Online Appendix for
"Disasters and Tightness of Social Norms:
The Case of Female Genital Cutting"

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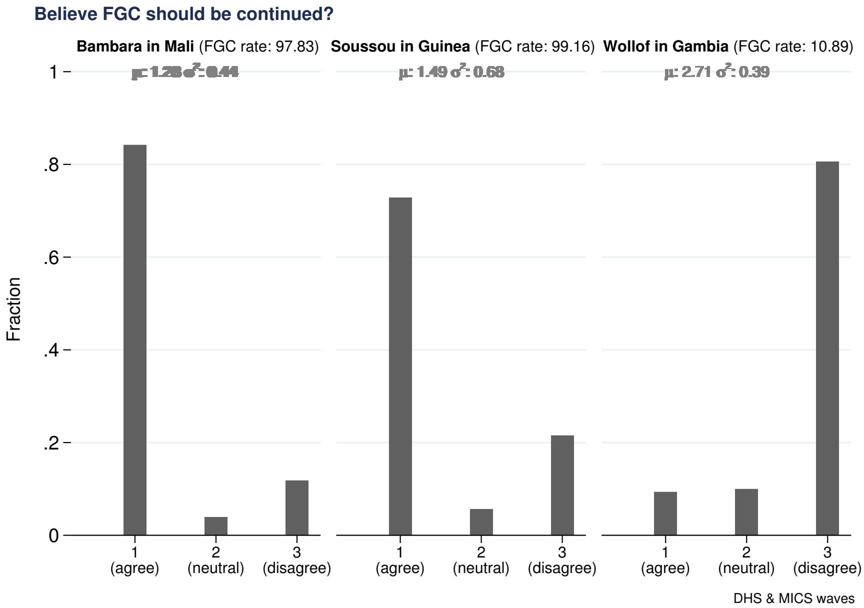
A Additional information

A.1 Measuring social norms tightness

We discuss two approaches used in the literature to measure the tightness of social norms. First, the tightness of a norm is measured based on people's perceptions of whether their culture is tight or not. Gelfand et al. (2011) and Harrington and Gelfand (2014) employ this approach, using survey questions designed to assess the clarity and people's agreement on social norms, freedom of behavior, degree of sanctioning, and compliance to norms. First, the approach fails to measure tightness on the basis of its outcome - variance in professed normative opinions about a given cultural topic or practice. Second and more importantly, the measure does not characterize tightness as a cultural-level concept. Culture tightness, as noted, is characterized by pervasive norms and sanctioning of deviance from norms, attributes that apply to specific social or cultural groups. Moreover, in a tight culture, people's normative opinions and behaviors are similar to each other. Thus, cultural tightness reflects homogeneity at the cultural level (Carpenter, 2000; Triandis, 1989). As such, tightness and looseness tap into variances in normative opinions (Uz, 2015).

To address the limitations outlined above, different studies propose to measure the tightness of a social norm based on variations in responses to survey questions. Uz (2018, 2015) speak first in the context of this construction, applying the concept of variance to determine cultural tightness-looseness. This measure is constructed as an index of the variance of answers to normative questions on a variety of behavioral practices and varies at the country level. For the purpose of this analysis, this approach, on the one hand, is suboptimal and thus inhibits a causal identification strategy given the level of variation of the measure. On the other hand, country is a broad level to correctly specify the relevant cultural group to identify tightness in social norms because strong norm-adherence and sanctioning for deviance have a different reference point within each country. The approach used in Winkler (2021), which explores variations in survey responses to normative questions to compute the proportion of respondents' views that are similar to the most frequent opinion within their cultural group, is instead the most appropriate since it allows to develop measures of tightness of social norms at the individual level and the tightness-looseness is characterized as a cultural-level concept. Our construction of the tightness of FGC norm follows this approach.

Figure A.1: Examples of FGC norm content and tightness



The figure displays the distribution of normative opinions on whether female genital cutting (FGC) should be continued, collected from men and women in Mali, Guinea, and Gambia. Responses were recoded to integers ranging from 1 to 3, where higher values indicate stronger disagreement with the practice. For the ethnic groups – Bambara, Soussou and Wollof, we compute the mean and variance of responses. The figure also reports the prevalence of FGC for each group.

A.2 Normative Questions and Surveys

Table A.1: FGC Normative Opinions and Tightness Measures

Variable	Label	Source	$TFGC_{Q12}$	$TFGC_{Q10}$	$TFGC_{Q4}$	$TFGC_{Q2}$
contfgc	Should FGC be continued or discontinued	DHS, MICS	✓	✓	✓	✓
fgcrel	Believe FGC is a religious requirement	DHS	✓	✓	✓	✓
fgcpresex	Would you say FGC is a way to prevent premarital sex	DHS	✓	✓		
fgchygiene	Is cleanliness/hygiene a benefit girls get if they undergo FGC	DHS	✓	✓		
fgcsacc	Is social acceptance a benefit girls get if they undergo FGC	DHS	✓	✓	✓	
fgcmarr	Is better marriage prospects a benefit girls get if they undergo FGC	DHS	✓	✓	✓	
fgcmpls	Do you think FGC offers more sexual pleasure for men	DHS	✓	✓		
fgcvirgin	Do you think FGC preserves virginity	DHS	✓	✓		
fgcrelap	Is religious approval a benefit girls get if they undergo FGC	DHS	✓	✓		
fgcdel	Is safe delivery a benefit girls get if they undergo FGC	DHS	✓	✓		
fgcother	Are there other benefits associated with FGC	DHS	✓			
fgcnoadv	Do you believe there are no benefits associated with FGC	DHS	✓			

Notes: DHS: Demographic and Health Survey. MICS: Multiple Indicator Cluster Survey. TFGC denotes tightness of FGC norm. ✓ means the normative opinion/question is included in computing the tightness measure.

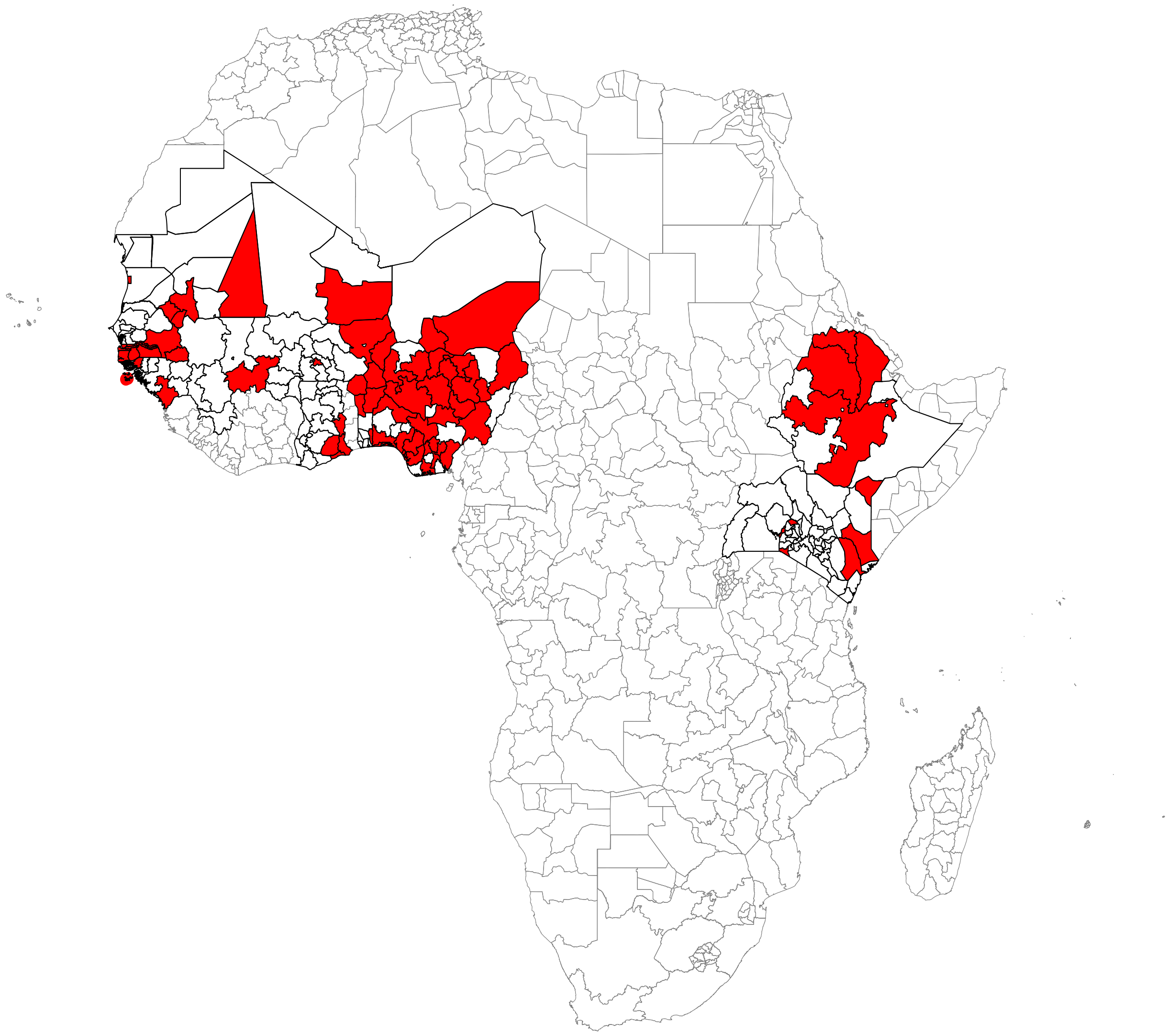
Table A.2: Surveys and year of FGC legal ban

Country	Surveys	Year of Legal law
Benin	DHS: 2001, 2006, 2011 MICS: 2014	2003
Burkina Faso	DHS: 1998, 2003, 2010 MICS: 2006	1996
Cameroon	DHS: 2004	2016
Central African Republic	DHS: 1994 MICS: 2000, 2006, 2010	1966
Chad	DHS: 2014 MICS: 2019	2003
Cote D'Ivoire	DHS: 1998, 2011 MICS: 2006	1998
Ethiopia	DHS: 2000, 2005, 2016	2004
Gambia	DHS: 2013, 2019 MICS: 2005, 2010, 2018	2015
Ghana	MICS: 2006, 2011, 2017	1994
Guinea	DHS: 1999, 2005, 2012, 2018 MICS: 2016	1965
Guinea Bissau	MICS: 2006, 2014, 2018	2011
Kenya	DHS: 1998, 2008, 2014	2001
Mali	DHS: 1995, 2001, 2006, 2012 , 2018 MICS: 2009	No law
Mauritania	DHS: 2019 MICS: 2007, 2011, 2015	2005
Niger	DHS: 1998, 2006, 2012	2003
Nigeria	DHS: 2003, 2008, 2013, 2018 MICS: 2007, 2016	2015
Senegal	DHS: 2005, 2010, 2014, 2015, 2016, 2017, 2018, 2019	1999
Sierra Leone	DHS: 2008, 2013, 2019 MICS: 2010, 2017	2019
Togo	DHS: 2013 MICS: 2006, 2010, 2017	1998
Uganda	DHS: 2011	2010

B Short-term Effects

B.1 Additional figures and tables

Figure B.1: Disaster exposed regions



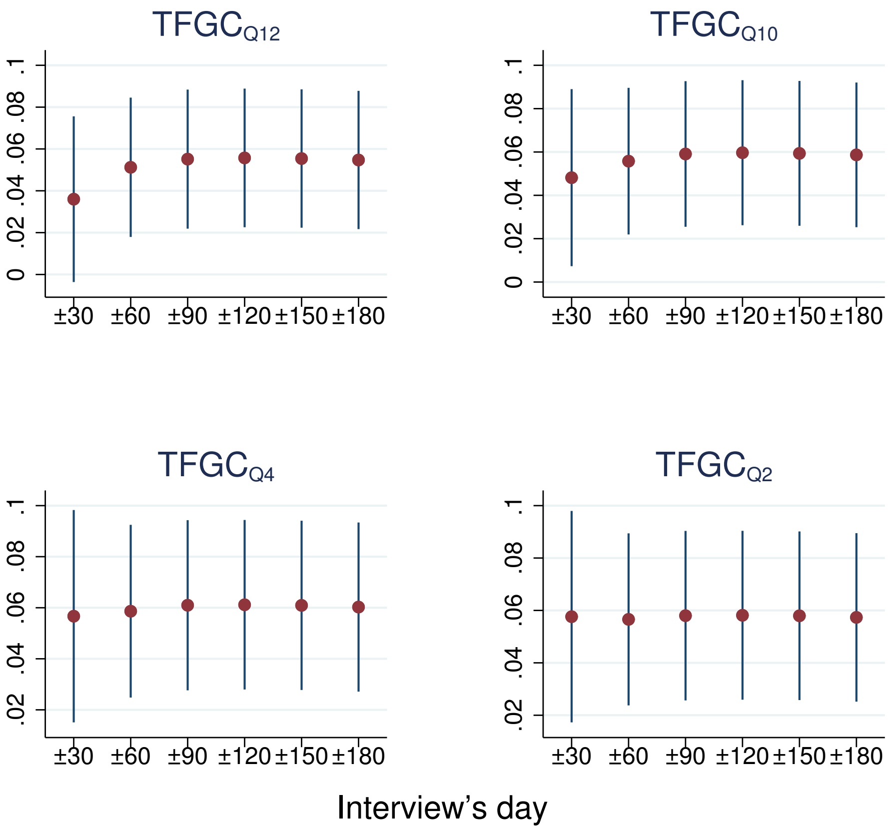
Notes: (Red) - locations of subnational regions exposed to the short-term disasters. See Table B.1 for details. Uganda's subnational regions are not colored, as the map shows regional boundaries rather than districts, which were the precise locations of the disasters' occurrences.

Table B.1: Disasters

Start date	End date	Disaster	Disaster date	Country	Region	Death
2001-08-06	2001-11-14	Epidemic	2001-08-27	Benin	Alibori, Atacora, Borgou, Donga	21
2003-06-15	2003-12-16	Flood	2003-08-10	Burkina Faso	Centre	0
2005-02-01	2005-06-27	Epidemic	2005-04-11	Guinea	Conakry, Kindia	72
2006-01-01	2006-06-25	Epidemic	2006-01-01	Niger	Dossa, Maradi, Tillaberi, Zinder	18
2006-04-01	2006-12-17	Flood	2006-08-03	Mali	Gao, Sikasso	1
2007-06-01	2007-10-28	Flood	2007-08-07	Mauritania	Gorgol, Guidimagha	2
2008-11-03	2009-03-08	Flood	2008-11-10	Kenya	Busia, Garissa, Mandera, Migori, Tana River, Trans-Nzoia, Waji, Kasese	17
2010-04-14	2010-08-09	Flood	2010-07-15	Gambia	Central River, Lower River, North Bank, Upper River, West Coast, Kanifing	8
2011-06-14	2011-12-09	Flood	2011-08-20	Uganda	Kampala, Masaka, Mbale, Mpigi, Rukungiri, Sironko	27
2011-09-03	2011-12-15	Flood	2011-10-26	Ghana	Eastern, Greater Accra, Volta	14
2013-02-05	2013-07-11	Flood	2013-04-14	Nigeria	Abia, Bauchi, Ebonyi, Edo, Gombe, Jigawa, Kano, Katsina, Kebbi, Zamfara	19
2014-01-23	2014-10-25	Epidemic	2014-03-08	Senegal	Kedougou, Kolda, Sedhiou, Tambacounda, Ziguinchor	-
2016-01-10	2016-06-10	Flood	2016-04-02	Ethiopia	Afar, Amhara, Oromia, Tigray	28
2016-09-08	2017-01-28	Epidemic	2016-12-04	Nigeria	Anambra, Bauchi, Borno, Cross River, Ebonyi, Edo, Enugu, Gombe, Jigawa, Kaduna, Kano, Kogi, kwara, Lagos, Nasarawa, Ogun, Ondo, Plateau, Rivers, Taraba	121
2018-01-04	2019-03-15	Storm	2018-06-27	Guinea Bissau	Biombo, Bissau, Bolama, Oio	3
2018-08-15	2018-12-31	Flood	2018-09-20	Nigeria	Anambra, Delta, Kogi, Niger	199
2019-11-20	2021-03-30	Flood	2020-09-01	Mauritania	Assaba, Hodh Ech Chargi, Nouakchott	9

Notes: The Start and End dates refer to the specific periods during which interviews were conducted for each survey within each country.

Figure B.2: Short-term effects of the disaster: Alternative time windows



Notes: The figure shows estimated coefficients from an OLS regression. Sample includes respondents interviewed in x days before and after a disaster occurred in the region. The coefficients are estimated from separate regressions that control for region FE and individual characteristics: gender, marital status, urban residence, dummies for age, dummies for educational attainment, and dummies for wealth quintile. The tightness of FGC are based on different constructions. TFGC$_{Q12}$ is computed using all 12 normative questions about FGC. TFGC$_{Q10}$ is computed using 10 questions; TFGC$_{Q4}$ is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and TFGC$_{Q2}$ is constructed based on 2 questions - support for FGC and FGC required by religion. The measures are normalized to z-score. 95 confidence intervals are based on robust standard error clustered by region-day of the interview.

Table B.2: Summary statistics

	Mean	St. Dev.	Min	Max	Obs.
Tightness of FGC_{Q12}	0.00	1.00	-2.45	0.61	69750
Tightness of FGC_{Q10}	0.00	1.00	-2.40	0.61	69750
Tightness of FGC_{Q4}	0.00	1.00	-2.23	0.60	69731
Tightness of FGC_{Q2}	0.00	1.00	-2.09	0.58	69708
Post disaster	0.48	0.50	0.00	1.00	69766
Post epidemic	0.14	0.35	0.00	1.00	69766
Post natural disaster	0.34	0.47	0.00	1.00	69766
Age	29.64	10.00	15.00	64.00	69766
Male	0.21	0.41	0.00	1.00	69766
No education	0.48	0.50	0.00	1.00	69754
Primary education	0.22	0.41	0.00	1.00	69754
Secondary education	0.24	0.43	0.00	1.00	69754
Higher education	0.06	0.23	0.00	1.00	69754
Never married	0.25	0.43	0.00	1.00	69750
Married	0.66	0.47	0.00	1.00	69750
Widowed	0.02	0.13	0.00	1.00	69750
Divorced	0.02	0.15	0.00	1.00	69750
Separated	0.01	0.11	0.00	1.00	69750
Urban	0.37	0.48	0.00	1.00	69766
Religious group member	0.98	0.14	0.00	1.00	64567
Christian	0.31	0.46	0.00	1.00	64567
Muslim	0.65	0.48	0.00	1.00	64567
Other	0.02	0.14	0.00	1.00	64567
No religion	0.02	0.14	0.00	1.00	64567
Poorest (Quintile 1)	0.22	0.41	0.00	1.00	69766
Poor (Quintile 2)	0.19	0.39	0.00	1.00	69766
Middle (Quintile 3)	0.18	0.38	0.00	1.00	69766
Rich (Quintile 4)	0.19	0.39	0.00	1.00	69766
Richest (Quintile 5)	0.23	0.42	0.00	1.00	69766

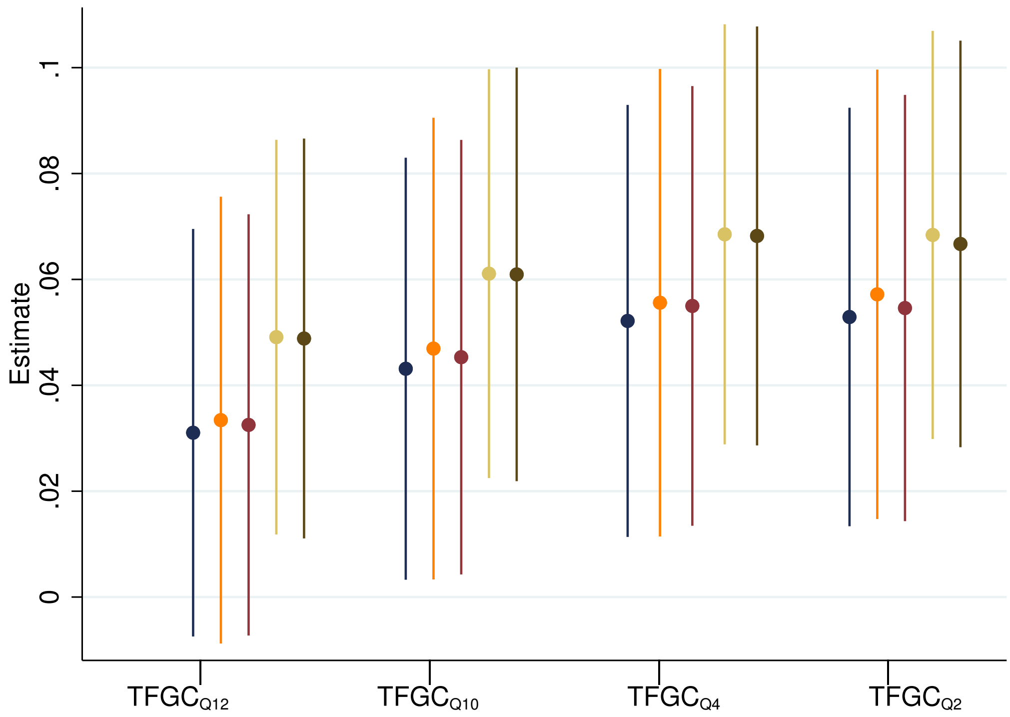
Notes: Tightness of FGC_{Q12} is a normalized z-score computed based on 12 set of FGC normative norms; Tightness of FGC_{Q10} is computed based 10 questions; Tightness of FGC_{Q4} is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and Tightness of FGC_{Q2} is constructed based on 2 questions - support for FGC and FGC required by religion. Post disaster takes 1 for all respondents interviewed after an epidemic outbreak or a natural disaster (floods and storms) regardless it caused death or not, 0 otherwise.

Table B.3: Short-term effects of the disaster - excluding gender from reference group

	Tightness of FGC			
	*Q*12	*Q*10	*Q*4	*Q*2
	(1)	(2)	(3)	(4)
Post disasters	0.026	0.038*	0.047**	0.049**
	(0.019)	(0.020)	(0.021)	(0.020)
Observations	26,932	26,932	26,913	26,908
R-squared	0.146	0.140	0.111	0.100
Region FE	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes

Notes: OLS estimates. Sample includes respondents interviewed in the 30 days before and after a disaster occurred in the sub. region. All columns control for sub. region FE and individual characteristics: gender, marital status, urban residence, dummies for age, dummies for educational attainment, dummies for wealth quintile. The tightness of FGC are based on different constructions. TFGC_{Q12} is computed using all 12 normative questions about FGC. TFGC_{Q10} is computed using 10 questions; TFGC_{Q4} is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and TFGC_{Q2} is constructed based on 2 questions - support for FGC and FGC required by religion. The measures are normalized to z-score. In all columns, the reference group is defined based on the subnational region x ethnic group.

Figure B.3: Short-term effects of the disaster: Alternative Reference Group



Notes: The figure shows estimated coefficients from an OLS regression. Sample includes respondents interviewed in 30 days before and after a disaster occurred in the region. The tightness of FGC measures are based on different constructions. TFGC$_{Q12}$ is computed using all 12 normative questions about FGC. TFGC$_{Q10}$ is computed using 10 questions; TFGC$_{Q4}$ is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and TFGC$_{Q2}$ is constructed based on 2 questions - support for FGC and FGC required by religion. The measures are normalized to z-score. The estimates in the figure are presented based on different definition of reference groups. For navy markers, reference group is defined based on region x gender x ethnic group x urban/rural. For orange, it is defined based on region x gender x ethnic group x religion; maroon, it is defined based on region x gender x ethnic group x low/high education; sand markers, it defined based on region x gender x ethnic group x poor/rich; while for olive markers, it is defined based on region x gender x ethnic group x poor/rich x low/high education. All models control for region FE and individual characteristics: gender, marital status, urban residence, dummies for age, dummies for educational attainment, and dummies for wealth quintile. 95 confidence intervals are based on robust standard error clustered by region-day of the interview.

Table B.4: Changes in missing/don't know answers after disaster

	No. of missing/don't know answers normative questions (1)
Post disaster	0.006
	(0.010)
Observations	7,987
R^2	0.100
Region FE	Yes

The table tests for changes in the number of missing or don't know (dk) answers in normative questions for respondents interviewed before and after the same disaster in the same region

B.2 Short-term Effects: Regression Discontinuity Estimations

This section presents the results of the short-term effects of disasters on the measures of tightness of FGC norms using a regression discontinuity design. In this alternative approach, we compare the tightness of FGC of individuals interviewed just before and after the disaster using the days between the interview and disaster as running variable. Individuals interviewed the day of the disasters were removed from the sample. Identification in the regression discontinuity proposed does not rely on individuals interviewed before and after the survey to be similar, but rather on the relation between these characteristics and the time of the interview to be continuous at the cut-off. On the other hand, the variation used in the identification comes from a smaller number of individuals around the cut-off. More formally, we estimate the following equation:

$$TFGC_{ir} = \alpha \ + \ \beta(interviewed_{ir} \geq c_r) \ + \ \theta f(W_{ir}) \ + \ \nu_{ir} \tag{1}$$

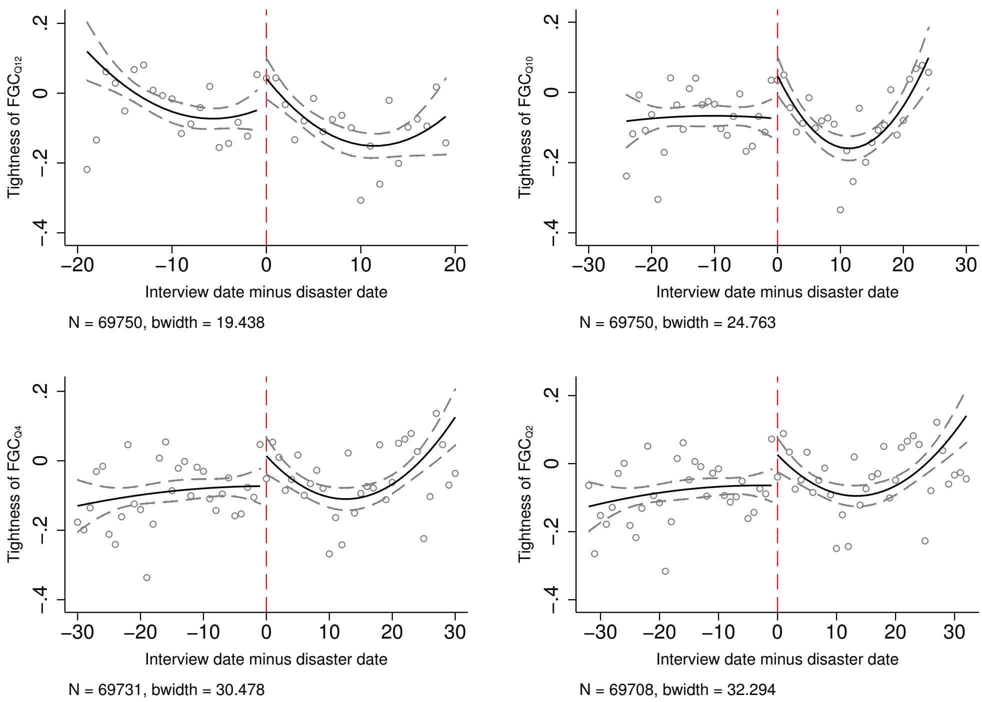
where c_r is the date of disaster in region r, $(interviewed_{ir} \geq c_r)$ is an indicator that takes value one for all respondents interviewed after the disaster, and 0 otherwise, $f(W_{ir})$ is a continuous function of the interview days (i.e. the distance from the date of disaster exposure). The parameter of interest is β, the treatment effect of being exposed to disaster. In a subset of regressions, we estimate the effects controlling for observables: gender, age, urban residence, marital status, educational attainment and household wealth. To estimate β, we assume a low-order polynomial functional form for $f()$ as suggested by Lee and Card (2008). Specifically, $f()$ is a second order polynomial that is flexible on each side of the cutoff. Following Calonico et al. (2014), we present our results using triangular kernel weights. Robust standard errors and optimal bandwidths are obtained as described by Calonico et al. (2014). To check the robustness of our results, we also estimate the discontinuities under smaller/larger bandwidths.

In our empirical framework, three conditions are necessary for the validity and causal interpretation of our results. First, at the passing cutoff, there must be a discontinuity in tightness of FGC norm. Figure B.4 below displays the relationship between our tightness of FGC outcomes and W. The plotted points are unsmoothed average of the outcome with a bin width of one. The solid line is the predicted values of second order polynomial with triangular weights and bandwidth shown in the figure. As we can clearly see, Figure B.4 reveals a clear discontinuity at the passing threshold of 0, while the relationship looks rather smooth elsewhere. Second, there must not be a substantial discontinuity in other characteristics of respondents, which would suggest self-selection across the threshold. We checked whether two sets of characteristics are balanced: one set consists of baseline characteristics of respondents: age, gender and urban residence, while the other set has marriage variable, education variables, income variables and a variable capturing religious identity of respondents. Figure B.5 and Table B.5 below show the results from testing whether these characteristics are balanced at the treatment threshold. For each variable we report estimates from the optimal bandwidth. Only one of the 11 estimates is significant at the 10 percent level. Thus, as a whole, we have no substantial evidence of a discontinuous effect at the threshold for these characteristics. Consequently, our results provide strong support for the validity of our research design. Third, there must be no substantial bunching of the density of the assignment variable near the cutoff, which would suggest manipulation. We test for evidence of manipulation by searching for a break in the distribution of W, at the cutoff. For this, we use the McCrary (2008) test, which is a test of whether the density of W is continuous at the threshold 0. Figure B.6 below presents a visual representation of the McCrary (2008) test and shows no evidence of discontinuity in the distribution of the assignment variable at the threshold, which rules out manipulation hypothesis. In addition to the visual inspection, we also formally test for this continuity by applying the manipulation test developed in Cattaneo et al. (2020). Table B.6 below shows that the estimated discontinuity at the threshold is not statistically significant, confirming that the distribution of the assignment variable is continuous through the threshold.

Table B.7 below shows the estimated discontinuity in our tightness of FGC outcomes. As in the previous section, we present results with and without the individual characteristics. Following others (Calonico et al., 2014), we estimate equation (1) using optimal bandwidths. As expected, we find that strict adherence to FGC is much larger among respondents just above the cutoff than respondents just below 0-days cutoff. It is reassuring to find evidence in all four of the outcomes we considered. Panels A through C of Table B.7 suggest that the estimated effects are also quite insensitive to the inclusion of the control variables: estimates range from 8 to 12.2 percent of a standard deviation without any covariates and from 7.7 to 11.5 percent of a standard deviation with covariates. In line with our research hypothesis, all estimated coefficients are positive and statistically significant at conventional confidence levels, and larger compared to OLS estimates.

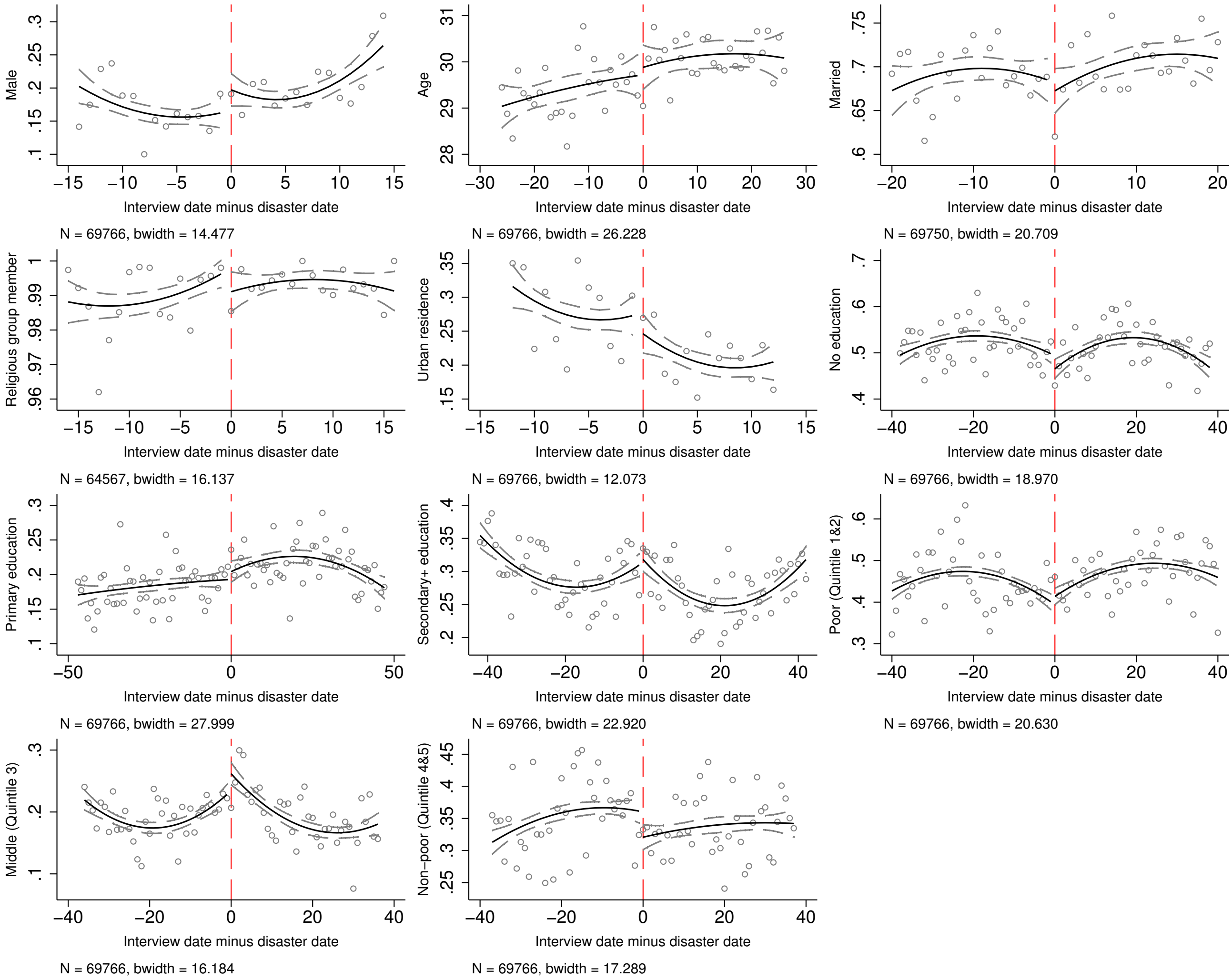
We probe the stability of these estimates to different empirical exercises. We conclude that our estimated disaster exposure effects are remarkably robust to other specification checks suggested in the RD literature. We first re-estimate equation (1) using alternative bandwidths. Figure B.7 presents the point estimates of this robustness check, along with 95 percent confidence intervals for our polynomial specification. These are in line with our main results. As expected, for some outcomes, the estimates are less precise at smaller bandwidths. However, almost all estimated impacts are statistically significant at conventional confidence levels and similar to the corresponding estimates in Table B.7. Second, in Table B.8 we also examined our main results where we do not use triangular weights, rather uniform kernel weights. The disaster exposure effects are remarkably stable and, if anything, they are more precisely estimated. Third, in Figure B.8 we also re-estimate the main results using donut-RD models where we remove observations very close to the disaster exposure cutoff. Here, we test our estimates without a one-week donut around the cutoff. The results remain virtually unaffected and, if anything, become somewhat larger. These findings suggest that the likelihood of observing a significant increase in the tightness of FGC norms due to disaster exposure, purely by chance, is small. The heterogeneity analysis is also confirmed. Figure B.9 presents the RDD analysis by gender, while Figure B.10 shows the analysis by rural and urban areas, as in the main analysis. The results remain consistent across both dimensions.

Figure B.4: Discontinuity in Outcomes



Notes: Outcome is a normalized z-score based on the share of a respondent's opinions that are similar to the most frequent opinion among members of his/her reference group. Plotted points are unsmoothed average of the outcome with a binwidth of one. Solid line (Top figure): predicted values of a local linear regression with triangular weights. Solid line (Bottom figure): predicted values of second order polynomial with triangular weights. Optimal bandwidth noted in figure.

Figure B.5: Discontinuity in Covariates



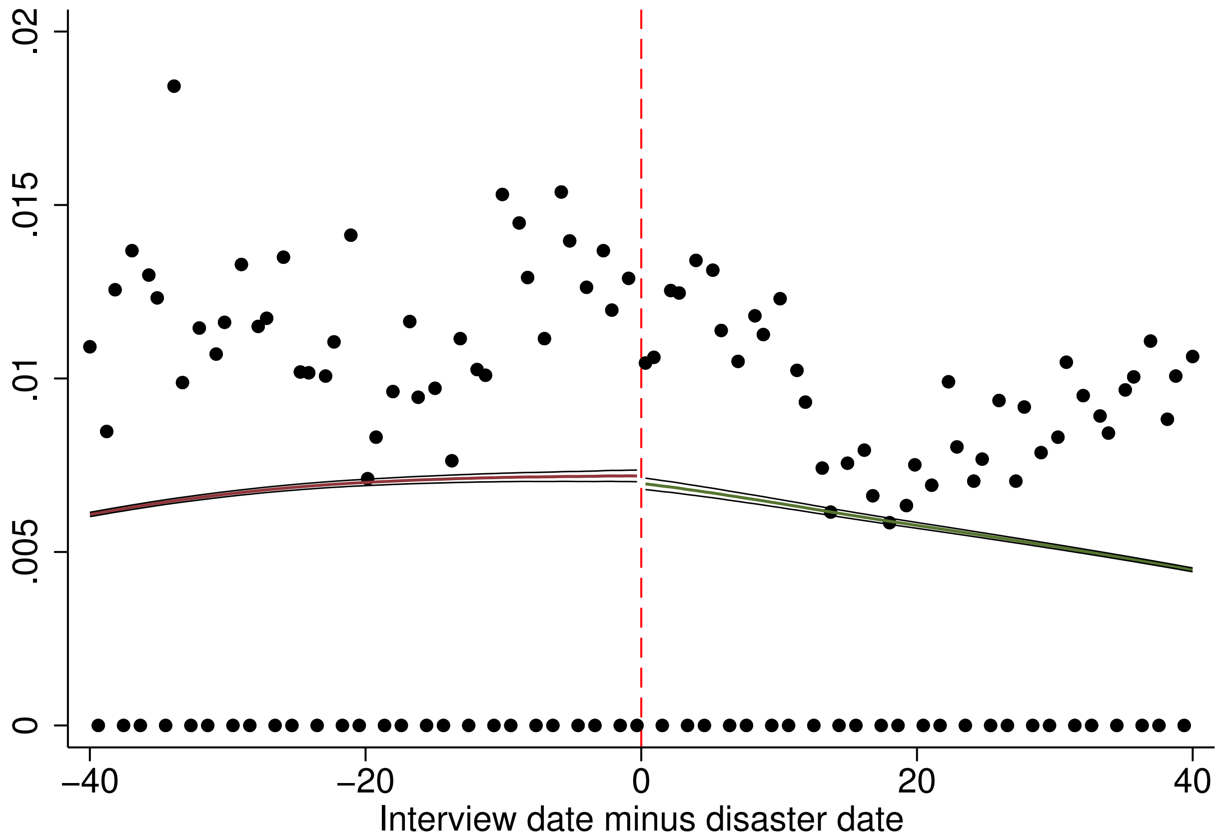
Notes: Each point is an unsmoothed average of the outcome with a bin width of one. The solid line is the predicted values of a second order polynomial with uniform weights and a bandwidth noted in the figure.

Table B.5: Covariate Balance around cutoff

Covariate	Baseline mean	RD estimate	Std. error	N	Bandwidth
Age	29.719	0.163	0.371	23523	26.23
Male	0.166	0.031	0.020	14333	14.48
No education	0.461	0.005	0.022	17237	18.97
Primary educ.	0.195	0.028*	0.015	24312	28.00
Secondary educ. & above	0.320	0.018	0.007	20284	22.92
Married	0.682	-0.009	0.020	18488	20.71
Urban	0.278	-0.031	0.024	12955	12.07
Religious group member	0.998	-0.007	0.005	14844	16.14
Poor (Quintile 1&2)	0.454	-0.024	0.021	18494	20.63
Middle (Quintile 3)	0.236	0.027	0.019	15810	16.18
Non-poor (Quintile 4&5)	0.322	-0.004	0.022	16588	17.29

Notes: The table reports estimates from a second order polynomial. Robust standard errors in parentheses. All bandwidths are selected based on Calonico et al. (2014) package. *** p<0.01, ** p<0.05, * p<0.1.

Figure B.6: Density of forcing variable at cutoff



Notes: McCrary density test: interview date relative to disaster date as the forcing variable. McCrary (2008) is a test of whether the density of the forcing variable, interview date relative to disaster date, is continuous at threshold.

Table B.6: Manipulation test

	Interview date minus disaster date (1)
Robust Bias-Corrected p-value	0.78634
Robust Bias-Corrected SE	0.00038
Number of obs - left	36164
Number of obs - right	33602
Eff. number of obs - left	11273
Eff. number of obs - right	9782
Order est. (p)	2
Order BC. (q)	3
Bandwidth values - left	23
Bandwidth values - right	23

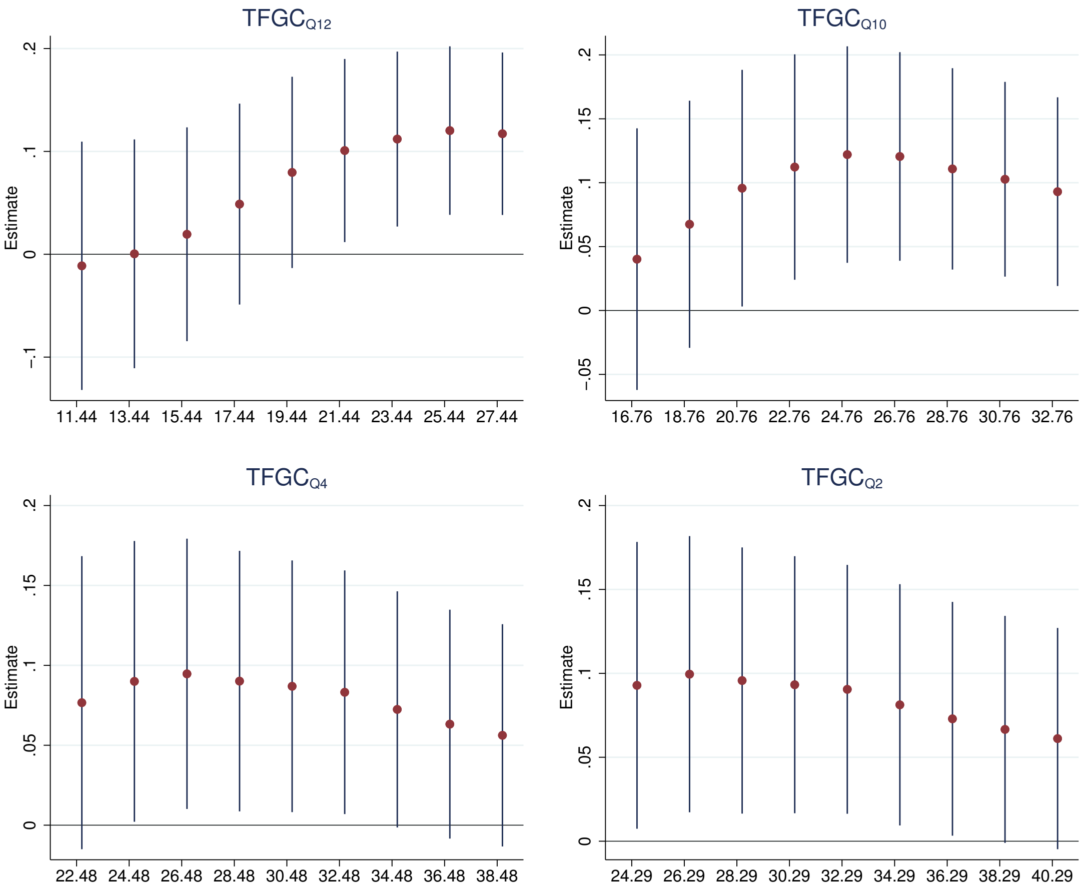
This table tests for manipulation of the running variable based on density discontinuity. All results are estimated with Cattaneo et al. (2020) package using an unrestricted model and a triangular kernel function, and employ the jackknife standard errors estimator. The table suggests we cannot statistically detect manipulation in the running variable.

Table B.7: Effect of the disaster

	Tightness of FGC			
	Q12	*Q10*	*Q4*	*Q2*
	(1)	(2)	(3)	(4)
Panel A				
Interviewed ≥ c	0.080*	0.122***	0.087**	0.090**
	(0.047)	(0.043)	(0.040)	(0.038)
Effective Observations	17,848	21,762	26,906	28,689
Bandwidth	19.44	24.76	30.48	32.29
Panel B				
Interviewed ≥ c	0.090*	0.124***	0.085**	0.089**
	(0.047)	(0.043)	(0.040)	(0.038)
Baseline controls	Yes	Yes	Yes	Yes
Effective Observations	17,848	21,762	26,906	28,689
Bandwidth	19.44	24.76	30.48	32.29
Panel C				
Interviewed ≥ c	0.079*	0.115***	0.077*	0.082**
	(0.047)	(0.043)	(0.040)	(0.038)
Baseline controls	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes
Effective Observations	17,848	21,762	26,906	28,689
Bandwidth	19.44	24.76	30.48	32.29

Notes: Estimates from a second order polynomial using a triangular kernel. Robust standard errors in parentheses. All bandwidths are selected based on Calonico et al. (2014) package. Baseline controls contain gender, dummies for age, and urban residence. Additional controls include dummies for marital status, dummies for educational attainment and dummies for wealth quintile. The dependent variable in columns 1 thru 4 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC- Tightness of FGC_{Q12}. In column 2, it is computed using 10 questions - Tightness of FGC_{Q10}; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect - Tightness of FGC_{Q4}; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC_{Q2}. The tightness of FGC measures are normalized to z-score. *** p<0.01, ** p<0.05, * p<0.1.

Figure B.7: Effect of the disaster - bandwidth selection



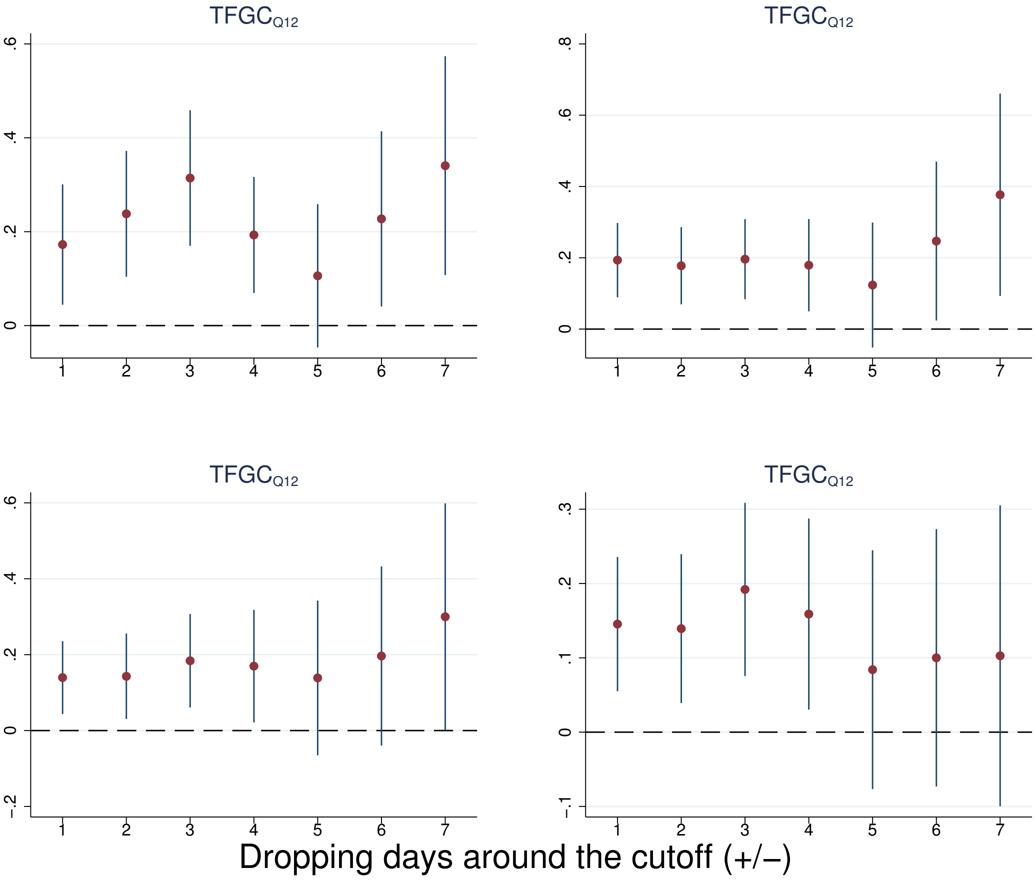
Notes: Estimates from a second order polynomial using a selected bandwidths. Robust standard errors in parentheses. All models contain gender, dummies for age, and urban residence, dummies for marital status, dummies for educational attainment and dummies for wealth quintile. The dependent variable in columns 1 thru 4 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC- Tightness of FGC$_{Q12}$. In column 2, it is computed using 10 questions- Tightness of FGC$_{Q10}$; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect -Tightness of FGC$_{Q4}$; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC$_{Q2}$. The tightness of FGC measures are normalized to z-score. *** p<0.01, ** p<0.05, * p<0.1.

Table B.8: Effect of the disaster using a uniform kernel

	Tightness of FGC			
	Q12	*Q10*	*Q4*	*Q2*
	(1)	(2)	(3)	(4)
Panel A				
Interviewed $\geq$ c	0.155***	0.125***	0.111**	0.124***
	(0.046)	(0.040)	(0.044)	(0.042)
Effective Observations	17,848	22,522	20,251	21,011
Bandwidth	19.61	25.02	22.06	23.91
Panel B				
Interviewed $\geq$ c	0.162***	0.120***	0.103**	0.120***
	(0.046)	(0.040)	(0.044)	(0.042)
Baseline controls	Yes	Yes	Yes	Yes
Effective Observations	17,848	22,522	20,251	21,011
Bandwidth	19.61	25.02	22.06	23.91
Panel C				
Interviewed $\geq$ c	0.150***	0.111***	0.090**	0.105**
	(0.046)	(0.040)	(0.044)	(0.042)
Baseline controls	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes
Effective Observations	17,848	22,522	20,251	21,011
Bandwidth	19.61	25.02	22.06	23.91

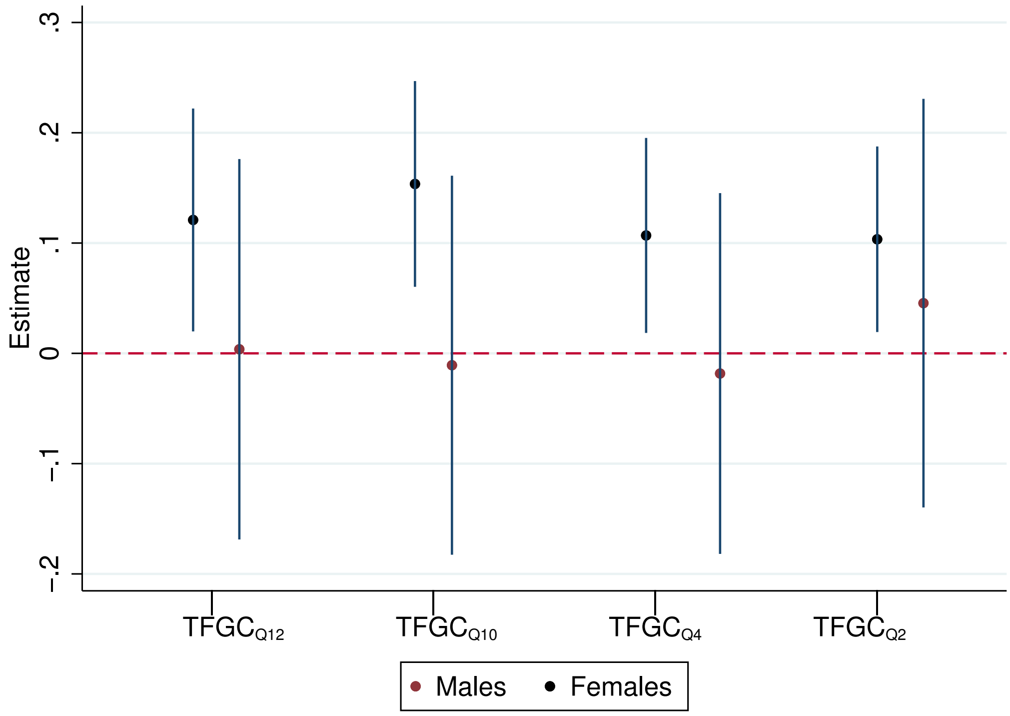
Notes: Estimates from a second order polynomial using a uniform kernel. Robust standard errors in parentheses. All bandwidths are selected based on Calonico et al. (2014) package. Baseline controls contain gender, dummies for age, and urban residence. Additional controls include dummies for marital status, dummies for educational attainment and dummies for wealth quintile. The dependent variable in columns 1 thru 4 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC - Tightness of FGC_{Q12}. In column 2, it is computed using 10 questions-Tightness of FGC_{Q10}; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect - Tightness of FGC_{Q4}; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC_{Q2}. The tightness of FGC measures are normalized to z-score. *** p<0.01, ** p<0.05, * p<0.1.

Figure B.8: Effect of the disaster - Donut regressions



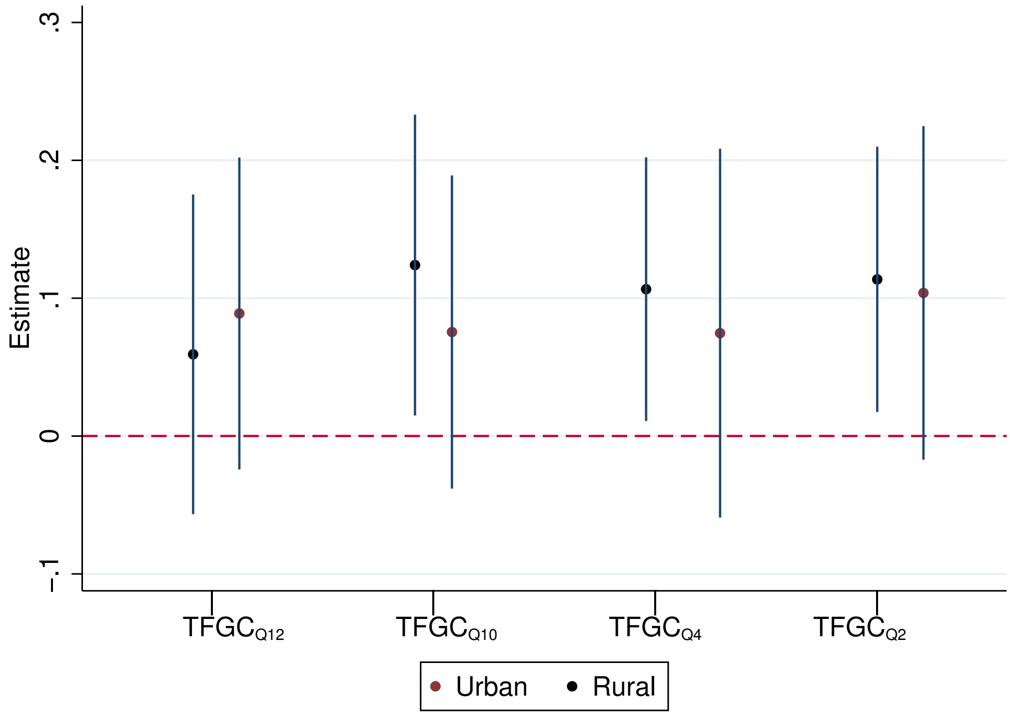
Notes: Estimates from a second order polynomial using a selected bandwidths. Robust standard errors in parentheses. All models contain gender, dummies for age, and urban residence, dummies for marital status, dummies for educational attainment and dummies for wealth quintile. The dependent variable in columns 1 thru 4 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC- Tightness of FGC$_{Q12}$. In column 2, it is computed using 10 questions- Tightness of FGC$_{Q10}$; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect -Tightness of FGC$_{Q4}$; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC$_{Q2}$. The tightness of FGC measures are normalized to z-score. *** p<0.01, ** p<0.05, * p<0.1.

Figure B.9: Effect of the disaster



Notes: Estimates from a second order polynomial using a selected bandwidths. Robust standard errors in parentheses. All models contain dummies for age, and urban residence, dummies for marital status, dummies for educational attainment and dummies for wealth quintile. The dependent variable is tightness of FGC, based on different constructions. Tightness of FGC$_{Q12}$ is computed using all 12 normative questions about FGC. Tightness of FGC$_{Q10}$t is computed using 10 questions; Tightness of FGC$_{Q4}$ is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and Tightness of FGC$_{Q2}$ is constructed based on 2 questions - support for FGC and FGC required by religion. The tightness of FGC measures are normalized to z-score. *** p<0.01, ** p<0.05, * p<0.1.

Figure B.10: Effect of the disaster



Notes: Estimates from a second order polynomial using a selected bandwidths. Robust standard errors in parentheses. All models contain gender, dummies for age, dummies for marital status, dummies for educational attainment and dummies for wealth quintile. The dependent variable is tightness of FGC, based on different constructions. Tightness of FGC$_{Q12}$ is computed using all 12 normative questions about FGC. Tightness of FGC$_{Q10}$t is computed using 10 questions; Tightness of FGC$_{Q4}$ is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and Tightness of FGC$_{Q2}$ is constructed based on 2 questions - support for FGC and FGC required by religion. The tightness of FGC measures are normalized to z-score. *** p<0.01, ** p<0.05, * p<0.1.

C Long-term Effects: Additional figures and tables

C.1 Disaster data for long-term analysis

We rely on the same databases used for the short-term analysis as well as other sources. Data on epidemics are obtained as before from EM-DAT. To measure natural disasters, we collect data on storms, floods, droughts, and earthquakes. As in the short-term, to measure storms, we rely on data from the EM-DAT database.

Conversely, in the long-run, we measure floods using data from self-calibrating Palmer Drought Severity Index (scPDSI), which is maintained by the Climate Research Unit (CRU). The CRU TS v.4.05 provides worldwide monthly scPDSI measures in 0.5 degree $\times$ 0.5 degree grid cells (0.5 degrees is approximately 55 km at the Equator). The scPDSI index ranges from $\leq$ -4 to $\geq$ 4, with negative values denoting dry spells and positive values indicating wet spells (van der Schrier et al., 2013). The gridded data is constructed from weather stations around the globe and spans the period January 1901 to December 2020 (van der Schrier et al., 2013). Following others who have used these data (Winkler, 2021), we make three adjustments to the weather data before defining the flood shock. First, we focus on severe flood conditions based on scPDSI values of 3 or more (van der Schrier et al., 2013). Second, for each grid cell, we count the number of months with flood in a given year and aggregate spatially the gridded data to the country-year level. Following Dell et al. (2012), we make our measures reflect the average weather condition experienced by a person in a country, using a fixed set of population weights. In particular, we compute the population-weighted average severe flood conditions for each country and year. Our weights are computed from 2000 population data at 0.5-degrees resolution from the Global Rural-Urban Mapping project (Balk et al., 2006). This gives us yearly average frequencies of severe floods for the SSA countries in our sample.

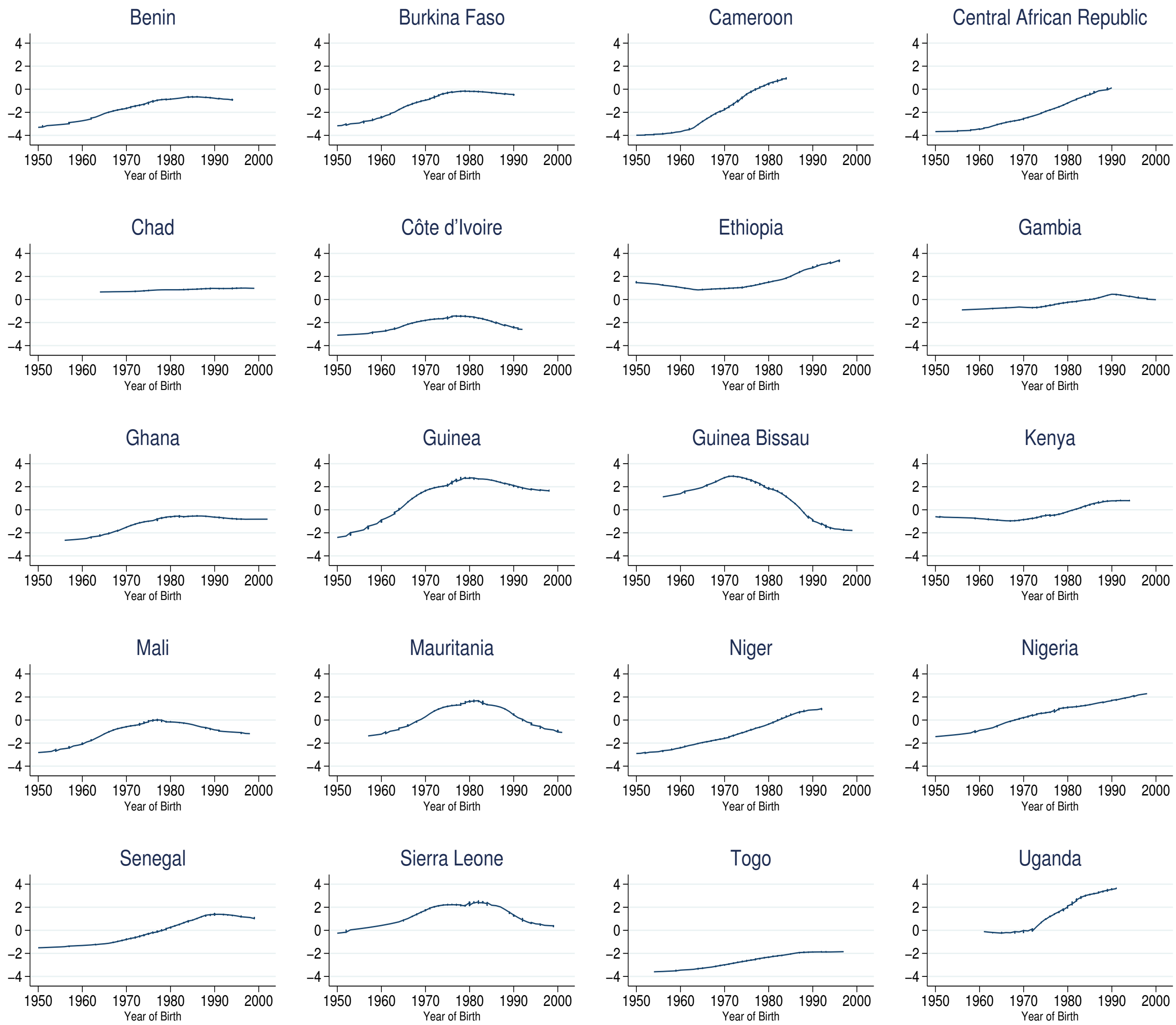
Unlike the short-term, in the long-run, data on severe droughts can be effectively used. Employing the same dataset and approach outlined above, for each sampled country and year, we compute the average frequencies of severe droughts. These are defined as scPDSI values of $\leq$ -3, as periods of extreme dryness result in significant scarcity and amplify the benefits of cooperation (Döring and Hall, 2023).

To build measures of earthquake hazard, we use data on earthquakes collected from the Global Significant Earthquake Database, assembled by National Oceanic and Atmospheric Administration (NOAA) and publicly available on their website. The data contains information on 5,700 recorded earthquakes that occurred worldwide since 2150 B.C, including the magnitude, intensity, latitude and longitude of each seismic event. Each seismic event included is considered significant enough to create physical damages or cause fatalities.[1] To obtain population-weighted average earthquake frequencies for each country and year observed, we follow these steps. We begin with the 2000 population gridded data at 0.5-degrees resolution from the Global Rural-Urban Mapping project, and create a distance buffer of 100km to each grid cell's centroid. We then assign earthquake hazards to grid cells if they occurred within this radius. We assign earthquake events based on Richter magnitude (Mw), which is a standardized measure of an earthquake size and less dependent on subjective evaluations of its economic effect (Buonanno et al., 2023). Since events of very low Mw are hardly perceived by humans, we use earthquakes of high Mw. Specifically, we use earthquake hazards that have Mw higher than 4.63, a threshold value above which a seismic event causes physical damages and induces greater cooperation according to a conversion scale between intensity and magnitude (Rovida et al., 2016; Scordilis, 2006; Buonanno et al., 2023). These thresholds are common in the economic literature (Buonanno et al., 2023). For each grid and year, we count the frequencies of earthquakes and construct the average earthquake events experienced by a person using the population as weights. Our resulting data therefore contains yearly average earthquake

[1] An earthquake is significant if it created approximately \$1 million or more damages, caused 10 or more deaths, had a magnitude 7.5 or greater, had modified mercalli intensity X or greater, or generated a tsunami.

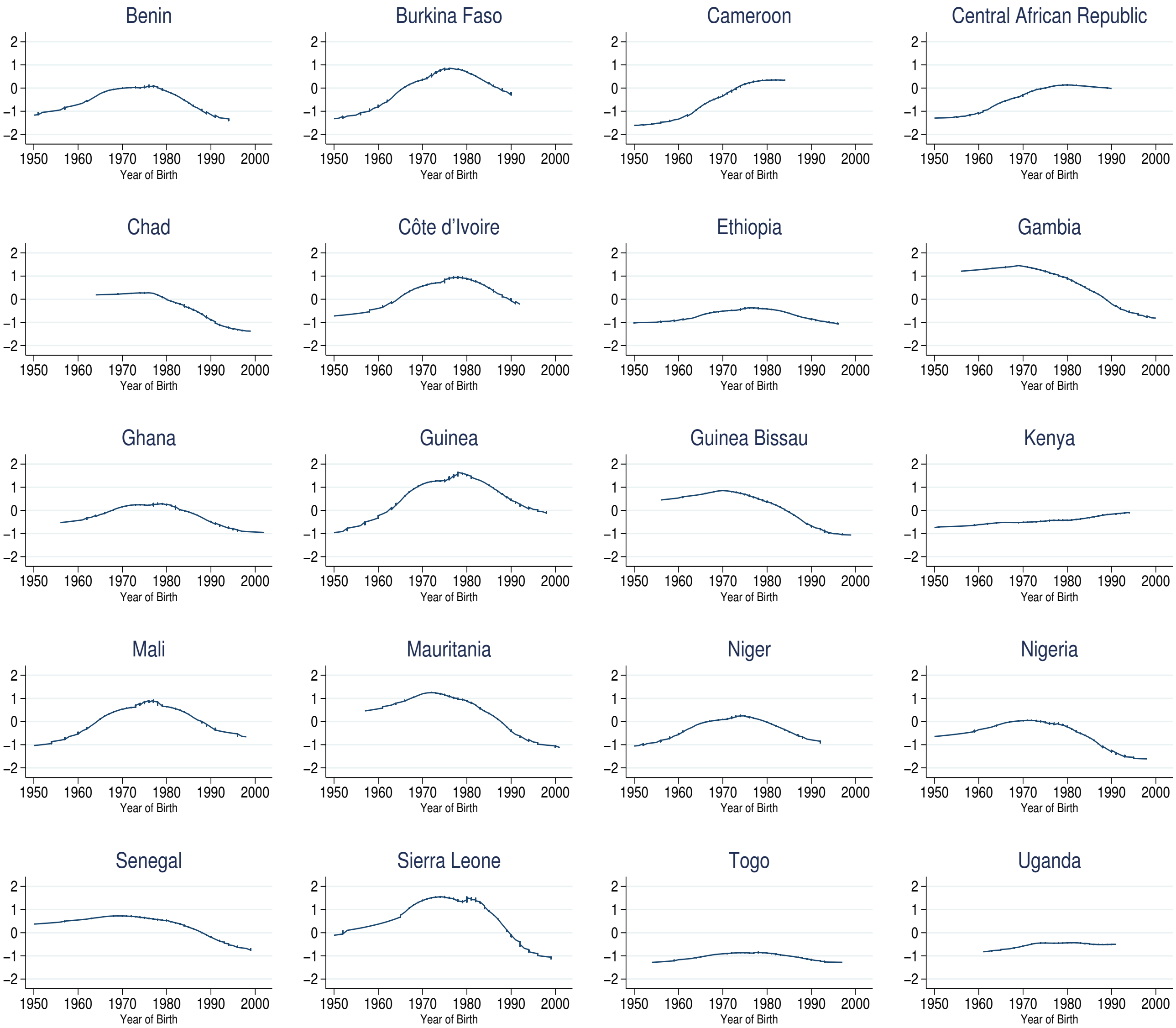
frequencies for the countries covered in the DHS and MICS.

Figure C.1: Average exposure to disasters during ages 1-19



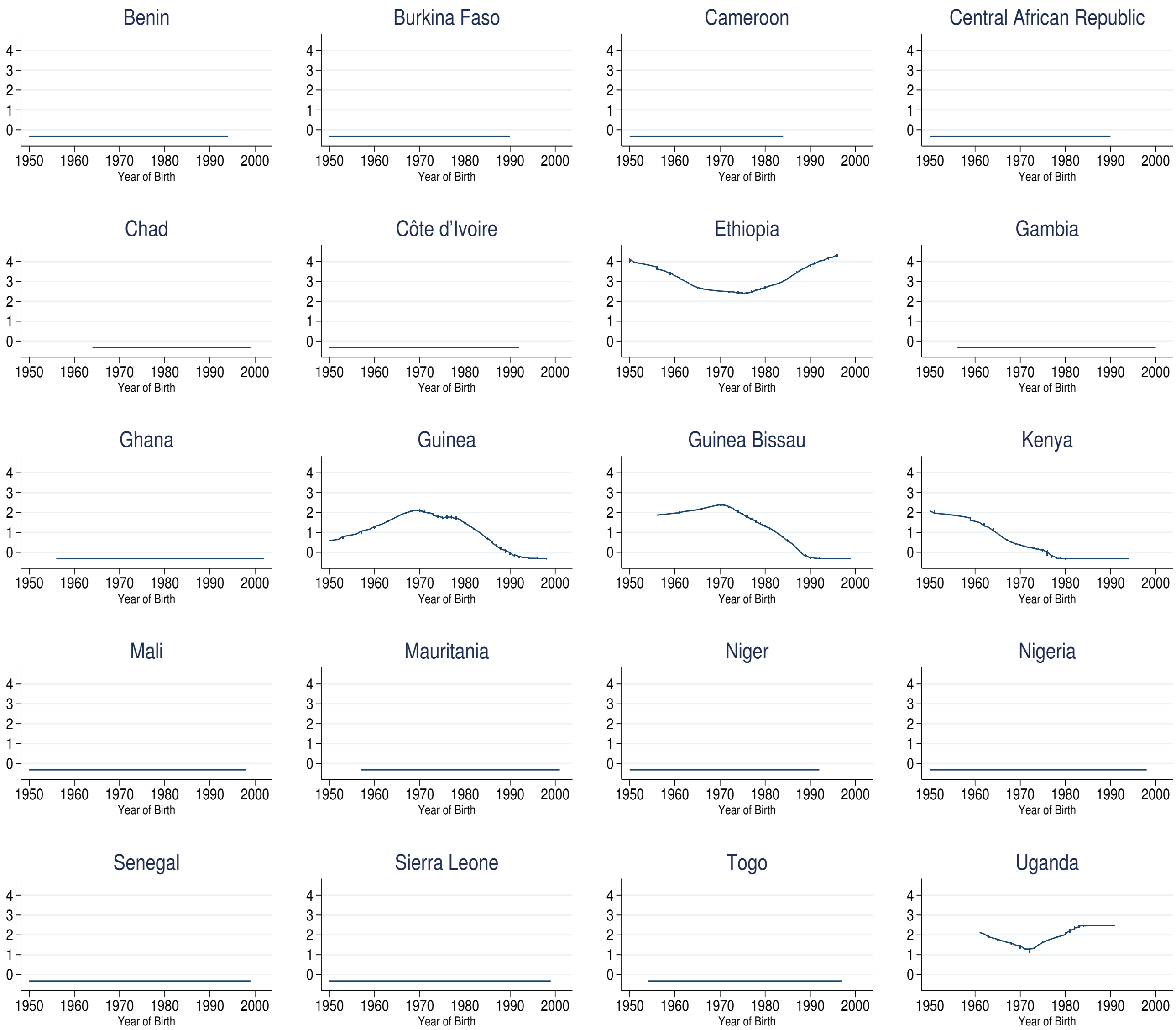
Notes: Cohort-level average exposure to disasters during ages 1-19. Computed from exposures to droughts, earthquakes, epidemics, and storms, where each variable are standardized to z-scores.

Figure C.2: Average exposure to droughts during ages 1-19



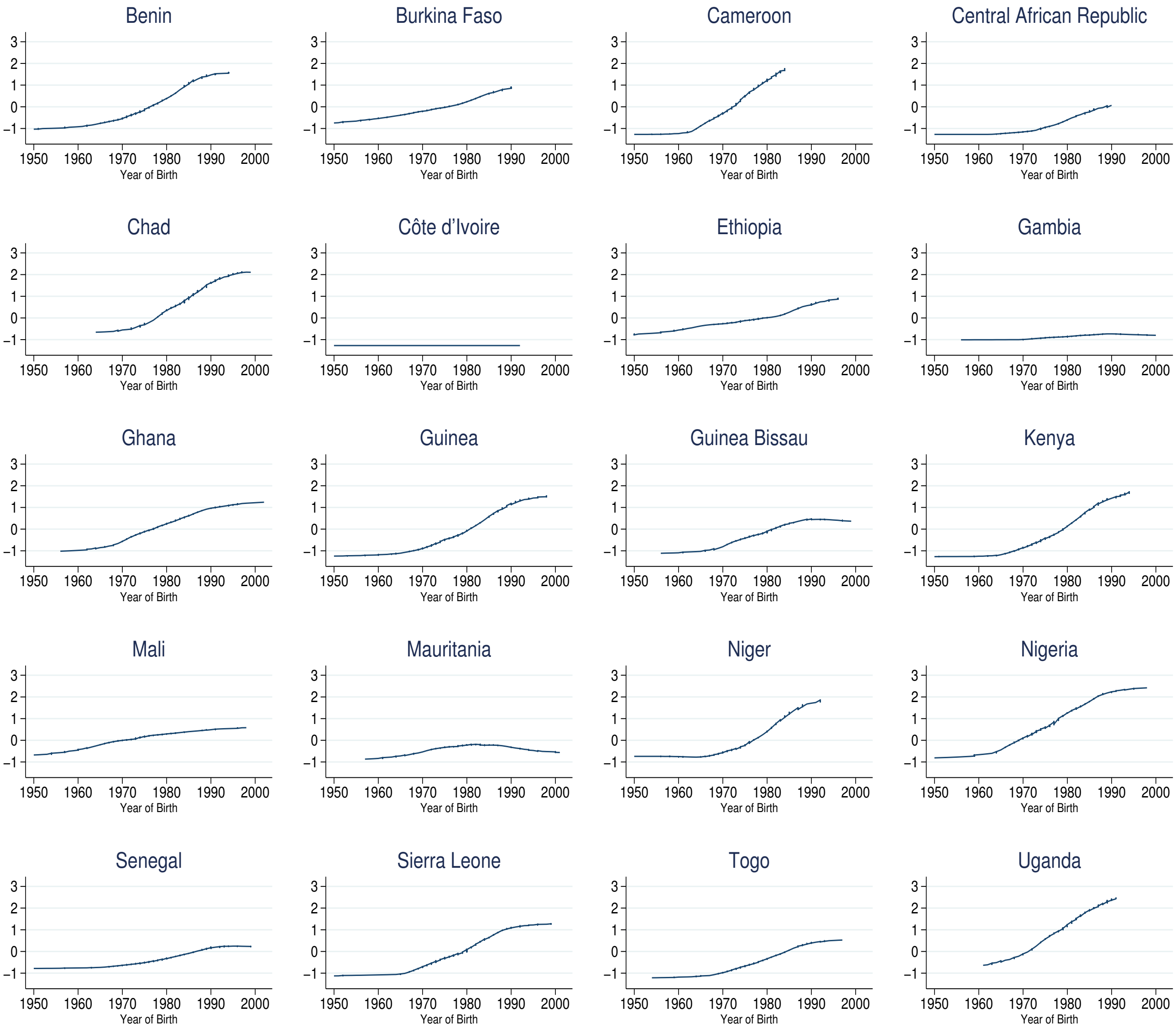
Notes: Cohort-level average exposure to droughts - ages 1-19

Figure C.3: Average exposure to earthquakes during ages 1-19



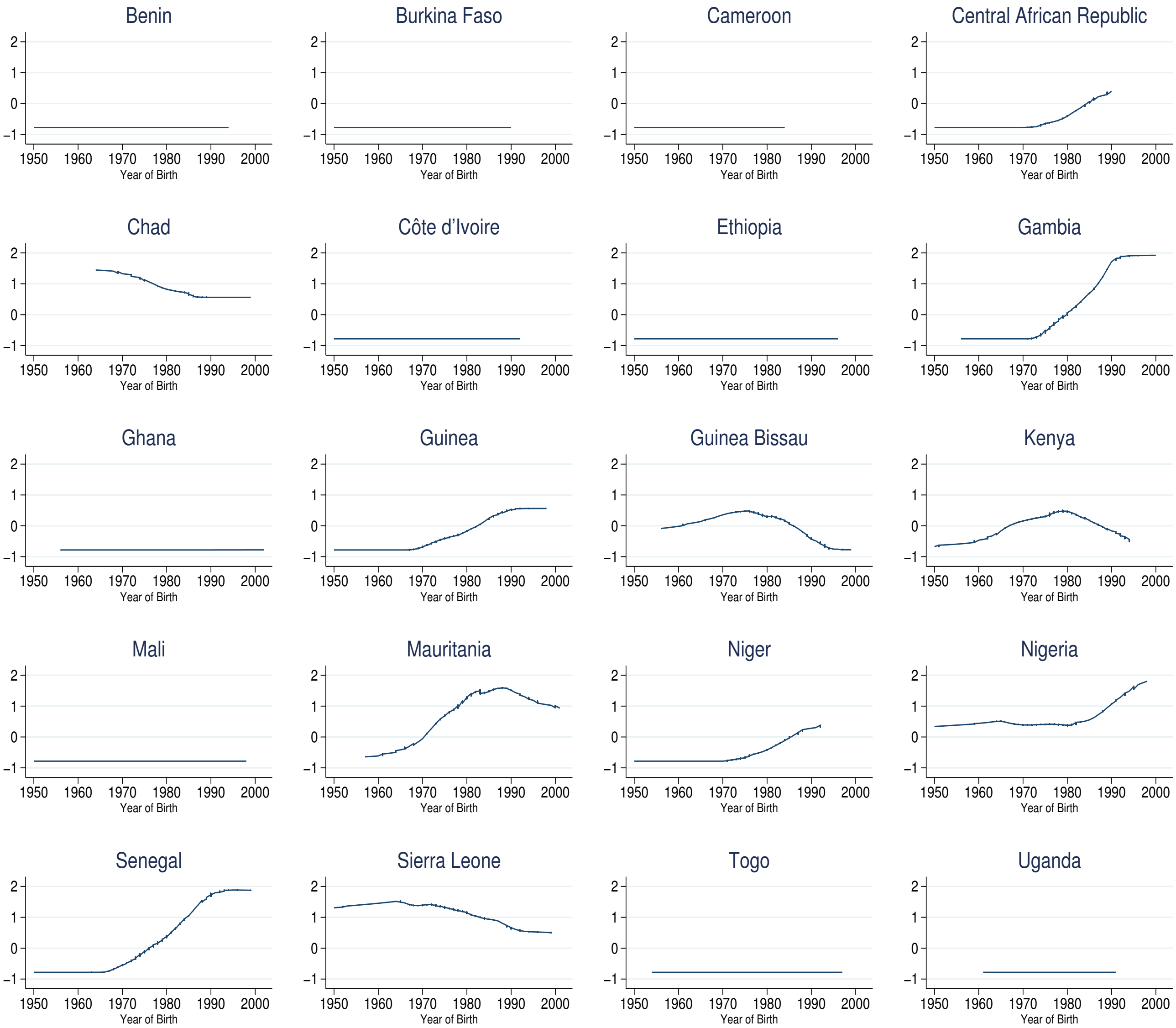
Notes: Cohort-level average exposure to earthquakes - ages 1-19

Figure C.4: Average exposure to epidemics during ages 1-19



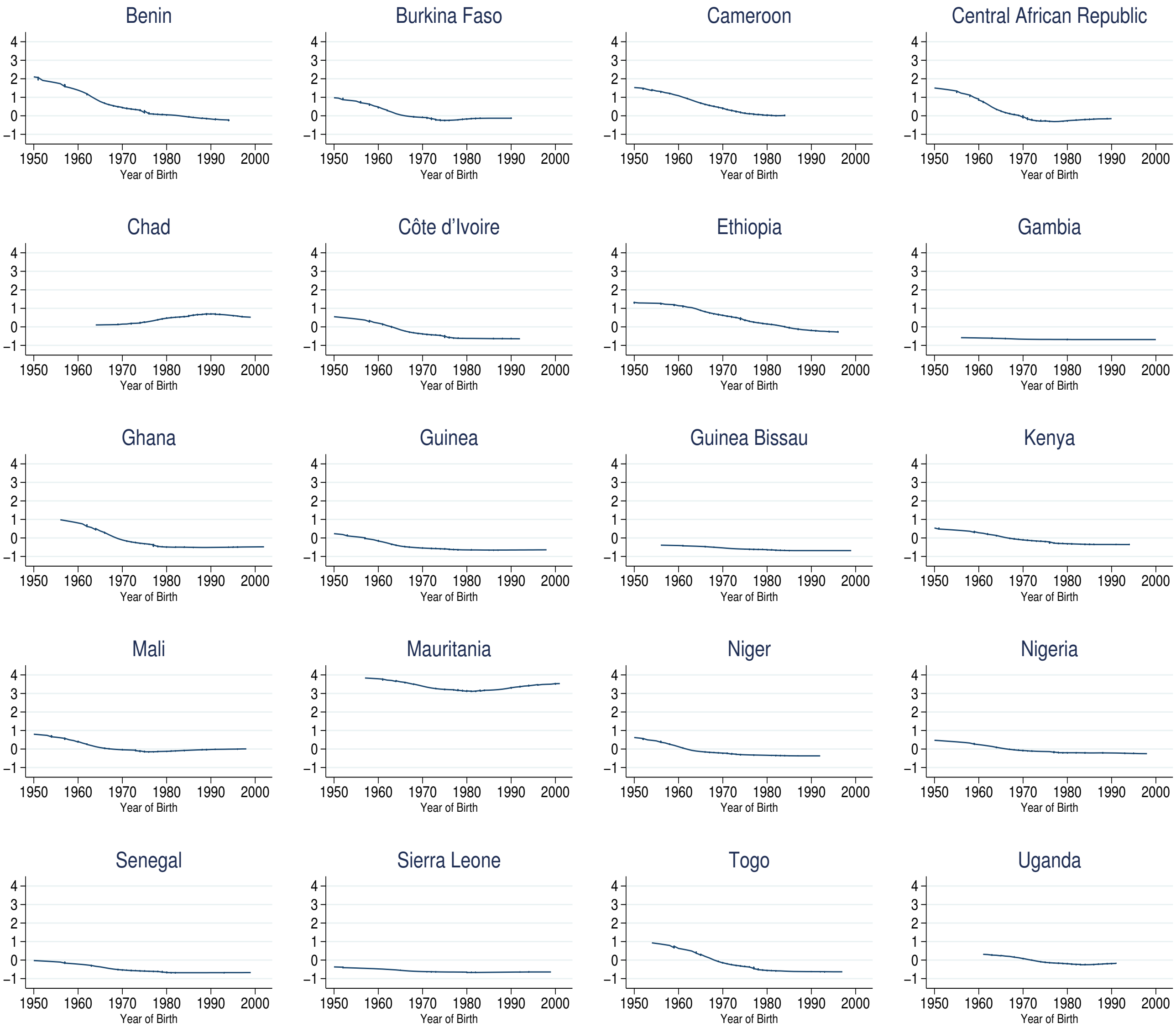
Notes: Cohort-level average exposure to epidemics - ages 1-19

Figure C.5: Average exposure to storms during ages 1-19



Notes: Cohort-level average exposure to storms - ages 1-19

Figure C.6: Average exposure to floods during ages 1-19



Notes: Cohort-level average exposure to floods - ages 1-19

C.2 Additional figure and tables

Table C.1: Long-term effects of the disaster - non-migrant only

	Tightness of FGC			
	$Q12$	$Q10$	$Q4$	$Q2$
	(1)	(2)	(3)	(4)
Disasters	0.011***	0.013***	0.016***	0.016***
	(0.004)	(0.004)	(0.004)	(0.005)
Country x survey-year FE	Yes	Yes	Yes	Yes
Birth-Cohort FE	Yes	Yes	Yes	Yes
Baseline Controls	Yes	Yes	Yes	Yes
FGC law	Yes	Yes	Yes	Yes
Observations	130,241	130,241	130,240	130,186
R^2	0.123	0.131	0.101	0.071

Notes: OLS estimates of exposure to disasters during ages 1 to 19. An observation is an individual. The dependent variable in columns 2 thru 5 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC - Tightness of FGC$_{Q12}$. In column 2, it is computed using 10 questions-Tightness of FGC$_{Q10}$; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect - Tightness of FGC$_{Q4}$; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC$_{Q2}$. The baseline controls include gender, age, age squared and urban residence. Robust standard errors in parentheses are clustered at country x birth-cohort level and observations are weighted using survey-specific weights that are adjusted for comparability across time and country using population estimates from the UN. *** p<0.01, ** p<0.05, * p<0.1. Disasters include epidemics, storms, floods, droughts and earthquakes. All tightness and disaster measures are normalized to z-score.

Table C.2: Long-term effects of the disaster - endogenous covariates

	Tightness of FGC			
	$Q12$	$Q10$	$Q4$	$Q2$
	(1)	(2)	(3)	(4)
Disasters	0.007***	0.008***	0.010***	0.009***
	(0.002)	(0.002)	(0.003)	(0.003)
Country x survey-year FE	Yes	Yes	Yes	Yes
Birth-Cohort FE	Yes	Yes	Yes	Yes
Baseline Controls	Yes	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes	Yes
FGC law	Yes	Yes	Yes	Yes
Observations	724,910	724,910	724,908	724,719
R^2	0.099	0.104	0.088	0.074

Notes: OLS estimates of exposure to disasters during ages 1 to 19. An observation is an individual. The dependent variable in columns 2 thru 5 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC - Tightness of FGC_{Q12}. In column 2, it is computed using 10 questions-Tightness of FGC_{Q10}; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect - Tightness of FGC_{Q4}; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC_{Q2}. The baseline controls include gender, age, age squared and urban residence. Additional controls contain fixed effects for marital status, educational attainment and wealth. Robust standard errors in parentheses are clustered at country x birth-cohort level and observations are weighted using survey-specific weights that are adjusted for comparability across time and country using population estimates from the UN. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Disasters include epidemics, storms, floods, droughts and earthquakes. All tightness and disaster measures are normalized to z-score.

Table C.3: Long-term effects of the disaster - imputed birth year

	Tightness of FGC			
	*Q*12	*Q*10	*Q*4	*Q*2
	(1)	(2)	(3)	(4)
Disasters	0.007***	0.008***	0.010***	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)
Country x survey-year FE	Yes	Yes	Yes	Yes
Birth-Cohort FE	Yes	Yes	Yes	Yes
Baseline Controls	Yes	Yes	Yes	Yes
FGC law	Yes	Yes	Yes	Yes
Observations	708,043	708,043	708,041	707,868
R^2	0.092	0.097	0.081	0.068

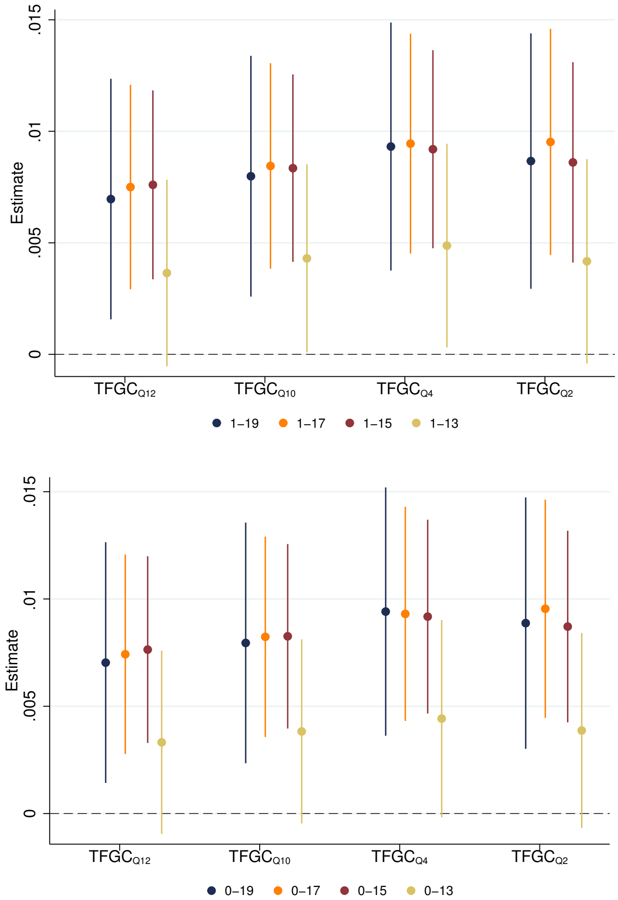
Notes: OLS estimates of exposure to disasters during ages 1 to 19. An observation is an individual. The dependent variable in columns 2 thru 5 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC - Tightness of FGC_{Q12}. In column 2, it is computed using 10 questions-Tightness of FGC_{Q10}; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect - Tightness of FGC_{Q4}; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC_{Q2}. The baseline controls include gender, age, age squared and urban residence. Robust standard errors in parentheses are clustered at country x birth-cohort level and observations are weighted using survey-specific weights that are adjusted for comparability across time and country using population estimates from the UN. *** p<0.01, ** p<0.05, * p<0.1. Disasters include epidemics, storms, floods, droughts and earthquakes. All tightness and disaster measures are normalized to z-score.

Table C.4: Long-term effects of the disaster - missing specific ethnic group

	Tightness of FGC			
	*Q*12	*Q*10	*Q*4	*Q*2
	(1)	(2)	(3)	(4)
Disasters	0.007***	0.009***	0.010***	0.010***
	(0.003)	(0.003)	(0.003)	(0.003)
Country x survey-year FE	Yes	Yes	Yes	Yes
Birth-Cohort FE	Yes	Yes	Yes	Yes
Baseline Controls	Yes	Yes	Yes	Yes
FGC law	Yes	Yes	Yes	Yes
Observations	663,209	663,209	663,207	663,029
R^2	0.107	0.111	0.096	0.083

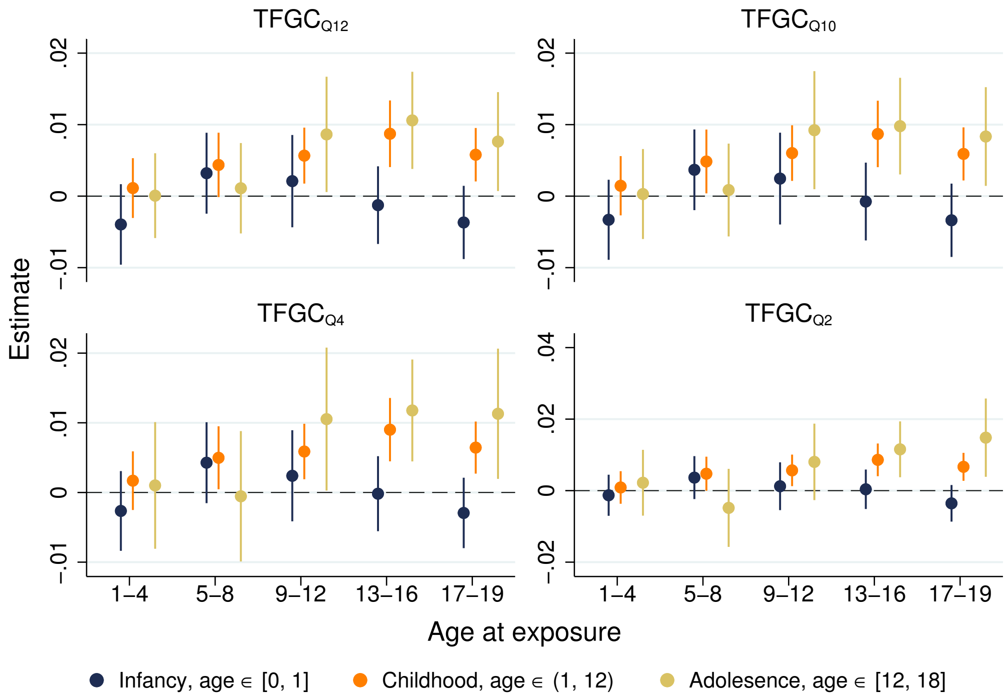
Notes: OLS estimates of exposure to disasters during ages 1 to 19. An observation is an individual. The dependent variable in columns 2 thru 5 is tightness of FGC, based on different constructions. In column 1, tightness is computed using all 12 normative questions about FGC - Tightness of FGC_{Q12}. In column 2, it is computed using 10 questions-Tightness of FGC_{Q10}; in column 3, it is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect - Tightness of FGC_{Q4}; and in column 4, it is constructed based on 2 questions - support for FGC and FGC required by religion - Tightness of FGC_{Q2}. The baseline controls include gender, age, age squared and urban residence. Robust standard errors in parentheses are clustered at country x birth-cohort level and observations are weighted using survey-specific weights that are adjusted for comparability across time and country using population estimates from the UN. *** p<0.01, ** p<0.05, * p<0.1. Disasters include epidemics, storms, floods, droughts and earthquakes. All tightness and disaster measures are normalized to z-score.

Figure C.7: Long-term effects of the disaster - Alternative thresholds



Notes: OLS estimates of exposure to disasters during ages shown beneath the figure. Confidence intervals are based on robust standard errors, clustered at the country-cohort level and observations are weighted using survey-specific weights that are adjusted for comparability across time and country using population estimates from the UN. The coefficients are estimated from a multiple regressions which includes fixed effects for country-of-residence × survey-year and birth cohort and controls for gender, age, age squared, urban residence and legal ban on FGC. The tightness of FGC are based on different constructions. TFGC_{Q12} is computed using all 12 normative questions about FGC. TFGC_{Q10} is computed using 10 questions; TFGC_{Q4} is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and TFGC_{Q2} is constructed based on 2 questions - support for FGC and FGC required by religion. The measures are normalized to z-score. Disasters include epidemics, storms, floods, droughts, and earthquakes.

Figure C.8: Long-term effects of the disaster by age at exposure



Notes: OLS estimates of exposure to disasters during ages shown beneath the figure for different region-ethnic-specific timing of FGC. Confidence intervals are based on robust standard errors, clustered at the country-cohort level and observations are weighted using survey-specific weights that are adjusted for comparability across time and country using population estimates from the UN. The coefficients are estimated from a multiple regressions which includes fixed effects for country-of-residence × survey-year and birth cohort and controls for gender, age, age squared, urban residence and legal ban on FGC. The tightness of FGC are based on different constructions. TFGC_{Q12} is computed using all 12 normative questions about FGC. TFGC_{Q10} is computed using 10 questions; TFGC_{Q4} is based on 4 questions - support for FGC, FGC required by religion, FGC required for social acceptance, and FGC required for marriage prospect; and TFGC_{Q2} is constructed based on 2 questions - support for FGC and FGC required by religion. The measures are normalized to z-score. Disasters include epidemics, storms, floods, droughts and earthquakes.

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