

Online Appendix to “Natural Disasters and Political Engagement: Evidence from the 2010-11 Pakistani Floods”

C. Christine Fair* Patrick M. Kuhn† Neil Malhotra‡ Jacob N. Shapiro§

The appendix consists of three sections. Section A contains the summary statistics on all the variables in the dataset. Section B shows the results of additional regressions mentioned in the main text. Finally, Section C provides survey evidence captured 5-17 months post-flood and 14 months pre-election that indicates a behavioral change among flood-affected individuals in so far as they seem to have invested more time and effort in acquiring political knowledge and become more supportive of aggressive political action. However, given that the survey data are cross-sectional, we are unable to make strong causal inferences. We include this information to better elucidate the inductive reasoning that generated the predictions in this paper.

* Associate Professor, School of Foreign Service, Georgetown University; Email: c_christine.fair@yahoo.com.

† Lecturer (Assistant Professor) in Comparative Politics; School of Government & International Affairs; University of Durham (UK); E-mail: p.m.kuhn@durham.ac.uk.

‡ Professor of Political Economy, Stanford Graduate School of Business; E-mail: neilm@stanford.edu.

§ Associate Professor, Woodrow Wilson School and Department of Politics, Princeton University, Princeton, NJ 08544; Email: jns@princeton.edu. Corresponding author.

A Appendix: Summary Statistics

Table A.1: Summary Statistics for All Covariates of the Provincial Assembly Constituency Data

Variable	Unit	Median	Mean	Std. Dev.	Min	Max	N
Panel A: Outcomes							
Turnout 2002	percentage points [0,1]	0.408	0.409	0.093	0.096	0.763	565
Turnout 2008	percentage points [0,1]	0.442	0.440	0.120	0.064	0.786	565
Turnout 2013	percentage points [0,1]	0.564	0.541	0.104	0.019	0.738	556
Turnout Change 2008-2002	percentage points [0,1]	0.030	0.031	0.080	-0.316	0.316	565
Total Votes Cast 2013	100,000 voters	0.843	0.802	0.273	0.007	1.564	556
Total Valid Votes 2013	100,000 voters	0.822	0.776	0.264	0.007	1.509	565
Registered Voters 2013	100,000 voters	1.475	1.452	0.388	0.328	3.004	565
Provincial Incumbent Vote Share 2013	percent [0,1]	0.349	0.308	0.213	0	0.898	565
PPP Vote Share 2013	percent [0,1]	0.060	0.144	0.184	0	0.898	565
PML-N Vote Share 2013	percent [0,1]	0.271	0.256	0.206	0	0.714	565
Panel B: Flood Treatment							
% Population Exposed 2010 & 2011	percent [0,1]	0	0.067	0.147	0	1	565
Panel C: Controls							
PPP Won Seat 2008	dummy	0	0.306	0.461	0	1	565
PML-N Won Seat 2008	dummy	0	0.191	0.394	0	1	565
PML-Q Won Seat 2008	dummy	0	0.173	0.379	0	1	565
Electoral Competitiveness 2008	index	0.835	0.771	0.215	0.037	0.999	565
UNEP Flood Risk	average of 6pt index	0.957	1.312	1.266	0	5	565
Flood Risk ≥ 1	dummy	0	0.497	0.500	0	5	565
Distance to Nearest Major River	100 kilometers	0.270	0.582	0.895	0.001	6.353	565
Constituency Neighboring Major River	dummy	0	0.375	0.485	0	1	565
Std. Dev. of Elevation	1,000 meters	0.002	0.026	0.053	0	0.323	565
Mean of Elevation	1,000 meters	0.054	0.118	0.183	0.001	1.293	565
% Population Exposed 2012	percent [0,1]	0	0.013	0.062	0	0.700	565
Total Votes Cast 2008	100,000 voters	0.641	0.606	0.222	0.087	1.270	565
Total Valid Votes 2008	100,000 voters	0.623	0.590	0.216	0.086	1.243	565
Registered Voters 2008	100,000 voters	1.364	1.365	0.357	0.139	2.259	565
Total Votes Cast 2002	100,000 voters	0.519	0.510	0.193	0.070	1.062	565
Total Valid Votes 2002	100,000 voters	0.506	0.496	0.187	0.068	1.027	565
Registered Voters 2002	100,000 voters	1.286	1.217	0.282	0.325	1.945	565
Index of Total Relief	pca index	-0.773	0.011	1.621	-0.773	7.628	555
Migration Estimate	percent [0,1]	0.003	0.021	0.04	0	0.224	351

B Appendix:Further Robustness Checks

Table B.1: Non-Linear Turnout Response to Flood Exposure

	Full Sample			Near Maj. Rivers			Neighboring Maj. River		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
% Pop. Exposed	0.153 (0.070)	0.182 (0.070)	0.078 (0.050)	0.129 (0.066)	0.151 (0.057)	0.048 (0.048)	0.095 (0.069)	0.108 (0.060)	0.079 (0.058)
% Pop. Exposed ²	-0.059 (0.085)	-0.085 (0.086)	-0.018 (0.060)	-0.060 (0.075)	-0.065 (0.071)	0.021 (0.054)	-0.051 (0.082)	-0.042 (0.072)	-0.016 (0.069)
Joint Significance:									
F-stat	6.688	11.524	4.703	4.162	9.663	3.833	3.185	7.750	4.531
p-value	(0.002)	(0.000)	(0.011)	(0.019)	(0.000)	(0.026)	(0.048)	(0.001)	(0.015)
Marginal Effects:									
Flood Impact (Median = .07)	0.010 (0.004)	0.012 (0.004)	0.005 (0.003)	0.009 (0.004)	0.010 (0.004)	0.003 (0.003)	0.006 (0.004)	0.007 (0.004)	0.005 (0.004)
Flood Impact (75th pctile = .21)	0.030 (0.012)	0.035 (0.011)	0.016 (0.008)	0.025 (0.011)	0.029 (0.009)	0.011 (0.008)	0.018 (0.011)	0.021 (0.010)	0.016 (0.010)
Flood Impact (90th pctile = .42)	0.053 (0.017)	0.061 (0.016)	0.029 (0.012)	0.043 (0.017)	0.051 (0.014)	0.023 (0.012)	0.031 (0.016)	0.038 (0.014)	0.030 (0.014)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.549	0.605	0.706	0.547	0.612	0.752	0.584	0.624	0.707
Observations	556	556	556	389	389	389	209	209	209
Clusters	109	109	109	77	77	77	63	63	63

Notes: Unit of observation is a Provincial Assembly constituency. All regressions include controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, mean constituency elevation, the percentage of the population affected by flooding in 2012, and turnout levels in 2002 and 2008. Joint Significance reports the F-statistic for significance of % Pop. Exposed and its squared term jointly. Marginal Effects show the linear combination of % Pop. Exposed and % Pop. Exposed² at the indicated level of flood impact (Note: impact distribution level conditional on flood exposure>0). Standard errors are clustered at the district level and reported in parentheses.

Table B.2: Checking For Difference in Response to Flooding Between Urban and Rural Areas

	Full Sample			Near Maj. Rivers			Neighboring Maj. River		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
% Pop. Exposed	0.132	0.138	0.081	0.098	0.114	0.066	0.060	0.081	0.064
	(0.036)	(0.030)	(0.028)	(0.037)	(0.026)	(0.028)	(0.032)	(0.025)	(0.031)
Urban	0.000	-0.002	0.010	-0.018	-0.015	-0.008	-0.033	-0.021	-0.022
	(0.010)	(0.010)	(0.013)	(0.013)	(0.010)	(0.008)	(0.012)	(0.010)	(0.009)
% Flooded \times Urban	-0.112	-0.077	-0.094	-0.052	-0.029	-0.038	-0.006	-0.016	-0.024
	(0.052)	(0.058)	(0.049)	(0.056)	(0.064)	(0.034)	(0.048)	(0.054)	(0.045)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.551	0.606	0.708	0.554	0.615	0.754	0.598	0.630	0.713
Observations	556	556	556	389	389	389	209	209	209
Clusters	109	109	109	77	77	77	63	63	63

Notes: Outcome is turnout in 2013. Unit of observation is a Provincial Assembly constituency. ‘Urban’ is defined as constituencies with population density above the 75th percentile of the population density distribution, approximately 921 people per square kilometer. All regressions include controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency’s elevation, mean constituency elevation, the percentage of the population affected by flooding in 2012, and turnout levels in 2002 and 2008. Standard errors are clustered at the district level and reported in parentheses.

Table B.3: Alternative Turnout Measure (Valid Votes/ Registered Voters)

	Turnout 2013 (mean=0.525; sd=0.100)								
	Controls			Controls & Turnout Trend			Controls & Turnout Levels		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
% Pop. Exposed	0.088 (0.032)	0.131 (0.024)	0.057 (0.027)	0.094 (0.032)	0.136 (0.025)	0.060 (0.026)	0.094 (0.030)	0.106 (0.024)	0.043 (0.023)
Province FE	X			X			X		
Division FE	X			X			X		
R-Squared	0.304	0.472	0.626	0.311	0.475	0.628	0.485	0.569	0.682
Observations	565	565	565	565	565	565	565	565	565
Clusters	109	109	109	109	109	109	109	109	109

Notes: Outcome variable is turnout in the 2013 election measured as valid votes/registered voters. Models 4 through 6 control for previous turnout using a trend variable ($trend = turnout_{08} - turnout_{02}$). Models 7 through 9 control for previous turnout through 2002 and 2008 turnout level variables ($turnout_{02}$, $turnout_{08}$). All regressions include controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, and mean constituency elevation, as well as the percentage of the population affected by flooding in 2012. Unit of observation is a Provincial Assembly constituency. Standard errors are clustered at the district level and reported in parentheses.

Table B.4: Alternative Turnout Measure (Valid Votes/ Registered Voters)

	Full Sample			Near Maj. Rivers			Neighboring Maj. River		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
% Pop. Exposed	0.094 (0.030)	0.106 (0.024)	0.043 (0.023)	0.069 (0.028)	0.092 (0.017)	0.045 (0.022)	0.050 (0.025)	0.070 (0.017)	0.048 (0.023)
Province FE	X			X			X		
Division FE	X			X			X		
R-Squared	0.485	0.569	0.682	0.468	0.564	0.691	0.531	0.586	0.665
Observations	565	565	565	394	394	394	212	212	212
Clusters	109	109	109	77	77	77	63	63	63

Notes: Outcome variable is turnout in the 2013 election measured as valid votes/registered voters. Unit of observation is a Provincial Assembly constituency. All models control for previous turnout through 2002 and 2008 turnout level variables ($turnout_{02}$, $turnout_{08}$). All regressions include controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, mean constituency elevation, and the percentage of the population affected by flooding in 2012. Standard errors are clustered at the district level and reported in parentheses.

Table B.5: Regressions on Components of Turnout for Different Subsets

	Votes Cast 2013			Valid Votes Cast 2013			Registered Voters 2013		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Full Sample									
% Pop. Exposed	-0.004 (0.084)	0.128 (0.048)	0.142 (0.050)	-0.008 (0.086)	0.115 (0.049)	0.130 (0.048)	-0.234 (0.135)	-0.063 (0.110)	0.104 (0.064)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.618	0.751	0.798	0.611	0.745	0.799	0.427	0.586	0.702
Observations	556	556	556	565	565	565	565	565	565
Clusters	109	109	109	109	109	109	109	109	109
Panel B: Near Major Rivers									
% Pop. Exposed	0.051 (0.100)	0.193 (0.056)	0.162 (0.060)	0.044 (0.100)	0.177 (0.053)	0.148 (0.056)	-0.117 (0.145)	0.080 (0.095)	0.143 (0.076)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.474	0.654	0.732	0.460	0.641	0.719	0.223	0.419	0.582
Observations	389	389	389	394	394	394	394	394	394
Clusters	77	77	77	77	77	77	77	77	77
Panel C: Neighboring Major Rivers									
% Pop. Exposed	0.012 (0.098)	0.174 (0.062)	0.186 (0.067)	0.006 (0.095)	0.151 (0.057)	0.150 (0.061)	-0.136 (0.161)	0.098 (0.119)	0.151 (0.074)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.532	0.651	0.757	0.525	0.638	0.749	0.277	0.412	0.671
Observations	209	209	209	212	212	212	212	212	212
Clusters	63	63	63	63	63	63	63	63	63

Notes: Unit of observation is a Provincial Assembly constituency. All regressions include controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, mean constituency elevation, the percentage of the population affected by flooding in 2012, and turnout levels in 2002 and 2008. Standard errors are clustered at the district level and reported in parentheses.

Table B.6: Controlling for Migration

	Full Sample			Near Maj. Rivers			Neighboring Maj. River		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Controlling for Migration									
% Pop. Exposed	0.097 (0.042)	0.120 (0.036)	0.058 (0.027)	0.040 (0.030)	0.066 (0.029)	0.037 (0.029)	0.036 (0.018)	0.036 (0.021)	0.040 (0.039)
Migration	0.089 (0.189)	0.074 (0.174)	-0.081 (0.149)	-0.202 (0.179)	-0.200 (0.163)	-0.117 (0.144)	0.205 (0.104)	0.214 (0.107)	0.238 (0.159)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.582	0.626	0.741	0.511	0.537	0.729	0.630	0.638	0.680
Observations	345	345	345	218	218	218	113	113	113
Clusters	58	58	58	39	39	39	30	30	30
Panel B: Subset of Constituencies with No Migration									
% Pop. Exposed	0.102 (0.031)	0.102 (0.026)	0.060 (0.021)	0.090 (0.034)	0.097 (0.030)	0.061 (0.024)	0.099 (0.034)	0.104 (0.033)	0.066 (0.025)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.569	0.644	0.743	0.549	0.606	0.719	0.549	0.602	0.717
Observations	378	378	378	332	332	332	281	281	281
Clusters	87	87	87	77	77	77	71	71	71

Notes: Migration measure was calculated using our national survey data by assuming that all those reporting any damage who live in unaffected districts migrated because of the flood and then estimating the migration rates for the 61 districts in our survey (recall the sample was designed to be district representative). This is an imperfect measure but if people who moved out were less likely to vote, then we should see a negative conditional correlation between the number of migrants in unaffected communities and our outcome variables. Unit of observation is a Provincial Assembly constituency. All regressions include controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, mean constituency elevation, the percentage of the population affected by flooding in 2012, and turnout levels in 2002 and 2008. Standard errors are clustered at the district level and reported in parentheses.

Table B.7: Controlling for Total Relief Provision

	Full Sample			Near Maj. Rivers			Neighboring Maj. River		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
% Pop. Exposed	0.126 (0.037)	0.117 (0.032)	0.060 (0.023)	0.099 (0.038)	0.099 (0.031)	0.061 (0.025)	0.084 (0.033)	0.081 (0.030)	0.069 (0.026)
Total Relief	-0.002 (0.003)	0.002 (0.003)	0.002 (0.003)	-0.002 (0.003)	0.001 (0.003)	0.001 (0.002)	-0.003 (0.003)	0.000 (0.003)	-0.000 (0.003)
Province FE		X			X			X	
Division FE			X			X			X
R-Squared	0.549	0.604	0.706	0.544	0.609	0.751	0.587	0.624	0.707
Observations	546	546	546	379	379	379	209	209	209
Clusters	106	106	106	74	74	74	63	63	63

Notes: Unit of observation is a Provincial Assembly constituency. All regressions include controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, mean constituency elevation, the percentage of the population affected by flooding in 2012, and turnout levels in 2002 and 2008. Standard errors are clustered at the district level and reported in parentheses.

C Appendix: Individual-Level Survey Based Results

This section summarizes results from a nationally representative survey we conducted in early 2012, in between the floods and the 2013 general election in Pakistan. The questions reported on in this section were included in the 2012 survey because we expected that the flood might influence support for aggressive political action/participation. We built in a vignette experiment to test that hypothesis and also included measures of political knowledge.

The research described in this appendix generated the hypothesis in the main paper that flood impact should increase turnout at the aggregate level. We present this work here to better explain our inductive process.

C.1 Data

The National Survey

We created district-representative samples of 155-675 households in 61 districts with a modest over-sample in heavily flood-affected districts as determined by our spatial flood exposure data. We sampled 15 districts in Balochistan, 14 in KPK, 12 in Sindh, and 20 in Punjab to ensure we covered a large proportion of the districts in each of Pakistan’s four regular provinces. Within each province we sampled the two largest districts and then chose additional districts using a simple random sample. The main results below should be taken as representative for our sampling strategy which, while diverse in terms of coverage, does overrepresent Pakistanis from the smaller provinces.¹ Our Pakistani partners, SEDCO Associates, fielded the survey between January 7 and March 21, 2012, 17 months after the 2010 flood, 5 months after the summer 2011 floods in Sindh, and 14 months prior to the 2013 general election. Our overall response rate was 71%, with 14.5% of households contacted refusing to complete the survey and 14.5% of the targeted households not interviewed because no one was home who could take the survey. This response rate is similar to the 70% obtained in the General Social Survey in recent years and exceeds the 59.5% achieved by the 2012 American National Election Survey (GSS, 2013; ANES, 2014).

Treatment Measure: Subjective Reports

Our subjective measure of flood exposure comes from a question included in our survey. To get variation in flood impacts at the household level, we also asked respondents how the floods impacted them personally. We use the following question to measure respondents’ subjective assessments of flood damage:²

“How badly were you personally harmed by the floods?” (response options: “extremely badly,” “very badly,” “somewhat badly,” “not at all”)

We coded the Likert scale to range from 0 to 1.

¹Weighted results using either sample weights calculated from Landscan gridded population data or those provided by the Pakistan Federal Bureau of Statistics for our survey are substantively and statistically similar.

²Responses to this question correlate well with our other self-reported measure. We asked respondents to rate how much money they lost as a result of the floods on an ordinal scale: less than 50k Pakistani Rupee (Rs.), 50k Rs. to 100k Rs., 100k-300k Rs., and more than 300k Rs. The Pearson correlation between that loss and the subjective measure of exposure above is quite high ($r = .73$).

Outcome Measure: Political Knowledge

We construct a measure of political knowledge using a battery of binary questions. To tap awareness of political issues, we asked respondents whether they were aware of four policy debates prominent in early 2012: whether to use the army to reduce conflict in Karachi; how to incorporate the FATA into the rest of Pakistan; what should be done to resolve the disputed border with Afghanistan; and whether the government should open peace talks with India. We also asked six questions about various political offices and scored whether respondents correctly identified the following: who led the ruling coalition in Parliament (the PPP); and the names of the President, Prime Minister, Chief Minister of their Province, Chief of Army Staff, and Chief Justice of the Supreme Court.

Following Kolenikov and Angeles (2009), we conducted a principal components analysis on the polychoric correlation matrix of these items and use the first principal component as our measure of political knowledge. That component accounts for 49.15% of the variance in the index of ten components, suggesting it does a good job of capturing the underlying construct.

The political knowledge index can also be considered a proxy for political engagement. Respondents either know these facts or they do not; they cannot dissemble. Differences between respondents across the flood gradient must either reflect some real investment in acquiring political knowledge or some pre-existing background trait that is correlated with both experiencing the floods and political knowledge. The latter is unlikely subject to our identifying assumptions outlined below. Moreover, since our core estimating equation for individual-level outcomes includes controls for a range of slow-changing factors that one could imagine are correlated with both exposure risk and political engagement—including literacy, numeracy, age, education, gender, and head of household status—we believe the knowledge variable most likely represents investments in political knowledge triggered by the flood.

Outcome Measure: Support for Assertive Political Action

In order to measure support for assertive political action we use a vignette experiment. This approach circumvents three main challenges to measuring political attitudes. First, respondents may face social desirability pressures to not explicitly support particular views (e.g., aggressive civic protests). Second, concepts such as the political efficacy of being assertive are not easily explainable in standard survey questions but can be illustrated with examples. Third, respondent answers to direct questions may not be interpersonally comparable (King et al., 2004). To overcome these challenges, we wrote two vignettes describing concrete (but fictional) examples of two different ways of getting the government’s attention: passive petition or assertive protest. Respondents were randomly assigned to receive one of the vignettes before answering the same two survey questions on how effective they think the chosen method is and whether they approve of it.

More specifically, the vignette experiment works as follows. At the primary sampling unit (PSU) level, respondents are randomly assigned to read one of the following two vignettes:

Passive Petition. Junaid lives in a village that lacks clean drinking water. He works with his neighbors to draw attention to the issue by collecting signatures on a petition. He plans to present the petition to each of the candidates before the upcoming local elections.

Assertive Protest. Junaid lives in a village that lacks clean drinking water. He works with his neighbors to draw attention to the issue by angrily protesting outside the office of the district coordinating official. As the government workers exit the office, they threaten and shove them.

Following the vignette respondents are asked the following:

- *Effectiveness*. “How effective do you think Junaid will be in getting clean drinking water for his village?” (response options: “extremely effective,” “very effective,” “moderately effective,” “slightly effective,” “not effective at all”)
- *Approval*. “How much do you approve of Junaid’s actions?” (response options: “a great deal,” “a lot,” “a moderate amount,” “a little,” “not at all”)

Our vignette experiment is intended to convey a clear difference in the aggressiveness with which citizens demand government services. We therefore varied three elements of how the citizens in the vignette engaged with the government: immediacy, target, and method. The next election was expected to happen in 2013 when we did our survey, so the *Passive Petition* vignette clearly conveys a demand that will be delayed, while the *Assertive Protest* one describes something that could happen right now. With respect to target, the district coordinating official (DCO) is the relevant official for drinking water issues, but he/she is an appointed bureaucrat who reports to the Chief Minister of the province. If citizens go to the DCO he/she can do something right away, whereas local politicians have to go to the senior party leadership of the party in power in their province who may then reach back down to the DCO. The *Passive Petition* vignette thus conveys a situation where the response to citizen action will be indirect at best, while the *Assertive Protest* one portrays citizens going right to the official who has to implement any changes. With respect to method, holding a protest that turns violent is clearly more aggressive than signing a petition. While our compound treatment does not allow us to distinguish which of the three elements was critical, it provides a clear difference in how assertive the citizens’ approach is understood to be in the Pakistani context.

Our sample is well balanced across conditions in the vignette experiment on a broad range of geographic, demographic, and attitudinal variables. The difference in means between the groups within a region therefore provides an estimate of how effective/acceptable citizens think the use of assertive action is to pressure their government officials.

Demographic Controls

We include the following demographic controls: gender, a head of household indicator, age, a literacy and basic numeracy competency indicator, education, a Sunni indicator, and an index of religious practice.

C.2 Empirical Strategy

Our estimation strategy at the individual level is to use fixed effects and respondent-level controls to isolate the effect of local variance in flood impact that is unrelated to average flood risk. At the individual level, we estimate the model with tehsil fixed effects, the third level administrative subunit in Pakistan, thereby exploiting variation in flood effects at the household level within tehsils. Our choice of this strategy is motivated by discussions with those involved in flood relief who cited great within-village variance. Surveys done to assess post-flood recovery needs also showed there could be huge variation in damages suffered at the household level that were not anticipated (Kurosaki et al., 2011), likely due to minor topographical features that impacted flow rates, how long areas were submerged, and so on.

For the the political knowledge index our estimating equation is therefore a fixed-effect regression

$$Y_i = \alpha + \beta_1 F_i + \beta_2 R_i + \gamma_d + \mathbf{B}\mathbf{X}_i + \epsilon_i, \quad (1)$$

where F_i is one of our flood exposure measures, R_i is the UNEP measure of *ex ante* flood risk, γ_d is a district fixed-effect for objective flood treatments (i.e., the measure of tehsil-level flood exposure derived from the UNOSAT data) and a tehsil fixed-effect for subjective flood exposure measures (i.e., self-reports), and \mathbf{X}_i is a vector of demographic and geographic controls to further isolate the impact of idiosyncratic flood effects by accounting for the linear impact of those variables within tehsils. We cluster standard errors at the primary sampling unit level when analyzing survey data.

For the vignette experiment our measurement approach leverages a difference-in-difference estimator to answer the following question: given that people are generally opposed to the assertive vignette, is the difference in reactions between the two vignettes smaller for people in areas exposed to the flooding? To answer that question we need to control for a range of potential confounding variables. For example, is it possible that the land in districts close to rivers (which are most likely to be flooded) is less desirable and so people living there tend to be poorer and more marginalized, which one could argue would make them more willing to support aggressive protest. In the Pakistani context this is unlikely since land near the rivers is actually more fertile, which may be why population density is substantially higher near major rivers. This observation, however, raises the possibility that people who are more likely to be affected by floods would tend to be wealthier and less marginalized. In either case, we risk confounding flood exposure with a more fixed characteristic of the region and the people who reside there. We cannot completely overcome this challenge because we only have survey data from a single cross section, but by including a broad range of controls and examining subsets of the data we can gain increased confidence in the results.

We therefore estimate the following as our core specification for analyzing the vignette experiment:

$$Y_i = \alpha + \beta_1 A_i + \beta_2 F_i + \beta_3 (A_i \times F_i) + \gamma_d + \mathbf{B}\mathbf{X}_i + \epsilon_i, \quad (2)$$

where i indexes respondents. The outcome, Y_i , represents a response to either the effectiveness or approval question. The key treatment variables are A_i , an indicator for whether an individual received the assertive protest vignette, and F_i , a respondent's flood exposure (either objectively measured or self-reported). To control for locality-specific propensities to express approval or perceived effectiveness, we include γ_d , a district fixed effect when F_i is based on objective tehsil-level measurements and a tehsil fixed-effect when F_i is measured with individually reported flood exposure. \mathbf{X}_i is a vector of demographic and geographic controls to further isolate the impact of idiosyncratic flood effects. We again cluster standard errors at the PSU level since that is the level at which the vignette was randomized.³

The estimate of β_3 in these equations isolates the causal impact of the flood to the extent that: (1) which vignette a respondent got was exogenous to their political attitudes; and (2) how exposed one was to the floods depended on factors orthogonal to pre-existing political factors once we condition on district-specific traits and the geographic controls. The first condition is true due to random assignment of the survey treatment. The second condition is likely to be met because the floods had a large random component and because we are controlling for the obvious factors that could have been used *ex ante* to predict which areas were likely to be flooded.

³Results are robust to clustering at the district level to account for the possibility that the variance in attitudes is highly correlated within districts as well as within PSUs.

C.3 Results

The floods clear increased both political knowledge acquired 7-14 months after the floods as well as support for assertive politics.

As Table C.1 highlights, we find clear evidence of behavioral change among flood-affected individuals in so far as they seem to have invested more in acquiring political knowledge. Our main index of political knowledge is increasing across both the UNOSAT data on flood exposure and self assessments of flood impact. The effects are statistically quite strong and substantively meaningful. A one standard deviation increase in the proportion of the population affected by the floods in the surveyed teshils (.165) predicts a .022 increase in the additive knowledge index and a .072 increase in the PCA index, both approximately .1 standard deviation treatment effects. For self-assessed flood exposure movement from the bottom of the scale to the top was associated with a .13 standard deviation increase in the additive index and a .16 standard deviation increase in the PCA index.

Table C.1: Impact of Flooding on Political Knowledge

	Additive Index		PCA Index	
	(1)	(2)	(3)	(4)
% Pop. Exposed	0.136 (0.041)		0.438 (0.138)	
Flood Exposure (4-pt Likert Scale)		0.029 (0.012)		0.120 (0.040)
District FE	X		X	
Tehsil FE		X		X
R-Squared	0.379	0.407	0.375	0.404
Observations	10925	10925	10925	10925
Clusters	1058	1058	1058	1058

Notes: Unit of observation is an individual. All regressions include individual level controls for gender, head of household, age, reading and mathematical abilities, education, sunni, and intensity of religious practice. Columns 1 and 3 also include geographic controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, mean constituency elevation calculated at the tehsil level. Standard errors are clustered at the survey's primary sampling unit and reported in parentheses. Subjective flood exposure scaled to be in .25 to 1.

Turning to the vignette experiment, we find that citizens exposed to floods are significantly more supportive of assertive approaches towards demanding public services and believe them to be more effective than their non-exposed counterparts, as Table C.2 shows. The first coefficient in each model, β_1 from Equation 2, measures the difference in the outcome variables between the assertive and passive vignettes for people who scored a zero on the flood exposure measures. Those who received the assertive vignette but did not experience flooding rated the effectiveness of Junaid's actions between .23 and .3 units lower on a 0-1 scale controlling for a broad range of geographic and demographic controls, a movement of more than .5 standard deviations in all models. That effect is consistent across objective (Column 1) and self-reported measures of flooding (Column 2). We find results of similar magnitude for the approval dependent variable (Columns 3 and 4).

Exposure to the flood substantially and significantly decreased this disapproval. The coefficient on the third variable in each model, β_3 from Equation 2, indicates the moderating impact of flood exposure on the effect of the assertive vignette. A one standard deviation movement in the proportion of the population exposed in tehsils with non-zero flood exposure (.17) corresponds to a .16 standard deviation increase in perceived effectiveness of the assertive approach and a .18

standard deviation increase in approval for it. High levels of flood exposure

To benchmark these results we can consider the relationship between the vignette response and gender. Existing research has shown that men are on average more likely to have more assertive attitudes in the context of normal social relations (e.g., Funk et al., 1999) and tend to have more extreme views in some political settings involving violent contestation (e.g., Jaeger et al., 2012). The difference in perceived effectiveness of the assertive vignette between men and women is approximately .08, which equates to a .2 standard deviation movement in effectiveness, and the difference in approval is of similar size (.07). The difference between those affected by the flood and those who were not in terms of approval is thus slightly smaller than the gender difference in the approval of assertive action. The gender difference in perceived effectiveness and approval across the two conditions is even smaller, roughly .06 for effectiveness and .04 for approval, both of which are substantially smaller than all the flood coefficients.

Drawing on prior work we can also compare the flood affects to differences across attitudes towards Islamist militants' political positions. Following Fair, Malhotra and Shapiro (2012), we measured individuals' support for five political positions espoused by militant Islamist groups and combined these in a simple additive scale ranging from 0 to 1. Moving from 0 to 1 on this scale equates to a .21 increase in approval for the assertive vignette and a .11 increase in effectiveness. The impact of a one standard deviation move in flood exposure is similar in terms of approval of the assertive vignette to the difference between people who agree with none of the Islamist policy positions and those who agree with all five (and is much larger on the effectiveness measure), which indicates a substantively significant shift.

Interestingly, the results are not a proxy for satisfaction with flood relief. We asked respondents "In your opinion, did the government do a good or bad job in responding to the floods after they occurred?" on a four-point scale ranging from "very bad" to "very good" with no midpoint so respondents were forced to assign a direction to their views of the government response. Respondents' feelings about the assertive vignette are not consistently correlated with how they believe the government did in responding to the floods. For some measure of flood effects the difference-in-difference is larger among the 5,188 respondents who felt the government did a poor job of responding to the floods (about 50% of the sample after controlling for individual level covariates), while for others it is higher among the 5,171 respondents who felt the government did a good job. Clearly we cannot interpret the lack of a difference as falsifying a causal relationship between the quality of government response and attitudes on the vignette. Individuals who rate the government response poorly may do so because they have some unobservable difference that also makes them more approving of assertive protests to gain political services. Nevertheless, the fact that there is no consistent correlation suggests that the floods affected attitudes through some channel other than satisfaction with government performance.⁴

The finding that flood victims approve of assertive protests and believe they are more effective in getting a government response is quite robust. One might be concerned, for example, that there is unobserved heterogeneity between tehsils which is driving these results. To account for this possibility and to exploit the substantial within-village variation noted by many observers (Kurosaki et al., 2011), we estimated the impact of self-reported flood measures on the vignette experiment including tehsil fixed effects (Columns 2 and 4). The results on self-reported flood effects are about the same when we use fixed effects to account for any tehsil-level variance in flood impacts and other potential tehsil-level confounders.

Overall, it appears clear that citizens hit hard by the floods developed more assertive attitudes about demanding government services and invest more in acquiring political knowledge, but they do

⁴Results available from authors.

not swing to either the national ruling party at the time of the flood or the main opposition party. These changes could none-the-less shift politicians' incentives. It is easy to imagine a situation in which an exogenous increase in citizen attention leads politicians on all sides to exert increased effort, leading to increased turnout but leaving equilibrium vote shares unchanged.

Table C.2: Impact of Flooding on Approval and Perceived Efficacy of Aggressive Protest

	Effectiveness		Approval	
	(1)	(2)	(3)	(4)
Aggressive Vignette	-0.226	-0.231	-0.243	-0.250
	(0.018)	(0.019)	(0.018)	(0.019)
% Pop. Exposed	0.010		-0.043	
	(0.106)		(0.112)	
Aggressive \times % Flooded	0.325		0.366	
	(0.089)		(0.091)	
Flood Exposure (4-pt Likert Scale)		0.023		-0.018
		(0.026)		(0.029)
Aggressive \times Exposure		0.140		0.156
		(0.035)		(0.038)
District FE	X		X	
Tehsil FE		X		X
R-Squared	0.258	0.331	0.281	0.352
Observations	10761	10761	10761	10761
Clusters	1055	1055	1055	1055

Notes: Unit of observation is an individual. All regressions include individual level controls for gender, head of household, age, reading and mathematical abilities, education, sunni, and intensity of religious practice. Columns 1 and 3 also include geographic controls for ex ante UNEP flood risk, distance to major river, dummy for constituencies bordering a major river, std. dev. of the constituency's elevation, mean constituency elevation calculated at the tehsil level. Standard errors are clustered at the survey's primary sampling unit and reported in parentheses.

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