis purpose, we create a single dummy for disaster considering drought, flood, and storm. Table 1.2 reports the summary statistics for the disaster indicators.

Table 1.2: Summary statistics for disaster indicators.

Variable	Mean	Std. Dev.	Obs
Flood = 1	0.187	0.390	30,851
Drought = 1	0.319	0.466	30,851
Storm = 1	0.286	0.452	30,851
Any disaster = 1	0.523	0.499	30,851

Notes: Flood, drought, and storm are dummies indicating if at least one household or family is affected by the respective disasters in the commune. Any disaster is a dummy representing if at least a single family is affected in a commune.

Storm, flooding, and drought are common disasters affecting a large number of people in Cambodia. The incidence of these disasters varies by region in Cambodia. We measure incidence by the number of persons or families affected by the disasters in each district. We classify the degree of disaster incidence into quartiles. Eastern and South-western Cambodia seems relatively safe from either of the disasters.

Figure 1.1 presents the number of persons (on the left-hand side) and families (on the right-hand side) affected by storms. The figures show that storm incidence is high among districts around

north-western, central, and south-eastern Cambodia. Particularly, most districts in Banteay Meanchey, Oddar Meanchey, Battambang, Pursat, Stung Treng, Kampong Chhnang, Kampong Cham, and Kampot provinces are highly affected.

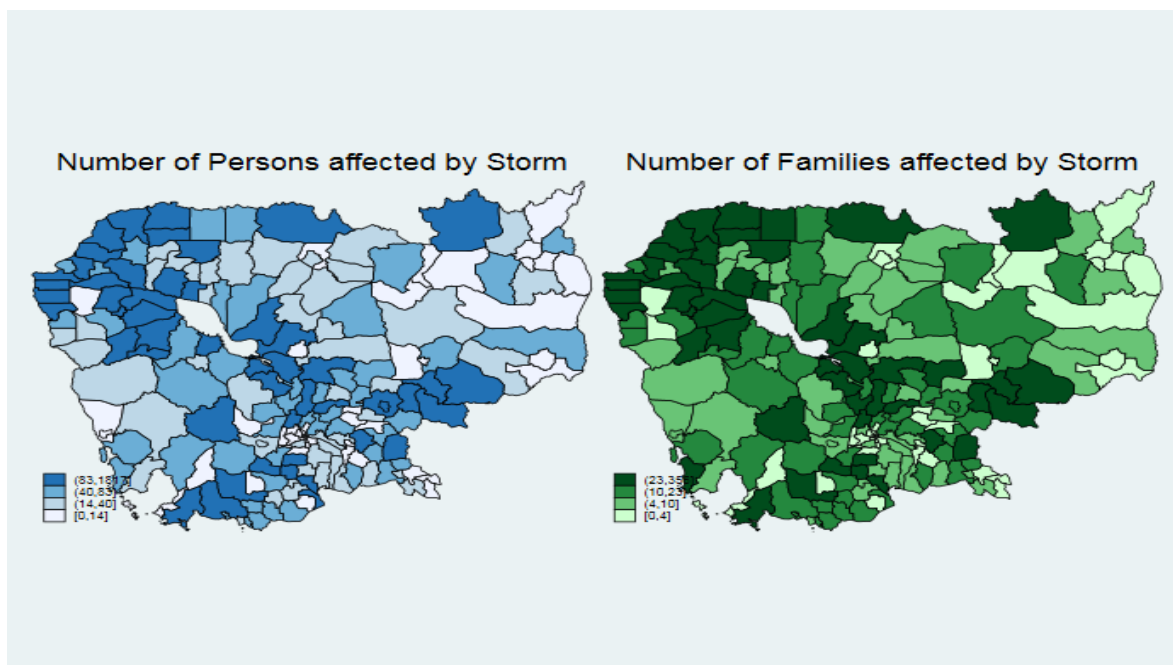


Figure 1.1: Storm Incidence Quartiles by District in Cambodia

Figure 1.2 presents the number of persons (on the left-hand side) and families (on the right-hand-side) affected by flooding. The figures show that flood affects mostly the districts in Banteay Meanchey, Battambang, Preah Vihear, Stung Treng, Kampong Thom, Kratie, Kampong Cham, and Prey Veng provinces.

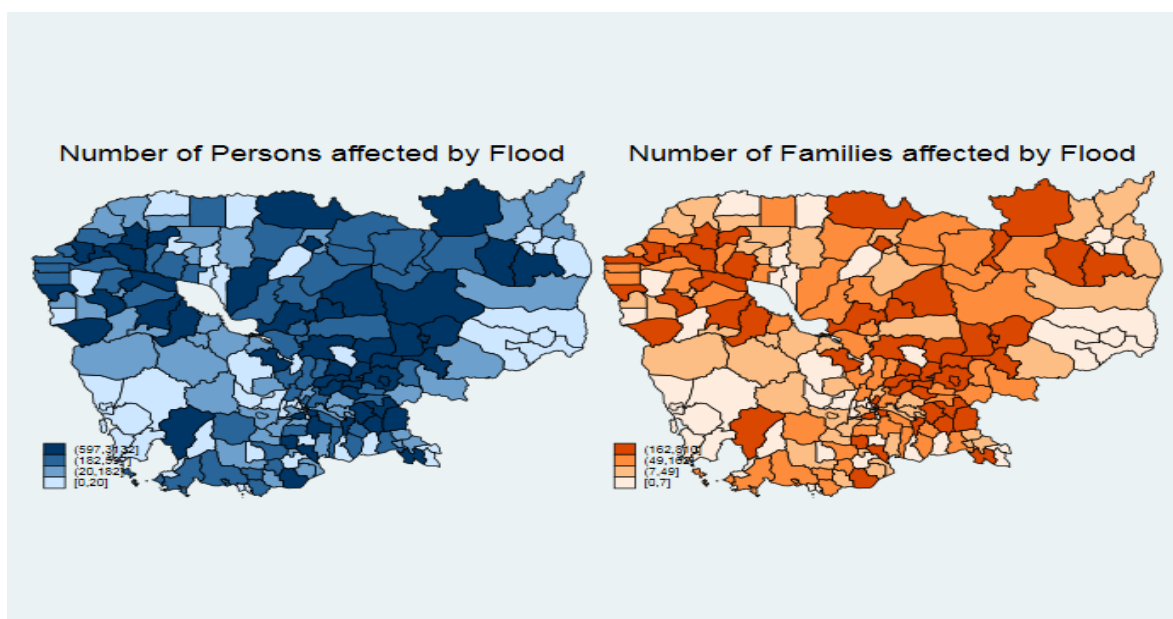


Figure 1.2: Flood Incidence Quartiles by District in Cambodia

Figure 1.3 presents the number of persons (on the left-hand side) and families (on the right-hand side) affected by drought. The figures show that drought affects mostly the north-western, central, and south-eastern parts of Cambodia. Particularly, most districts in Banteay Meanchey, Oddar Meanchey, Battambang, Siem Reap, Eastern Pursat, Kampong Thom, Kampong Speu, and Kratie provinces are highly affected.

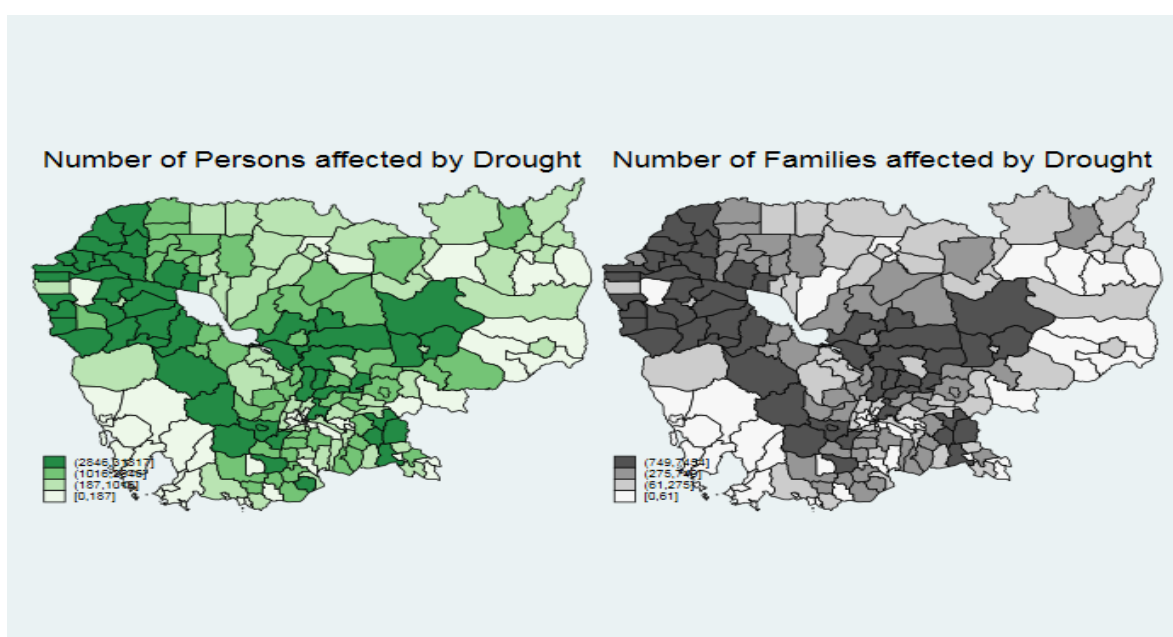


Figure 1.3: Drought Incidence Quartiles by District in Cambodia

1.3. Asset indicators

We employ principal component analysis to construct an asset index using the durable goods mostly used in Southeast Asia, including Cambodia. These basic goods include motorcycle, TV, mobile phone, transistor, fan/cooler, pumping, car, and refrigerator, among several others (Deutsch, 2020)¹. Table 1.3 presents the summary statistics for durable goods.

Table 1.3: Summary statistics for common durable goods

Variable	Mean	Std. Dev.	Obs
Television	0.800	0.400	30,851
Motorcycle	0.804	0.397	30,851
Cell phone	0.896	0.306	30,851
AC/fan	0.703	0.457	30,851
Radio	0.522	0.500	30,851
PC	0.365	0.481	30,851
Refrigerator	0.388	0.487	30,851

Notes: This table reports the means and standard deviations of the common asset indicators in Cambodia.

1.4. Other covariates

Other covariates we control for while estimating the effect of the disaster on household financial conditions include education level, land ownership, household size, presence of a sick person in the household, road length and number of banks and microfinance institutions in the commune, and the presence of any poor card (subsidy) by a household member. We report the summary statistics for these

¹ Joseph Deutsch, Jacques Silber, Guanghua Wan, Mengxue Zhao. 2020. Asset indexes and the measurement of poverty, inequality, and welfare in Southeast Asia, *Journal of Asian Economics*, 70, 101220.

variables in Table 1.4.

Table 1.4: Summary statistics for other covariates.

Variable	Mean	Std. Dev.	Obs
<i>Education for household head</i>			
Primary level = 1	0.156	0.363	30,851
Secondary level and above = 1	0.706	0.456	30,851
Diploma/certificate and above = 1	0.705	0.456	30,851
Degree and above = 1	0.705	0.456	30,851
<i>Others</i>			
Owns land = 1	0.537	0.499	30,851
Household size	4.445	1.762	30,851
Any sick member = 1	0.511	0.500	30,851
Female household head = 1	0.220	0.414	30,851
Log of road length (commune)	12.279	1.399	30,566
Any poor card = 1	0.445	0.497	30,851
Number of MFIs (commune)	2.047	10.359	30,801
Number of Banks (commune)	1.256	11.782	30,801

Notes: Any poor card is a dummy representing if at least one member of the household benefit from any type of subsidized card given for low income households.

2. Methodology

The objective of this project is to empirically estimate the impact of natural disasters on Cambodian households' financial condition. For this purpose, we use a simple ordinary least square (OLS) or linear probability model (LPM) method. Thus, our empirical specification is

$$HHF_{cdht} = \alpha_1 DIS_{ct} + \alpha_2 FI_{ht} + \alpha_3 DIS_{ct} \times FI_{ht} + X'_{cdht} \beta + \gamma_d + \varepsilon_{cdht}$$

where HHF represents the household financial condition, including income, expenditure, borrowing, and vulnerability. c , d , h , and t , indicate the commune, district, household, and time, respectively. DIS represents a dummy if at least a single household is affected in the commune by a drought, flood, and/or storm disaster. X is a vector of covariates, including education and sex of household head, household size, land ownership, whether any member of the household is sick and uses a poor card, and road length, the number of banks and microfinance institutions in the commune. While γ represents the district fixed effect, ε is the error term. We cluster the standard errors at the district level. α_1 and α_3 are our parameters of interest measuring the direct effect of disaster and disaster effect for those households accessing formal financial institutions.

3. Results

This section reports the results for the effect of natural disasters on household financial conditions. Table 3.1 presents the estimated effects of the disasters on household income. Moreover, we present the disaster impact on household expenditures in Table 3.2. Further, Table 3.3 shows the

results for the effect of the disasters on borrowing and food availability. Finally, we extend our analyses to examine the impact of the disaster on additional vulnerability indicators.

Table 3.1: The effect of natural disaster on household income

	Dependent variables			
	Total income	Income from employment	Income from crop	Income from livestock
Disaster = 1	-0.052** (0.023)	-0.028 (0.019)	-0.026 (0.033)	0.019 (0.065)
Formal FIs = 1	0.085*** (0.029)	0.018 (0.020)	-0.038 (0.034)	0.068 (0.061)
Disaster X Formal FIs	0.029 (0.036)	0.064** (0.025)	0.005 (0.050)	-0.134 (0.082)
Asset index	0.159*** (0.008)	0.105*** (0.008)	0.212*** (0.011)	0.191*** (0.020)
Secondary or above edu.	-0.062 (0.334)	0.230 (0.174)	-0.281 (0.325)	0.026 (0.625)
Diploma/certificate or above	0.448 (0.464)	-0.094 (0.333)	1.06** (0.448)	1.43** (0.632)
Degree or above	-0.451 (0.322)	-0.151 (0.284)	-0.75** (0.307)	-1.454*** (0.080)
Own land	-0.086*** (0.023)	-0.104*** (0.015)	0.044 (0.071)	0.477*** (0.054)
Household size	0.202*** (0.007)	0.140*** (0.005)	0.089*** (0.006)	0.069*** (0.011)
Sick	-0.098*** (0.014)	-0.085*** (0.011)	-0.112*** (0.017)	0.036 (0.039)
Female hh head	-0.071*** (0.019)	0.01 (0.014)	-0.316*** (0.024)	-0.312*** (0.046)
Road length	0.012 (0.010)	0.02** (0.007)	-0.045*** (0.014)	0.011 (0.020)
Any poor card	0.106*** (0.030)	0.057*** (0.020)	-0.373*** (0.043)	-0.259*** (0.068)
Number of MFIs	0.000 (0.001)	0.00** (0.000)	0.000 (0.000)	0.001 (0.001)
Number of banks	0.001** (0.000)	0.001*** (0.000)	-0.001*** (0.000)	0.000 (0.000)
District fixed effect	Yes	Yes	Yes	Yes
Sample size	27,034	19,791	16,271	10,021
Adjusted R-squared	0.238	0.295	0.215	0.091

Notes: Standard errors are clustered at the district level.

Table 3.2: The effect of natural disaster on household expenditure

	Dependent variables				
	Total expenditure	Food exp	Non-food expenditure	Crop related expenditure	Livestock expenditure
Disaster = 1	-0.027** (0.013)	-0.031** (0.013)	-0.018 (0.018)	-0.011 (0.030)	0.039 (0.040)
Formal FIs = 1	0.166*** (0.014)	0.051*** (0.012)	0.302*** (0.021)	0.082** (0.034)	0.079* (0.043)
Disaster X Formal FIs	0.016 (0.017)	0.021 (0.015)	0.003 (0.026)	0.003 (0.049)	-0.067 (0.053)
Asset index	0.172*** (0.005)	0.092*** (0.005)	0.305*** (0.006)	0.211*** (0.011)	0.149*** (0.017)
Secondary or above edu.	0.075 (0.073)	0.030 (0.061)	0.112 (0.120)	-0.051 (0.319)	-0.026 (0.311)
Diploma/certificate or above	-0.135 (0.125)	-0.315*** (0.121)	0.194 (0.163)	0.989** (0.430)	-0.614 (0.426)
Degree or above	0.042 (0.102)	0.281*** (0.104)	-0.352*** (0.112)	-0.927*** (0.290)	0.621** (0.294)
Own land	0.104*** (0.011)	-0.044*** (0.010)	0.100*** (0.015)	-0.014 (0.064)	0.481*** (0.036)
Household size	0.106*** (0.002)	0.110*** (0.002)	0.106*** (0.003)	0.078*** (0.006)	0.044*** (0.007)
Sick	0.043*** (0.007)	-0.018*** (0.006)	0.157*** (0.012)	-0.017 (0.017)	0.055** (0.022)
Female hh head	-0.157*** (0.008)	-0.141*** (0.007)	-0.151*** (0.012)	-0.260*** (0.024)	-0.308*** (0.028)
Road length	-0.007 (0.005)	0.001 (0.005)	-0.013* (0.008)	-0.048*** (0.012)	0.006 (0.016)
Any poor card	-0.100*** (0.013)	-0.059*** (0.012)	-0.135*** (0.017)	-0.355*** (0.035)	-0.201*** (0.040)
Number of MFIs	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.001*** (0.000)
Number of banks	0.001** (0.000)	0.001** (0.000)	0.001* (0.000)	0.001*** (0.000)	-0.001** (0.000)
District fixed effect	Yes	Yes	Yes	Yes	Yes
Sample size	30,566	30,563	30,566	16,286	16,210
Adjusted R-squared	0.542	0.546	0.469	0.238	0.107

Notes: Standard errors are clustered at the district level.

Table 3.3: The effect of natural disaster on household borrowing and shortage of food

	Dependent variables					
	Total borrowing	Have debt	Cheap food	Borrow food	Reduce meal number	Reduce meal size
Disaster = 1	-0.054 (0.072)	0.007 (0.005)	-0.001 (0.007)	-0.002 (0.002)	0.001 (0.001)	0.000 (0.002)
Formal FIs = 1	0.962*** (0.065)	0.920*** (0.005)	0.012** (0.006)	-0.001 (0.002)	0.002 (0.002)	0.001 (0.002)
Disaster X Formal FIs	-0.038 (0.075)	-0.021*** (0.007)	-0.007 (0.008)	0.000 (0.004)	0.001 (0.003)	-0.002 (0.003)
Asset index	0.323*** (0.016)	-0.018*** (0.002)	-0.031*** (0.003)	-0.012*** (0.001)	-0.003*** (0.001)	-0.005*** (0.001)
Secondary or above edu.	0.070 (0.377)	-0.005 (0.038)	-0.015 (0.014)	-0.006 (0.006)	-0.008 (0.004)	-0.005 (0.003)
Diploma/certificate or above	0.302 (0.438)	-0.048 (0.048)	-0.053*** (0.019)	-0.016* (0.009)	-0.003 (0.005)	-0.009** (0.005)
Degree or above	-0.383* (0.225)	0.045 (0.029)	0.075*** (0.014)	0.024*** (0.007)	0.011*** (0.003)	0.016*** (0.003)
Own land	0.015 (0.035)	-0.001 (0.003)	-0.013*** (0.004)	-0.012*** (0.003)	-0.003* (0.002)	-0.004** (0.002)
Household size	0.033*** (0.008)	0.004*** (0.001)	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)	0.001*** (0.000)
Sick	-0.129*** (0.025)	0.031*** (0.003)	0.028*** (0.004)	0.011*** (0.002)	0.004*** (0.001)	0.006*** (0.001)
Female hh head	-0.185*** (0.036)	-0.007** (0.004)	0.013*** (0.004)	0.006*** (0.002)	0.004*** (0.001)	0.002 (0.002)
Road length	0.016 (0.013)	0.001 (0.002)	0.004 (0.003)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)
Any poor card	-0.220*** (0.036)	0.022*** (0.006)	0.071*** (0.007)	0.039 (0.005)	0.012*** (0.003)	0.022 (0.003)
Number of MFIs	0.001 (0.001)	0.000** (0.000)	0.000* (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Number of banks	0.000 (0.001)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
District fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	10,221	30,566	30,566	30,566	30,566	30,566
Adjusted R-squared	0.376	0.765	0.103	0.042	0.019	0.027

Notes: Standard errors are clustered at the district level.

Table 3.4: The effect of natural disaster on household vulnerability.

	Dependent variables				
	Ever no food	Sold HH goods	Sold prod. Assets	Spent saving	Sold house or land
Disaster = 1	-0.007* (0.004)	0.001 (0.001)	0.001 (0.001)	-0.002 (0.003)	0.000 (0.001)
Formal FIs = 1	-0.006* (0.003)	0.000 (0.001)	0.000 (0.000)	-0.001 (0.002)	-0.001 (0.000)
Disaster X Formal FIs	0.004 (0.004)	0.000 (0.001)	0.001 (0.001)	0.003 (0.003)	0.001 (0.001)
Asset index	-0.018*** (0.002)	-0.001** (0.000)	0.000* (0.000)	-0.007*** (0.001)	0.000* (0.000)
Secondary or above edu.	-0.017 (0.029)	-0.001 (0.001)	-0.001 (0.001)	-0.005 (0.004)	-0.001 (0.001)
Diploma/certificate or above	0.007 (0.033)	-0.003 (0.003)	-0.002 (0.003)	-0.007 (0.006)	-0.001 (0.003)
Degree or above	0.011 (0.015)	0.004 (0.003)	0.003 (0.002)	0.015*** (0.004)	0.003 (0.002)
Own land	-0.012*** (0.003)	-0.001 (0.001)	-0.001* (0.001)	-0.005** (0.002)	0.000 (0.000)
Household size	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)	0.001 (0.000)	0.000* (0.000)
Sick	0.008*** (0.002)	0.001 (0.000)	0.000 (0.000)	0.009*** (0.002)	0.000 (0.000)
Female hh head	0.000 (0.002)	0.000 (0.001)	0.001 (0.001)	0.001 (0.002)	0.001 (0.000)
Road length	-0.001 (0.001)	-0.001 (0.000)	0.000 (0.000)	0.000 (0.001)	-0.001 (0.000)
Any poor card	0.006 (0.005)	0.002 (0.001)	0.001 (0.001)	0.016*** (0.004)	0.001 (0.001)
Number of MFIs	0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Number of banks	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000*** (0.000)	0.000 (0.000)
District fixed effect	Yes	Yes	Yes	Yes	Yes
Sample size	30,566	30,566	30,566	30,566	30,566
Adjusted R-squared	0.885	0.008	0.005	0.032	0.007

Notes: Standard errors are clustered at the district level.

