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# Disasters and Tightness of Social Norms: The Case of Female Genital Cutting

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## ABSTRACT

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# Disasters and Tightness of Social Norms: The Case of Female Genital Cutting

We examine the empirical relationship between exposure to disasters and tightness of social norms, focusing on the practice of female genital cutting (FGC) in Sub-Saharan Africa. Social norms tightness refers to the extent to which cultural groups enforce adherence to norms and punish deviations. It is a key factor in shaping how societies function and individuals behave, influencing everything from social order and conflict to collective effort and institutional dynamics, and often emerges and evolves as an adaptive response to adverse events. Drawing on occurrences of epidemics and natural disasters, we find that individuals surveyed in the aftermath of a disaster in their region adhere 4 to 6 percent of a standard deviation more closely to the opinions about FGC in their groups compared to those interviewed just before the disaster occurred. This effect is particularly pronounced among women and rural populations. By examining variations in early life exposure to disasters across birth cohorts within countries, we find that this effect persists over time and is strongest when the disaster occurs during the transition from childhood to early adolescence.

**JEL Classification:** D1, D7, I15, O1, O55, Z1

**Keywords:** social norms, cooperation, epidemics, natural disasters, Sub-Saharan Africa

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# 1 Introduction

Individuals do not behave in isolation. Rather, they rely on others to understand social and economic norms that shape their opinions, attitudes, and behaviors (Bernheim, 1994; Cialdini, Reno, & Kallgren, 1990; Dimant, 2023; Dimant, Gelfand, Hochleitner, & Sonderegger, 2025; Fatas, Heap, & Arjona, 2018). This highlights the importance of understanding how social norms emerge, develop, and persist over time.

The concept of cultural tightness-looseness provides insight into how societies respond to norms (Gelfand et al., 2011). Cultural tightness reflects “the strength of social norms, or how clear and pervasive norms are within cultures, and the strength of sanctioning, or how much tolerance there is for deviance from norms within cultures”. Therefore, compared to loose cultures, tight cultures show a pattern of stronger adherence to norms and harsher punishment of deviant behaviour (Gelfand, Harrington, & Jackson, 2017; Gelfand et al., 2011). Tight cultures foster strong social expectations, where individuals conform due to perceived obligations and shared normative beliefs, but also demonstrate greater resistance to change. In contrast, loose cultures, with weaker social expectations, are more open to adaptation and behavioral change (Jackson et al., 2021; Li & Gelfand, 2022). Tight norms often emerge and evolve as an adaptive strategy in response to adverse events, which increase the returns to conformity and cooperation with the group (De, Nau, & Gelfand, 2017; Harrington & Gelfand, 2014; Jackson, Gelfand, & Ember, 2020; Roos, Gelfand, Nau, & Lun, 2015; Szekely et al., 2021; Winkler, 2021).

This paper explores how disasters affect the tightness of social norms in both the short- and long-run, using female genital cutting (FGC) as a case study. Specifically, we examine how disasters shape individuals’ views about the prevailing beliefs and attitudes toward FGC within their community, testing whether such events lead people to align more closely with dominant social expectations. FGC is a particularly relevant example because it is deeply embedded in cultural and social expectations and often reflects broader patterns of social cohesion, identity, and compliance with community norms. This makes it a powerful lens through which to study the dynamics of harmful norms in the face of external shocks.

FGC is the practice of cutting or removing part of the female genitalia for non-medical reasons, and it is typically performed for girls between infancy and 15 years of age, depending on the setting. Affecting 4 million girls every year and over 200 million women worldwide (United Nations Population Fund, 2023), the practice of FGC is deeply ingrained in the tradition of many communities. Despite its well-documented negative consequences on health and education (García-Hombrados & Salgado, 2022; Jones, Diop, Askew, & Kaboré, 1999; Wagner, 2015), progress in eradicating the practice remains uneven, with little change in prevalence in many countries (WHO, 2018). Various factors contribute to FGC’s persistence, including limited women’s empowerment and education (De Cao & La Mattina, 2019; Harari, 2019), its role in facilitating marriage and securing a higher bride price (García-Hombrados & Salgado, 2022; Khalifa, 2022), and connections to religion (Ahmadu, 2001). The prevailing hypothesis, however, emphasizes its role in shaping women’s identity and ensuring conformity to community norms (Ahmadu, 2001; García-Hombrados, Pérez-Parra, & Ciacchi, n.d.; Koso-Thomas, 1987; Shell-Duncan & Hernlund, 2000). One factor that contributes

to its adherence and persistence is reciprocal expectations of interdependent choices (Bicchieri & Marini, 2015; Lindskog, Congdon Fors, & Isaksson, 2022; Mackie, 1996; Shell-Duncan, Wander, Hernlund, & Moreau, 2011). Family attitudes and beliefs are conditioned by the attitudes and beliefs of others. If group members - especially girls and women - deviate from the practice of FGC, they might face reduced acceptance into the community (Toubia & Sharief, 2003), inferior perceived beauty and femininity (Shell-Duncan & Hernlund, 2000), denial of adult status (Shell-Duncan & Hernlund, 2000; Shell-Duncan, Moreau, Wander, & Smith, 2018), peer teasing and insults (Hernlund, 2000; Shell-Duncan et al., 2011). In some groups, those who fail to conform are often accused of witchcraft (Poyker, 2023; Weber, 2012).

Given that disapproval and adherence to the norm vary across different contexts, we would expect some variations in the shape of the distribution (that is, the variance) of normative opinions among cultural groups, where normative opinions are defined as shared beliefs within a group about what behaviors are acceptable, expected, or ideal in a given context. In tightly-knit communities, where opinions are less varied, there is stronger consensus either supporting or opposing the practice, higher conformity, and greater disapproval of deviation. This tightness often evolves as an adaptive response to disasters. Across different types of disasters and empirical methods, we find evidence of tighter FGC norms, potentially strengthening the practice in communities that already support it or weakening it in those where it is already declining. As an interdependent group action, FGC opinions become more tighten during negative shocks, where cooperation provides social and economic advantages, aligning individual attitudes with group norms, and promoting prosocial behavior. In line with the main hypothesis, we also find suggestive evidence that exposure to disasters increases the benefits of social cooperation and coordination, leading to stricter adherence to group norms.

To conduct our analysis, we rely on several rounds of the Demographic and Health Survey (DHS) and the Multiple Indicator Cluster Survey (MICS), which provide individual-level data on the opinions and prevalence of FGC in countries where the practice is common over the period from 1994 to 2020. Our sample consists of 20 Sub-Saharan African countries. The datasets have similar data collection methods and allow us to measure the tightness of FGC in a unique way. Our measure relies on individuals' normative responses regarding FGC, encompassing revealed preferences for continuing or stopping the practice, the reasons they believe it is performed, and its perceived connection to religious beliefs or broader societal benefits. By exploring variances in these normative opinions, our measure of FGC tightness captures the extent to which an individual's normative opinions align with those of others within their reference group who share similar normative perspectives. In our baseline analysis, following McGavock and Novak (2023), we define the reference group as all individuals of the same gender within the same region and ethnic group. We also examine the robustness of the results to the use of alternative definitions of the reference group and find reassuring results.

DHS and MICS data are combined with information on natural disasters and epidemics obtained from the Emergency Events Database (EM-DAT), the Climate Research Unit (CRU) self-calibrating Palmer Drought Severity Index, and the National

Oceanic and Atmospheric Administration (NOAA) over the period from 2001 to 2020. An interesting feature of our match is that all disasters occurred amid the fieldwork of DHS and MICS surveys about FGC normative opinions. Therefore, our main identification strategy leverages the random timing of disasters, comparing FGC tightness among individuals interviewed shortly before and after a disaster. Our estimates of the short-term effects of disasters reveal that they increase FGC tightness by 4-6 percent of a standard deviation. The effects are driven by women and rural populations and are robust to the use of a regression discontinuity approach (RDD).

To estimate the long-term effects of disasters on the tightening of FGC norms, we construct a retrospective measure of exposure to disasters during ages 1-19. We focus on exposure during this age range following recent literature emphasizing the relevance of this life period for beliefs formation (Adhvaryu & Fenske, 2023; G.S. Becker, 2019; Malmendier & Nagel, 2011). Variations in exposure are determined by both birth year and country of residence. The long-term results reveal a significant positive impact of past disaster exposure on present tightness of FGC practices. Individuals exhibit lower tolerance for non-conformism to FGC norms and their normative opinions are more aligned with the reference group even many years after experiencing disasters. The point estimates range between 0.7 and 0.9 percent of a standard deviation, and the effect is particularly strong when the disaster occurs during the transition from childhood to early adolescence.

We provide compelling evidence that our results are not driven by misspecification, endogenous selection, or measurement error. Moreover, we show that they are robust to a variety of empirical checks, including the use of alternative controls, alternative definitions of disaster exposure, the exclusion of observations with imputed birth-years or individuals not identifying with specific ethnic groups. We also rule out the possibility of institutions and deep history, including disasters that hit previous generations and whose effects may persist through intergenerational transmission confounding the effects. Finally, we also test and reject the hypothesis that results are driven by selective migration out of disaster-affected areas.

But how may disasters affect the tightness of FGC norms? We investigate four potential mechanisms. First, disasters may increase economic reliance on the community, enhancing the benefits of cooperation, which might lead the community to tighten - including in their shared opinions about FGC. Second, natural disasters are often followed by communal gatherings, where repeated interactions can lead to a tightening of social norms and opinions in the community (Holler & Schäfer, 2021; Landmann & Volland, 2024). Third, disasters may increase religious adherence as individuals turn to faith-based practices for coping. While FGC is not a religious practice and is not prescribed by the vast majority of religious leaders across faiths, some individuals falsely believe it is linked to religion. In this context, an increase in religiosity may lead some individuals to be more likely to support or engage in FGC if they believe it to be a religious obligation, potentially contributing to a tightening of opinions around FGC in some communities. Finally, because FGC decisions are, in some contexts, driven by the prospect of improved marriage opportunities, some families may cling more tightly to FGC norms in response to negative economic shocks, hoping to secure a higher bride price or a more advantageous marriage in times of economic hardship.

(McGavock & Novak, 2023). Our results rule out the latter two mechanisms: exposure to disasters do not increase FGC tightness through increased religiosity or improved marriage prospects. Instead, we provide evidence consistent with the hypothesis that increased payoff from cooperation and greater social interaction through communal gatherings within ethnic groups are key drivers of the effect of natural disasters on the tightening of this social norm.

Overall, our findings reveal that exposure to disasters strengthens within-group opinions about FGC and reduces tolerance for differing views, intensifying cultural cohesion within ethnic groups. This dynamic contributes to rising polarization by reinforcing in-group identity and deepening divisions between groups. Disasters amplify adherence to FGC norms, as individuals increasingly rely on shared values to maintain group solidarity and distinguish themselves from outsiders, with FGC norms serving as tools for managing cohesion within groups while widening societal divides.

Our research contributes to several strands of the literature. First, our study relates to the growing body of evidence that studies the evolution and persistence of cultural and social norms. Existing evidence suggests that cultural norms are typically an outcome of evolutionary process, in which historical environment or shock shaped their long-term evolution (e.g. Alesina, Brioschi, and La Ferrara 2021; Alesina, Giuliano, and Nunn 2013; Giuliano and Nunn 2021; Giuliano and Spilimbergo 2014). The closer study to ours is Winkler (2021), which documents how exposure to conflicts and natural disasters can lead to tighter cultural norms - including trust, opinions about immigrants, religion, taxes, among others - using data from Europe. We extend his framework and use data from Sub-Saharan Africa (SSA) to examine a harmful tradition deeply rooted in the culture of many communities, specifically upheld by strong shared social expectations, including both empirical and normative expectations. Unlike many norms in Winkler’s analysis, the norm we focus on carry significant costs, such as health risks. Our results show that economic shocks tighten FGC opinions within communities. This might increase the prevalence of FGC in communities where this practice is common, while reducing it in communities that reject this harmful norm.

Second, our paper is linked to the literature on ethnic and society polarization (Atkin, Colson-Sihra, & Shayo, 2021; Autor, Dorn, Hanson, & Majlesi, 2020; Desmet, Ortuno-Ortin, & Wacziarg, 2017; Desmet & Wacziarg, 2021; Winkler, 2021). Using the tightness of FGC as a case of study, our results show that disasters lead to greater homogeneity within ethnic groups, arguably contributing to a growing division and polarization between communities and ethnic groups who practice the social norm and those who do not.

Finally, our work contributes to the literature that explores the nature, origins, and persistence of the FGC practice (A. Becker, 2025; Bellemare, Novak, & Steinmetz, 2015; Chesnokova & Vaithianathan, 2010; Congdon Fors, Isaksson, & Lindskog, 2024; Efferson, Vogt, Elhadi, Ahmed, & Fehr, 2015; García-Hombrados et al., n.d.; García-Hombrados & Salgado, 2022; Gulesci, La Ferrara, Smerdon, & Sulaiman, 2020; La Ferrara, Corno, & Voena, 2020; Mackie, 1996; McGavock & Novak, 2023; Novak, 2020; Posner, 1994; Poyker, 2023; Wagner, 2011, 2015). We contribute to this literature by providing evidence on how the tightness around this harmful social norms can

be shaped by economic shocks. In very tight environments, where opinions are tightly distributed, there is less variation in attitudes and beliefs. Our findings show that disasters shape variations in norm tightness, offering insights into why the practice of FGC persists within some groups while declining in others. Notably, an increase in tightness can manifest as either a higher or lower prevalence of the norm, depending on the community’s baseline attitudes toward the practice.

The article is organized as follows. Section 2 explains more in detail the concept of social norm tightness and outlines the approach used to measure FGC tightness. Section 3 introduces the data used in our analysis. Sections 4 and 5 present the empirical strategy and the results of both short- and long-term effects of disasters on the tightness of social norms. Section 6 explores the potential mechanisms driving these effects, and section 7 concludes.

## 2 Social norms tightness and its measurement

In any culture, norms are seen as standards that guide and/or constrain behavior without the force of laws. For such norms to be social, they must be based on widely shared opinions of individual members of a social group (Bicchieri, 2006; Cialdini & Trost, 1998; Elster, 1989; Fehr & Schurtenberger, 2018). This definition entails two important features. First, a social norm applies to a specific group and is exclusively defined in terms of a normative behavioral standard. That is, it is not based on actual behavior, but in terms of how group members should or ought to behave. From an empirical point of view, this corresponds to what the average opinion is in a given social group (Dimant, 2023; Dimant et al., 2025; Winkler, 2021). Second, the “shared” element of norms requires that the normative behavioral standard is commonly known by group members. Thus, failure to comply with the norm triggers disapproval and sometimes even sanctions. If group members dislike the thought that others disapprove of them they automatically comply with the norm. The extent of this disapproval and norm-adherence is captured by the variance of the distribution of normative opinions (Dimant, 2023; Dimant et al., 2025; Fehr & Schurtenberger, 2018; Winkler, 2021).

In tight social environments, where opinions are tightly distributed, there is low variance, indicating high consensus about the normative standard and greater disapproval for norm deviance, while in loose environments where there is high variance, consensus about normative standards and disapproval are very low. Therefore, the variance in normative opinions indicates how important it is for individual members of a social group to adhere to the normative behavioral standard, and is referred in psychology as tightness of a social norm. Gelfand (2019) and Harrington and Gelfand (2014) speak in this context of tight and loose norms and show how this distinction generates systematic variations across cultures. Compared with loose cultures, tight cultures have strong and well defined norms and beliefs of other individuals tend to be more predictable. Implicit in this feature is the idea that, when faced with a tight culture, strategic uncertainty is minimal (Dimant, 2023; Dimant et al., 2025). In social groups with tight culture, norms are also reliably enforced (Jackson et al., 2021; Jackson, Gelfand, De, & Fox, 2019) and group members tend to have higher felt

accountability (Frink & Klimoski, 1998) and be less tolerant of deviant behavior. Conforming to local norms is considered a crucial element to display respect and behave in a morally virtuous manner, making individuals worthy of inclusion in their social network. Such differences in tightness-looseness are not random: tightness tends to evolve with high ecological threats. For social groups that face adverse threats, tight norms are adaptive as such norms promote the coordination necessary for survival (Gelfand, 2019; Harrington & Gelfand, 2014). Evolutionary game theoretic models support this notion, showing that groups that experience heightened collective threats tend to develop stricter rules to help coordinate social action (Roos et al., 2015). These conceptual patterns can be better understood by examining them in our context of interest. Online Appendix Figure A.1 presents distributions of opinions on whether FGC – our focal normative opinion – should be continued among men and women in three ethnic groups in Mali, Guinea, and Gambia. For each group, we report the variance (tightness) and, in parentheses, the prevalence of FGC. The figure highlights two key points. First, groups can have similar tightness despite different behavioral standards, as in the case of the Bambara in Mali and the Wolof in Gambia. Conversely, groups can share similar behavioral standards but differ in tightness (e.g., the Bambara in Mali and the Soussou in Guinea). Second, tightness does not necessarily align with prevalence: the Bambara in Mali exhibit tighter norms despite a lower FGC prevalence than the Soussou in Guinea.

Building on this illustrative example, we formally develop a measure of tightness of social norms, following the approach used in Winkler (2021), which explores variations in survey responses to normative questions to compute the proportion of respondents whose views align with the most common opinion within their cultural group. We believe that this approach is the most appropriate for two reasons. First, it allows to develop measures of tightness of social norms at the individual level for causal analysis. Second, by incorporating the respondent’s cultural group to identify variations in opinions, it appropriately characterizes tightness-looseness as a cultural-level concept.<sup>1</sup>

Our measure of social norm tightness focuses specifically on FGC, aiming to capture the degree to which an individual’s normative opinions about FGC align with those of others in their social or reference group. That is, it applies the concept of variance in FGC normative opinions to individual group members. The closer an individual’s opinion on FGC is to the prevailing group consensus, the more strongly s(he) holds to the opinion/belief and the tighter is the FGC norm on average. To construct this measure, our main sources are the Demographic and Health Survey (DHS) and Multiple Indicator Cluster Survey (MICS), which we describe in more detail in Section 3. In both datasets, we identify survey questions that ask respondents to state their normative opinions about a given topic of FGC practice. We focus on the set of questions that are purely normative and more representative of an individual’s attitude towards the norm; ranging from “should FGC continue” to “do you believe FGC is a religious requirement”. Online Appendix Table A.1 provides the list of questions: one set of questions consists of individual’s attitude toward support for the practice,

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<sup>1</sup>See Section A of the Online Appendix for a comprehensive discussion of the different methods used to measure the tightness of social norms.

the second set relates to religious requirement, while the third set comprises ten variables capturing rationales for the practice.<sup>2</sup> We note that the three sets of questions are asked independently to elicit respondent’s own opinions and are not designed to relate to each other. To ensure cross-country comparability, normative questions and answers are standardized in the two datasets so that responses can be compared across countries.<sup>3</sup>

We integrate views on the practice’s rationale in four different ways. First, we combine the ten variables capturing the motives for practicing FGC with two additional items on support and religious requirements, thus using all 12 normative questions about FGC included in the questionnaires. We denote this measure as  $\text{TFGC}_{Q12}$ . However, some of these variables may capture conceptually overlapping aspects of attitudes toward the practice. Therefore, we test the robustness of our results using alternative sets of variables avoiding potential redundancies. First, we drop two questions that do not contain a specific reason for practicing FGC, therefore using only 10 questions to compute the tightness measure,  $\text{TFGC}_{Q10}$ . Second, marriage prospects and social acceptance influence the adherence to the FGC norm in many communities. Thus, we use 4 questions; support for FGC, whether FGC is required by religion, and whether the practice is a requirement for social acceptance and marriage prospects,  $\text{TFGC}_{Q4}$ . Finally, we use only 2 questions; whether FGC should be continued and whether it is a religious requirement. We denote this measure as  $\text{TFGC}_{Q2}$ .

An important aspect of our exercise is to correctly identify the social group to which each individual in our sample belongs. To do so, we first have to define the concept of a social group. This, technically referred to as the reference group, includes the people whose opinions and behaviors influence an individual’s views regarding FGC and their approach to risk-sharing during adverse shocks. One possibility is to use all individuals within a country as reference group. Nevertheless, this creates a problem because FGC as a social norm exists within specific social group, and the distribution of FGC normative opinions may not be single-peaked, precluding to measure FGC tightness based on variance in opinions (Winkler, 2021). We define instead the reference group in our baseline analysis as all men (women) who live in the same region and identify with the same ethnic group. We combine region and ethnicity, as FGC is an ethno-local-specific norm. Ethnicity serves as an important marker for perpetuation of the practice, but there is substantial regional variation within an ethnic group. The combination of region and ethnicity offers the most accurate approximation of the groups in which FGC traditions originate and are transmitted across generations within local communities. Further, it best describes the group in which positive (negative) sanctions are likely to be applied for accepting (failing) to comply with this local ethnic-specific cultural norm.<sup>4</sup> The inclusion of respondents’ gender in the definition of the reference group is motivated by the fact that, in very rare cases, men and women (and crucially husbands and wives) consider FGC an appropriate topic for discussion (UNICEF, 2013). In our robustness checks,

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<sup>2</sup>This leaves us with 12 questions in DHS and 1 question in MICS.

<sup>3</sup>Not every question was asked in each country, or in each survey wave. We keep all questions irrespective of where or when they were asked. Among our identified survey normative questions, there are two types: those with a binary response (yes/no) and those with three or more categorical responses.

<sup>4</sup>The use of region and ethnicity to define the relevant reference population is also common in the literature. See for example McGavock and Novak (2023) or Novak (2020).

we refine this definition by excluding gender and by further including interactions with urban-rural residence, religion, education, and income (see Section 4.3 below for further details). Our measure of FGC norm tightness is therefore defined as follows:

$$TFGC_i = \frac{1}{Q} \sum_q \mathbb{1}_{\odot_{i,J}^q = \overline{\odot}_J^q}$$

where  $i$  denotes individuals,  $q$  is one of  $Q$  questions,  $\odot$  is the answer to  $q$ ,  $J$  represents  $i$ 's reference group, and  $\overline{\odot}_J$  represents FGC as a social norm within that reference group. First, for each question we define FGC practice as a social norm in a given reference group as the modal opinion among members of that reference group,  $\overline{\odot}_J^q$ . Second, we set an indicator equal to one if an individual who belongs to that reference group mentions the same opinion as the mode. Third, we average over all answered questions to get a single index of how tightly a respondent holds to the practice on average. This implies that our measure of tightness of FGC norm computes the proportion of the respondent's opinions that aligns with the prevailing opinions within his or her reference group.<sup>5</sup>

### 3 Data

In this section, we provide an overview of the data sources used for the analysis. We use five primary sources of data - the Demographic and Health Survey (DHS) and Multiple Indicator Cluster Survey (MICS) from a subset of SSA countries; the Emergency Events Database (EM-DAT) on natural disasters and epidemic outbreaks; the Climate Research Unit (CRU) self-calibrating Palmer Drought Severity Index: 1901-2020 Gridded Monthly Time Series, TS Version 4.05; and the earthquakes data provided by the National Oceanic and Atmospheric Administration (NOAA). We also use a database on the approval of FGC bans. All databases used in our analysis are summarized in Table A.2 in the Online Appendix.

#### 3.1 Demographic and Health Surveys and Multiple Indicator Cluster Surveys

Our principal sources of FGC outcomes are the Demographic and Health Survey (DHS) and Multiple Indicator Cluster Survey (MICS), a series of repeated cross-sectional surveys covering several countries across the globe. The DHS and MICS use very similar and consistent data collection practices that make the data comparable across countries and time, and are designed to be representative of a country's population of men aged 15-59 and women aged 15-49. We use data from 20 sub-Saharan African countries where the practice of FGC is significant and that were surveyed over the period from 1994 to 2020, amounting to 78 surveys.<sup>6</sup> This dataset includes information on

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<sup>5</sup>The index relies on the modal opinion of a reference group that responds both before and after the event. One might question whether it would be preferable to use only predetermined opinions to avoid potential confusion. However, we believe this approach is valid, as the modal value does not change significantly before and after the event. Responses to the FGC question appear stable across regions and over time, as we have verified empirically. Results available upon request.

<sup>6</sup>Our sample includes both men and women. Of the 78 surveys, 42 were administered to women only and 36 to both women and men.

respondents’ birth date, age, marital status, educational attainment, area of residence (urban/rural status), ethnicity and religion.<sup>7</sup> The surveys also provide individual-level answers to normative questions on FGC norm. As mentioned before, the questions are designed to assess individuals’ attitudes on different dimensions of FGC, including attitudes toward support, motivation for the practice, and religious requirement.

In addition, DHS and MICS contain information on the specific date when each survey was carried out, and on the administrative region of residence.<sup>8</sup> When combining multiple surveys, we follow DHS and MICS recommendations for weighting observations across surveys (Congdon Fors et al., 2024; ICF International, 2012; McGavock & Novak, 2023).<sup>9</sup>

### 3.2 Disaster data for short-term analysis

To study the short-term impact of disasters on FGC tightness, we collect information on common types of disasters experienced by households of various SSA countries. In particular, we collect data on outbreaks of epidemics and natural disasters that occurred post-1993. The data are obtained from the Emergency Events Database (EM-DAT) available from the Centre for Research on the Epidemiology of Disasters (CRED).<sup>10</sup> The EM-DAT considers an event as a disaster if it meets one or more of the following criteria: (i) 10 or more persons killed; (ii) 100 or more persons affected; (iii) declaration of state of emergency; or (iv) appeals for international assistance. For each disastrous event, EM-DAT provides information on the beginning and ending dates of the disaster, damage incurred (i.e. people killed, injured, and rendered homeless, and estimated monetary damage) and the exact location where it occurred.

Epidemics outbreaks, which include bacterial, viral, parasitic, fungal, and prion diseases, are recorded in EM-DAT as separate entries for each affected country. The matched epidemic outbreaks comprise bacterial and viral diseases such as cholera, Lassa fever, and Ebola, which have affected many SSA countries over decades. In addition, the data includes non-epidemic natural disasters such as floods, storms, droughts, and earthquakes.<sup>11</sup> We use information on the exact date of each disaster to combine these data with household survey from DHS and MICS. To be included, the location of the disaster must be at the level of the administrative areas observed

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<sup>7</sup>For DHS, information on ethnic and religious identity is recorded for all respondents, while for MICS, only recorded for household heads.

<sup>8</sup>DHS data includes information on the subnational region of residence, which are typically large administrative units. Moreover, many DHS surveys include the geographic coordinates for each man’s and woman’s cluster of residence. To ensure anonymity of interviewees, the GPS coordinates include a random error of up to 1 km in urban areas and up to 5 km in rural areas. However, since exposure to disasters is defined at the region level, the random error in GPS coordinates does not confound our results.

<sup>9</sup>The raw survey weights provided in the survey are not appropriate when pooling multiple waves since the population of potential respondents changes across waves. To overcome this limitation, we adjust the survey weights. Specifically, we multiply the provided survey weights by the ratio of the population of men aged 15-59 (or population of women aged 15-49) in the country at the time of the survey over the number of men aged 15 to 59 (or women aged 15 to 49) interviewed. We use population figures from the United Nations of men aged 15 to 59 and women aged 15 to 49 to make our estimates representative of the countries and years included in our analysis.

<sup>10</sup>Since 1988, CRED has maintained the Emergency Events Database (EM-DAT), compile from UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies.

<sup>11</sup>See Cavallo, Galiani, Noy, and Pantano (2013), Felbermayr and Gröschl (2014), and Kirchberger (2017) for empirical evidence on how these shocks pose significant threats to country-level productivity, household labor and consumption, and how these changes can lead to cooperative or prosocial behavior (Buonanno, Plevani, & Puca, 2023; Winkler, 2021).

in the household data. Overall, we use information from 17 disastrous events between 2001 and 2020, for which DHS and MICS surveys were administered before or after each disaster. Out of our sample of these events, 5 were epidemic outbreaks experienced by respondents in our survey, 11 were floods and 1 was a storm. We successfully mapped regions from 14 out of our 20 sampled SSA. From these countries, we matched 78 out of 235 administrative regions. The full list of the disasters exploited in the analysis is displayed in Table B.1 of the Online Appendix. We also include a map showing the areas affected by the disasters examined (Figure B.1 of the Online Appendix).

### 3.3 Disaster data for long-term analysis

When examining how long lasting the impact is, we use, as in the short-term, exposure to epidemics and natural disasters, but that have occurred in SSA between 1930 and 2020. We rely on the same databases presented above, supplemented with additional data on floods and severe droughts from the Climate Research Unit (CRU) and earthquake hazard from the National Oceanic and Atmospheric Administration (NOAA).<sup>12</sup>

To define individuals' exposure to past disasters, we matched occurrences of these large shocks to the birth-year and country of residence in the DHS and MICS surveys.<sup>13</sup> This gives us information on disaster from 725,179 respondents across 20 countries. Endowed with this data, we compute the average of exposures to each type of shock during ages 1 to 19, where exposure corresponds to the number of events an individual is affected at each age. To obtain a single index, we normalize the different measures to a z-score and sum them up. We plot the averages of these measures by countries and birth-cohorts in the Online Appendix Figures C.1 - C.6. According to a vast literature, childhood and adolescence are critical periods for preferences, attitudes and beliefs formation (Malmendier & Nagel, 2011). Nevertheless, there is no universal agreement on which are the age cutoffs (Adhvaryu & Fenske, 2023; Winkler, 2021). We take an agnostic approach and use the age period 1-19 and then examine the heterogeneous effects for the different subperiods. We prefer this definition for three reasons. First, childhood socialization - either through the family or other sources including peers - can push exposed individuals to converge to the common beliefs of their social groups.<sup>14</sup> Second, FGC attitudes formed during a parent's cutting, based on rewards received for following the norm or the sanctions imposed for deviating, are likely to be transmitted to children: experiences in childhood and early adolescence,

<sup>12</sup>Online Appendix C.1 provides full information on the data and definitions. Droughts and earthquakes were not in the short-term analysis. For droughts, the lack of precise occurrence dates prevents accurate matching. In the case of earthquakes, no events took place during the survey interview periods.

<sup>13</sup>Some of the survey data we use do not allow us to identify exposure at a smaller administrative or sub-regional level, thus we rely on individuals' country of residence. This suggests that we may be revealing lower bounds of our true estimates, as we are averaging the effects of disasters on both individuals exposed to them in their communities and those who were not, but who live in the same country.

<sup>14</sup>Early direct socialization efforts, including choosing appropriate neighborhoods and attending ceremonies, exert influence on children's cultural belief formation (Bisin & Verdier, 2000). Moreover, early socialization experience - along with events before adulthood - shape attitudes later in life in political context (Giuliano & Spilimbergo, 2014; Sears & Valentino, 1997). As ages between one and nineteen are vital stages with high coresidence with older family members in many SSA countries (Alesina, Hohmann, Michalopoulos, & Papaioannou, 2021), it is plausible that beliefs about FGC may form significantly for children and adolescents. Additionally, as many girls and boys who receive compulsory education do so between 1 and 19, it may be crucial to form attitudes about FGC during school and while interacting with peers.

conveyed by parents, may be particularly formative and influence attitudes later in life (Malmendier & Nagel, 2011). Children may rely on parents for prior experiences that shape their responses (Achen, 2002) and look to them as role models (Wolbrecht & Campbell, 2007). Third, studies have highlighted brain activity processes involved in preferences and beliefs formation (Sachs & Hirsch, 2008). Core attitudes, beliefs and preferences start to develop in the early years of life when the brain is sensitive and responsive to the environment and experiences (Druckman & Lupia, 2000; Seitz & Angel, 2020). Psychologically, individuals exposed to traumatic events also experience distressing and depressing emotions. For children and adolescents, this struggle can prompt them to develop deeper intimate connections with group members (Adhvaryu & Fenske, 2023; Annan, Blattman, Mazurana, & Carlson, 2011; Bauer et al., 2016; Stain et al., 2011), leading them to adopt the prevailing FGC beliefs within the group. In the Online Appendix C, we show that our results are robust to slight variations in these cutoff.

### 3.4 Dates of FGC bans

Because the introduction of FGC bans may affect the revealing of true preferences about FGC norms, in the long-run we control for the existence of FGC bans at the time of the interview. We rely on the database on FGC bans presented in United Nations Population Fund (2019) and World Bank (2018)’s “compendium of international and national legal frameworks on FGC”. We augment these data with information on country-specific briefs entitled “The Law and FGC”.<sup>1516</sup> As of this writing, 19 out of our 20 sampled countries have a legal law against FGC.<sup>1718</sup>

## 4 The short-term impact of disasters on FGC tightness

This section presents the empirical strategy and the results of the analysis of the short-term effects of disasters on FGC tightness. Moreover, we examine the robustness of these results to alternative specifications and empirical methods.

### 4.1 Empirical strategy

To estimate the short-term effects of disaster exposure on the reported FGC tightness, we exploit variation in exposure to disasters by comparing individuals interviewed within a month from the disaster. We focused on EM-DAT disasters that occurred

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<sup>15</sup>These data have been used extensively in economics and particularly in the FGC literature (Engelsma, Mackie, & Merrell, 2020; McGavock & Novak, 2023; Poyker, 2023).

<sup>16</sup><https://www.28toomany.org/research-resources/>.

<sup>17</sup>Mali is the only country without a prohibition law on the practice. The most recent law occurred in Cameroon in 2017, followed by Sierra Leone in 2019. Information on these new prohibitions is taken from United States Department of Justice (2017) and Batha and Peyton (2019).

<sup>18</sup>These laws are in the form of specific anti-FGC laws or specific legal provisions in other domestic laws against FGC. They also vary in characteristics, with those (i) criminalizing performance of FGC; (ii) criminalizing arrangement, assistance, or procurement of FGC; (iii) criminalizing failure to report incidents of FGC; (iv) punishing participation of doctors in acts of FGC; and (v) punishing practice of cross-border FGC. In our analysis, we do not distinguish between different characteristics.

during the fieldwork of DHS and MICS surveys. Specifically, we estimate the following regression:

$$TFGC_{ir} = \alpha + \beta Post\ disaster_{ir} + \theta' X_{ir} + \delta_r + \nu_{ir} \quad (1)$$

where  $TFGC_{ir}$  is the measure of tightness of individual  $i$  who live in region  $r$ ,  $X_{ir}$  is a vector of socio-demographic controls, such as age, gender (male), educational attainment, marital status, household wealth, and rural/urban status.  $\delta_r$  is a vector of region fixed effects, and  $\nu_{ir}$  is the error term. The variable of primary interest is  $Post\ disaster_{ir}$ , which is equal to 1 if the individual was interviewed in the days after a disaster occurred in his/her region and 0 if he/she was interviewed before the same disaster. The effect of interest is yielded by the parameter  $\beta$ , which compares the outcomes of those interviewed before and after the disaster. Standard errors are clustered at the region-day of the interview level.

The validity of the empirical strategy presented above relies on three main identification conditions. First, that conditional on region of residence, rural/urban status, and the rest of the individual covariates, individuals interviewed before and after the disasters are comparable in terms of characteristics affecting the tightness of FGC. This would be plausible if the order of the survey is quasi-random conditional on the covariates described above. We assess this condition by comparing individuals interviewed before and after the disaster in terms of several characteristics arguably unaffected by the disaster (i.e. age, gender, education, marital status, etc.).<sup>19</sup> The results reported in Table 1 show that, conditional on the region, the differences between individuals interviewed before and after the disasters are small and statistically indistinguishable from 0 for the vast majority of the variables. The only exceptions are divorce, and poorest wealth status, which do not exceed the expected number of false positives. Taken together, these results suggest that the interview order is quasi-random, and is consistent with the hypothesis that individuals interviewed before and after the disaster are comparable in terms of both observable and unobservable characteristics. Individuals included in our analytical sample are around 30 years old, with 79% being women. Half of these survey participants have not received any formal education, 66% are married, and over 60% live in rural areas. Comprehensive descriptive statistics for the analytical sample used in this analysis are provided in Table B.2 of the Online Appendix.<sup>20</sup>

Second, disasters might induce selection in the individuals surveyed due to increased difficulties for enumerators or transitory or permanent out-migration following the disasters. While the results of the balancing checks, including balanced levels

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<sup>19</sup>As can be seen, unlike in Table B.2 of the Online Appendix, we include here migrant status. This variable is added because migration can influence the selection of individuals surveyed, particularly in response to shocks. The test we perform here in Table 1 is to ensure that individuals are also comparable in terms of their migration status. We further elaborate on this point a few lines below and revisit it in Section 6.3 for the long-run analysis.

<sup>20</sup>As shown in Table B.2, nearly all survey participants are affiliated with a religious group, and they are mostly Muslims. However, some of the surveys lack information on the religion of the respondent or household head, resulting in a high number of missing observations. For this reason, we do not include religion in the main analysis. Nevertheless, our findings remain robust when controlling for religion in a subset of the data. These results are available upon request.

of migration, suggest no differential selection into the survey following the disaster, we conduct an additional check. Specifically, we examine how the number of interviews varied following the disasters using the manipulation test developed in [Cattaneo, Jansson, and Ma \(2020\)](#). The results show no discrete change in the number of interviews following the disaster ( $p\text{-value} = 0.78634$ ). Additionally, we assess whether the number of missing answers increases or changes post-disaster, and the results do not suggest any such pattern (Table B.4 of the Online Appendix).

Finally, the validity of our identification strategy requires that the outcome variable does not change over time within the time period considered, except for changes caused by the disaster. To make this assumption more credible, the main analysis focuses on individuals interviewed within a maximum time window of one month from the disaster, although we examine the robustness to alternative time windows. Additionally, to further address this concern, we report in the Online Appendix B.2 the results of a regression discontinuity in time, which focuses on those interviewed just before and after the disaster.

**Table 1** Balance in individual characteristics

Covariate	N	Coefficient	Std. error	p-value
Age	26954	0.167	0.136	0.220
Male	26954	0.003	0.006	0.624
No education	26943	-0.011	0.009	0.248
Primary education	26943	0.006	0.007	0.384
Secondary education	26943	0.006	0.007	0.345
Higher education	26943	-0.002	0.004	0.705
Never married	26947	0.004	0.007	0.522
Married	26947	0.001	0.007	0.839
Widowed	26947	-0.000	0.002	0.839
Divorced	26947	-0.004	0.002	0.042
Separated	26947	-0.001	0.001	0.491
Urban	26954	-0.000	0.016	0.996
Non-migrant	26954	0.001	0.005	0.849
Religious group member	25726	0.002	0.002	0.293
Poorest (Quintile 1)	26954	-0.022	0.013	0.075
Poor (Quintile 2)	26954	0.005	0.010	0.642
Middle (Quintile 3)	26954	0.009	0.009	0.324
Rich (Quintile 4)	26954	0.017	0.011	0.111
Richest (Quintile 5)	26954	-0.009	0.010	0.366

Notes: This table presents coefficients for nineteen regressions of individual characteristics on *Post disaster* and region FE. The sample includes respondents interviewed in the 30 days before and after the disaster occurred in the region. *Post disaster* takes value 1 if the respondent was interviewed in the 30 days after the disaster. Robust standard errors in parentheses are clustered at region-day of interview level.

## 4.2 Results

Table 2 reports the estimates for the short-term impact of disaster exposure on the tightness of FGC norm for our sample of respondents within 30 days of the disaster.<sup>21</sup>

Panel A reports the estimates using only region fixed effects. They indicate that the disaster has a short-term positive impact on all the measures of tightness of FGC opinions. The coefficients remain virtually unaffected in Panels B and C, where we include baseline individual-level controls (gender, age, urban/rural residence), as well as other sets of important controls known to be correlated with FGC normative opinions and tightness (marital status, educational attainment, and wealth). In all panels, the coefficients of the variable *Post disaster* are statistically significant at conventional confidence levels for all four outcomes. Individuals interviewed after a disaster show 4-6 percent of a standard deviation increase in tightness compared to respondents from the same region interviewed just before. These findings support our research hypothesis that norms became tighter following adverse shocks. To contextualize these effect sizes, we compare them to the gap in average FGC tightness between Guinea and Senegal – countries where the norm is particularly tight and loose, respectively, based on our sample data. The estimated effects represent between 15.6% to 25% of this gap.

## 4.3 Robustness

This subsection reports the results of various robustness checks. First, we re-estimate the main results of the short-term analysis using an unrestricted time window. Fieldwork in most surveys is typically completed in 3-4 months, which means that in some surveys, the pre- or post-disaster period might have a maximum of 4 months. While the 30-days time window makes the identification conditions more reasonable, we examine here whether the results are robust to the use of longer time windows. The results reported in Figure B.2 of Online Appendix show consistent effects of disasters on the tightness of social norms when we use longer time windows up to 180 days, reassuring the main conclusions of the analysis, and suggesting that the effect become stronger several days after the disaster.

Second, we test the robustness of our results to alternative definitions of the reference group for tightness. In line with McGavock and Novak (2023), we use region-ethnicity-gender as the main reference group in the main analysis. Here, we reestimate the analysis using two alternative reference groups. First, we exclude gender from the dimensions used to define the reference group. The results remain consistent with those of the main specification and are reported in Table B.3 of the Online Appendix. Second, we expand the reference group definition by including location of residence

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<sup>21</sup>As can be observed, the number of observations varies between the tightness measures Q12, Q4, and Q2. The issue arises because, when calculating the index for each question, the modal opinion is first determined within a reference group (RG). If two modes occur, no modal value is assigned, preventing the indicator for that question from being set for that RG. While this happened in only a few cases, it explains the differences in the number of observations.

**Table 2** Short-term effects of the disaster

	<i>Tightness of FGC</i>			
	$Q_{12}$ (1)	$Q_{10}$ (2)	$Q_4$ (3)	$Q_2$ (4)
<i>Panel A</i>				
Post disaster	0.038* (0.020)	0.050** (0.021)	0.059*** (0.021)	0.060*** (0.021)
Region FE	Yes	Yes	Yes	Yes
Observations	26,925	26,925	26,906	26,894
$R^2$	0.129	0.124	0.096	0.087
<i>Panel B</i>				
Post disaster	0.037* (0.020)	0.049** (0.021)	0.059*** (0.021)	0.060*** (0.021)
Region FE	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes
Observations	26,925	26,925	26,906	26,894
$R^2$	0.131	0.126	0.098	0.089
<i>Panel C</i>				
Post disaster	0.036* (0.020)	0.048** (0.021)	0.057*** (0.021)	0.058*** (0.021)
Region FE	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes
Observations	26,925	26,925	26,906	26,894
$R^2$	0.136	0.131	0.102	0.091

Notes: This table reports estimated coefficients from an OLS regression. The sample includes respondents interviewed in the 30 days before and after a disaster occurred in the region. Robust standard errors in parentheses are clustered at region-day of the interview level. 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 through 4 is tightness of FGC, based on different definition. 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. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

(urban/rural), religion, education, and income dimensions.<sup>22</sup> The results of this analysis are reported in Figure B.3 of the Online Appendix. They show that the short-term

<sup>22</sup>These characteristics are arguably relevant for our disaster-induced-cooperation hypothesis. For example, while households in rural areas are very likely to be aware of the opinions of other households by the

effects are robust to the use of alternative reference population for identifying FGC as a social norm.

Finally, we test the robustness of the results to the use of regression discontinuity design (RDD). Using time as the running variable, we calculate the impact of the disaster by comparing those individuals interviewed just before and after the disaster. The main advantage of this approach is that it relaxes some of the assumptions regarding the absence of confounding events or the quasi-random nature of the order of the survey. On the other hand, it has two main disadvantages. First, the identified effect is local and the statistical power of the analysis is lower. Second, it relies on the correct identification of the polynomial capturing the relation between the running variable and the outcome of interest. This is less likely in settings with small bandwidths. A detailed description of the RDD analysis and its results is provided in Online Appendix B.2. The results of the RDD show consistent positive effects of disasters on the tightening of FGC norms, reassuring the conclusions of the main analysis.

#### 4.4 Heterogeneity

This subsection examines whether the short-term effects of disasters on the tightening of FGC norms vary across different dimensions.

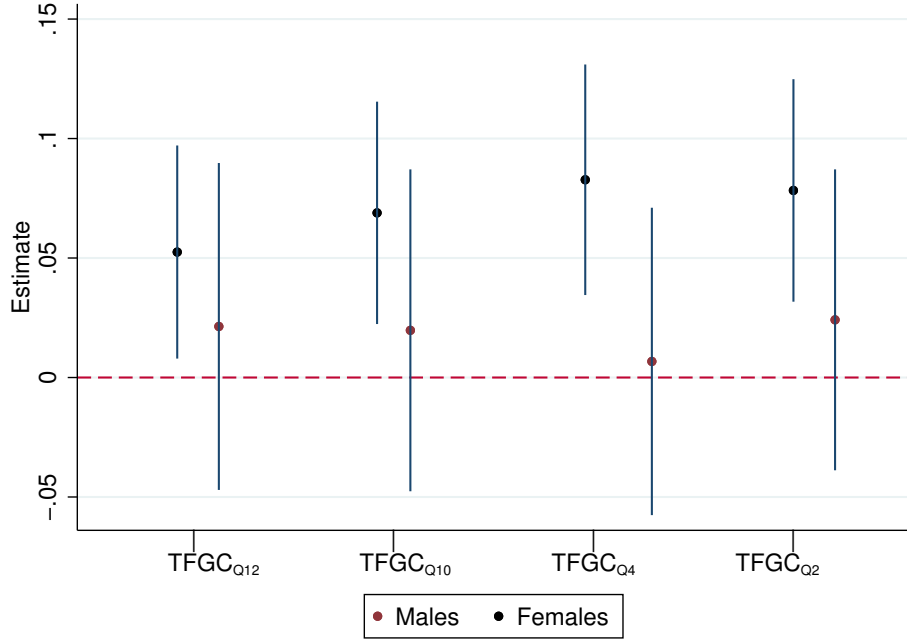
First, we explore the heterogeneous impacts of disasters arising from potential differences in prosocial behaviour across gender. In communities where FGC is practiced, support for FGC is typically higher among women, who are also the primary decision-makers regarding this practice (McGavock & Novak, 2023; Novak, 2020). In principle, we hypothesize women may perceive higher returns to social coordination in response to disasters if they believe that holding tightly to the norm would gain them reputation and honor within their group. Even more, women might internalized the group’s shared set of FGC attitudes and beliefs, as engaging in cooperative or prosocial behavior during disasters may lead to better outcomes for them. Moreover, various studies show that women are on average more likely to perceive themselves as prosocial (Andreoni & Vesterlund, 2001; Dyke & Murphy, 2006; Gardner & Gabriel, 2004; Lippa, 1998).

The results of the main analysis by gender are reported in Figure 1. They show that the overall effects are driven by women, while the effects for men are small and statistically insignificant.

Second, we explore the heterogeneity of the effects by urban or rural status. We hypothesize that individuals who live in rural areas might be more likely to hold tightly to FGC norms. Rural communities often exhibit higher levels of social cohesion and are typically more kinship-based, with less exposure to external cultural influences. In such settings, the returns to cooperation and conformity with community social norms are amplified, fostering stronger adherence to these norms (La Ferrara, 2003; Lowes, 2022). The results of this analysis are reported in Figure 2. They show that the likelihood of holding tightly to FGC norms following exposure to negative shocks increases in both rural and urban areas. However, as expected, the effects are more

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FGC and may face more difficulty escaping sanctions, this assumption is less likely to hold in urban areas. Further, since livelihoods in rural areas are more vulnerable, we might expect threats to the living standard to generate stronger social coordination than in urban areas.

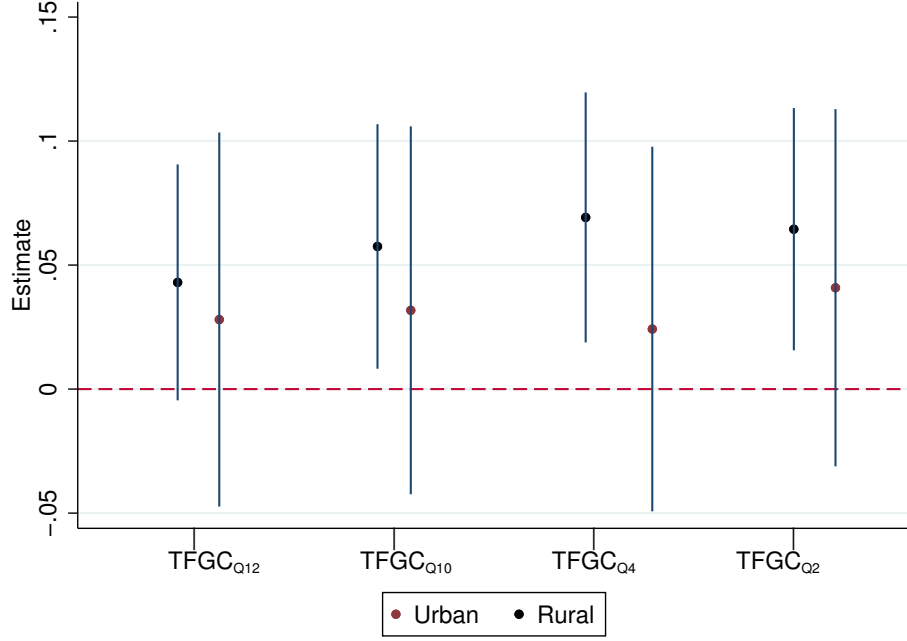


**Fig. 1** Short-term effects of the disaster by gender. OLS estimates - the sample includes individuals interviewed in the 30 days before and after a disaster in the region. The tightness of FGC are based on different constructions. TFGC<sub>Q12</sub> is computed using all 12 normative questions about FGC. TFGC<sub>Q10</sub> is computed using 10 questions; TFGC<sub>Q4</sub> 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<sub>Q2</sub> is constructed based on 2 questions - support for FGC and FGC required by religion. The measures are normalized to z-score.

precisely estimated for individuals in rural areas, where the majority of the individuals in our sample resides.

## 5 The long-run impact: Early lifetime disasters affect FGC tightness

Our previous section documented a robust positive short-term impact of disasters on the tightness of FGC norms and opinions. In this section, we examine whether this effect remains over time. Our approach is motivated by evidence showing that adverse circumstances during critical periods in early life often lead to permanent shifts in beliefs and attitudes (Eichengreen, Saka, & Aksoy, 2024; Etchegaray, Scherman, & Valenzuela, 2019; Giuliano & Spilimbergo, 2014; Krosnick & Alwin, 1989).



**Fig. 2** Short-term effects of the disaster by location. OLS estimates - the sample includes individuals interviewed in the 30 days before and after a disaster in the region. 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.

## 5.1 Empirical strategy

To examine the long-term effects of disasters on the tightness of the FGC norm, we assess the effect of exposure to past disasters during the ages of 1-19 on the tightness of the norm at the time of the survey. We focus on exposure to disasters during this age period because childhood and adolescence are crucial formative periods: early socialization experiences - along with economic conditions - and disaster-related psychological problems during these periods can lead exposed individuals to converge to the common FGC tightness attitudes of their reference groups (Adhvaryu & Fenske, 2023). Specifically, we estimate the following regression:

$$TFGC_{ibct} = \alpha + \beta aved_{ibct} + \phi legal\ ban_{bc} + \theta' X_{ibct} + \delta_{ct} + \gamma_b + \nu_{ibct} \quad (2)$$

where  $TFGC_{ibct}$  is the tightness of FGC norm reported by individual  $i$  born in cohort  $b$ , resident in country  $c$  and surveyed in year  $t$ . The variable of first interest is  $aved_{ibct}$ , which yields the average exposure to disasters during ages 1 to 19. Exposure is defined

as the number of events that affect the individual during this age period. We assign disaster exposure based on the country of residence and birth-year of each respondent.<sup>23</sup>  $legal\ ban_{bc}$  is a dummy variable that indicates whether respondent’s country of residence had a legal ban on FGC in the year s(he) was born;  $X_{ibct}$  is a vector of baseline control variables, including gender, age, age squared, and an indicator for whether she resides in an urban area at the time of survey. We do not include socioeconomic individual controls such as respondents’ marital status, educational attainment, or household wealth in the main specification because these variables might themselves be affected by disasters (Björkman-Nyqvist, 2013; Corno, Hildebrandt, & Voena, 2020; Jensen, 2000). Instead, we include both country-specific survey-year fixed effects ( $\delta_{ct}$ ) and birth-year fixed effects ( $\gamma_b$ ).  $\nu_{ibct}$  is the error term. Standard errors are clustered at the birth-cohort  $\times$  country level. In all our models, we normalize our outcomes of interest to a z-score. Finally, we use survey weights to ensure that our observations represent the national population.

The parameter of first interest is  $\beta$ , which yields the effect of exposure to one additional disaster between ages 1 to 19 in standard deviations of the outcome variable. A positive value would indicate that experiencing disasters early in life leads to more stringent adherence to the FGC norms prevalent in the reference group.

Following Giuliano and Spilimbergo (2014), Winkler (2021) and Adhvaryu and Fenske (2023), our estimates rely on variation within countries and across cohorts in exposure to disasters. The main identifying assumption is that within a cohort or country by survey-year, disasters are unexpected and orthogonal to potential confounders. We observe that the nature of the disasters considered - epidemics, floods, storms, droughts, and earthquakes - preclude the possibility that the timing of these shocks is endogenous to a given cohort within a specific country. Moreover, the inclusion of country-specific survey-year fixed effects accounts for country-level secular trends in the timing of disasters and absorbs country-specific determinants of FGC tightness such as institutions, deep history, or current economic conditions and allows those effects to vary by year. Finally, by conditioning on age and age squared, we remove life cycle impacts such as age-related increases in tightness of FGC.

Secondly, potential measurement error in reported FGC normative opinions and tightness could bias our estimates of interest. Such error, if any, takes the form of underreporting of attitudes among individuals interviewed after a legal law on FGC due to the fear of confessing a crime (García-Hombrados & Salgado, 2022). To address this concern, we follow previous literature and control for whether FGC is banned in the country (De Cao & Lutz, 2018; McGavock & Novak, 2023; Poyker, 2023).

## 5.2 Results

Table 3 summarizes the main findings of the analysis of the long-term effects of disasters on our measures of FGC tightness.

The estimated effects in all specifications are positive and statistically significant at 1%, suggesting that exposure to disasters has long-lasting effects on the tightness of

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<sup>23</sup>The analysis of long-term effects relies on a different set of DHS and MICS databases, some of them lacking information on the region of the individuals surveyed. To avoid a significant loss in the analytical sample data, we construct the measure of disaster exposure at the national for the long-term analysis.

**Table 3** Long-term effects of the disaster

	<i>Tightness of FGC</i>			
	$Q_{12}$ (1)	$Q_{10}$ (2)	$Q_4$ (3)	$Q_2$ (4)
Disasters	0.007** (0.003)	0.008*** (0.003)	0.009*** (0.003)	0.009*** (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	725,179	725,179	725,177	724,988
$R^2$	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 through 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.

FGC that persist for decades throughout people’s lives. The standardized coefficients are slightly smaller in quantitative size compared to short-term impacts, but present a fairly consistent picture. The point estimates range between 0.7 and 0.9 percent of a standard deviation, depending on the construction of the tightness measure.

### 5.3 Robustness checks

To address potential biases arising from disasters increasing migration out of communities by individuals who were less connected to them, we re-estimate the main results restricting the analysis to the sample of non-migrants. While we do not know where migrants spent their childhood and adolescence, approximately 50% report having always lived in the same place. The results of this analysis, reported in Table C.1 of the Online Appendix, are, if anything, larger than those estimated using the full sample.

Moreover, our results are robust to the inclusion of additional individual-level controls that are potentially endogenous. In our baseline reported in Table 3, we only control for gender, age and urban residence as these are clearly exogenous factors. Controlling for individual-level factors such as marriage, education and income may

be problematic as these variables may be a function of past and current exposure to disasters. Following [Bellemare et al. \(2015\)](#), we also test the robustness of our results to the inclusion of these variables in the specification, as they have been shown to be important determinants of the FGC practice. The results, reported in Table C.2 of the Online Appendix, show that our main estimates are unaffected.

We further assess the robustness of our results along several dimensions. First, we confirm that excluding individuals with imputed birth year data (2.4% of the sample) or missing ethnicity information (8.5%) does not materially alter our findings. In cases of missing birth year, we used self-reported age and survey year for imputation; for missing ethnicity, we grouped individuals with others of the same sex and region. Results, reported in Tables C.3 and C.4, remain virtually unchanged. Second, we test the sensitivity of our results to alternative age windows for disaster exposure – using age ranges 1-13, 1-15, and 1-17 – and find qualitatively similar patterns (Figure C.7 of the Online Appendix).

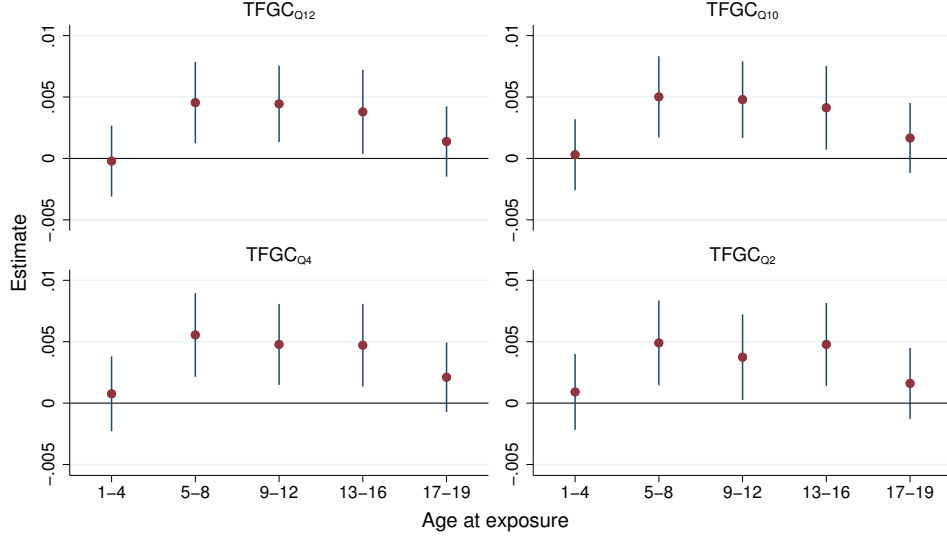
## 5.4 Heterogeneity

We then test whether the effects of disasters on the tightness of FGC vary depending on the age at exposure. Specifically, we construct disaster exposure categories based on age groups spanning four years: 1-4, 5-8, 9-12, 13-16, and 17-19. Because there is limited evidence in the literature on early-life conditions and later preferences regarding the most sensitive period for belief formation, we adopt an agnostic approach to uncover evidence about the most sensitive or critical periods. In Figure 3, we plot the coefficients and 95% confidence intervals of the effect of disasters on the tightening of FGC across the five distinct age subperiods of exposure.

The results show that exposure to disasters between the ages of 5 and 8 has the most significant and pronounced impact on the tightening of FGC norms. The effects then decrease over time and become statistically indistinguishable from zero for ages 17-19. These results challenge the “impressionable years” and “increasing persistence” hypotheses, at least in the case of attitudes toward a harmful norm ([Aksoy, Eichengreen, & Saka, 2020](#); [Archer & Kam, 2020](#); [Eichengreen et al., 2024](#)). These theories link belief formation to neurochemical and anatomical changes occurring in late adolescence ([Krosnick & Alwin, 1989](#); [Spear, 2000](#)).

Instead, socialization – particularly through parental and familial influence – emerges as a more convincing explanation for belief formation. Childhood socialization, whether through family or peers, shapes alignment with the beliefs of the dominant social group. Parental engagement in FGC, driven by rewards for adherence and sanctions for deviation, significantly influences attitudes ([Malmendier & Nagel, 2011](#)). Parents provide foundational priors that shape responses ([Achen, 2002](#)) and serve as enduring role models ([Wolbrecht & Campbell, 2007](#)), reinforcing their critical role in belief formation.

Consistent with this interpretation, Figure C.8 in the Online Appendix shows that the effect of disasters on FGC tightness is particularly strong in ethnic groups where FGC occurs during adolescence – typically as a rite of passage – when girls may be actively forming beliefs and attitudes. In such settings, their sense of group belonging,



**Fig. 3** Long-term effects of the disaster by age at exposure. OLS estimates, 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 main independent variables are exposure to epidemics and natural disasters (storms, floods, droughts and earthquakes) during ages shown beneath the figure. The coefficients are estimated from a single regression which includes fixed effects for country-of-residence  $\times$  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.

combined with exposure to adverse events, can shape their attitudes to converge with those of their social group.

## 6 Mechanisms

In this section, we propose and test different mechanisms that could be driving the increase in the tightness of FGC norms following natural disasters. An increase in the tightness of FGC norms does not necessarily imply an increase in the practice or support of FGC. In communities where the majority support FGC, tighter norms might lead to an increase in the support of the practice. Conversely, in communities with little support, tighter norms might reduce adherence to it.

First, negative economic shocks may increase economic reliance on the community, making mutual support and coordinated efforts within the community more valuable (Bauer et al., 2016; Voors et al., 2012). Thus, economic shocks could lead individuals

within the community to become more similar to one another in terms of their opinions and norms. In the case of tightness around FGC normative opinions, this would be particularly relevant in communities where FGC is practiced or not for social status reasons. To test this mechanism, we conduct two different empirical tests. First, we assess whether the effect of disasters on tightness is stronger among ethnic groups for which the main benefit of FGC is social belonging or acceptance. We compute, for each region and ethnic group, the share of respondents who consider social acceptance to be a benefit of practicing FGC. We then classify these region-ethnic group pairs into two categories: above median, indicating stronger social acceptance, and below median, reflecting weaker social acceptance. Figure 4 displays the results from estimating Eq.(1). As before, we estimate the impact of disasters on all different measures of FGC tightness. For ethnic groups that highlight social acceptance as the main benefit of FGC, we observe tighter FGC norms following exposure to disasters, as reflected in  $\text{TFGC}_{Q11}$  and  $\text{TFGC}_{Q9}$ .<sup>24</sup> However, results for  $\text{TFGC}_{Q3}$  are less consistent, suggesting a weaker relationship and caution in overgeneralizing the finding. Second, we examine whether the effect is greater in communities where, historically, the kinship intensity is higher. These are communities where economic relations with outsiders are scarce and reliance on the community is arguably higher (Bahrami-Rad, Beauchamp, Henrich, & Schulz, 2022; Enke, 2018; Haushofer et al., 2023; Takasaki, 2011). Therefore, returns to cooperation in the context of shocks are particularly crucial. To test this hypothesis, we merge our geolocated databases with the digitized version of ethnic boundaries taken from Murdock (1959).<sup>25</sup> We then calculate the Kinship Intensity Index presented in Schulz, Bahrami-Rad, Beauchamp, and Henrich (2019), using information from the *Ethnographic Atlas* on pre-industrial cultural and economic practices available at the ethnic-group level (Murdock, 1967).<sup>26</sup> The results, reported in Figure 5, confirm that the impact of disasters on FGC norm tightness is greater in areas with stronger kinship intensity. Across all outcome measures, the estimates are consistently positive and become significantly stronger several days after disasters, implying that kinship-based groups are significantly more likely to cling to their group’s norms after disaster exposure.

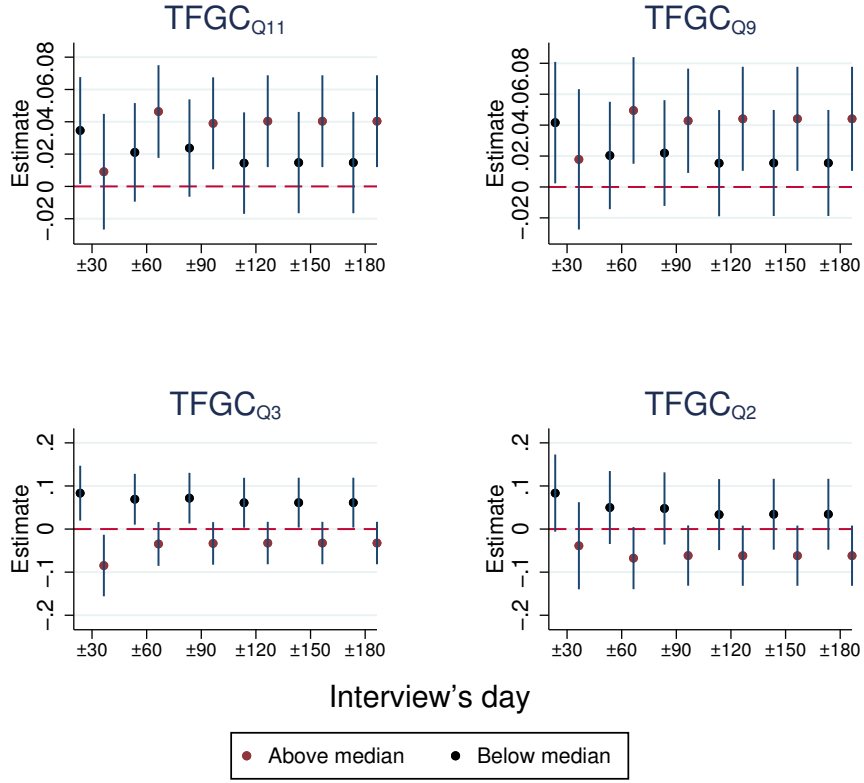
Second, by causing emotional and psychological distress due to their adverse effects on health and livelihoods, disasters may lead individuals to increase religiosity as a means of coping with these unpredictable and challenging situations (Dube, Blumenstock, & Callen, 2022; Sinding Bentzen, 2019). While FGC is not inherently tied to any specific religion, many communities falsely link this practice to religious requirements (Boyle, McMorris, & Gomez, 2002; Wagner, 2011). Thus, we hypothesize that disasters may strengthen individuals’ religious beliefs, eventually affecting the tightness of normative opinions about FGC. To test this hypothesis, we assess the effect of disasters on the tightness outcomes for ethnic groups that believe FGC is a religious

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<sup>24</sup>We refer to  $\text{TFGC}_{Q11}$  - rather than  $\text{TFGC}_{Q12}$  or the other indexes used in the previous section - because the indexes are computed excluding the normative question “Is social acceptance a benefit for FGC?”.

<sup>25</sup>Specifically, we use the methodology of previous studies (e.g., McGuirk and Nunn 2025; Michalopoulos and Papaioannou 2016) to match the locations in DHS and MICS to the Murdock Ethnic Homelands and Ethnographic Atlas. Of the 17 surveys used to estimate Eq.(1), 12 included the locations of the respondents.

<sup>26</sup>The Kinship Intensity Index is constructed based on five elements of kin-based institutions: (i) unilineal descent, (ii) polygyny, (iii) co-residence with extended family, (iv) community organization, and (v) cousin-marriage preference (Schulz et al., 2019). Following Schulz et al. (2019), we standardize each component and compute the index as the average of the five measures for each historical ethnic group.

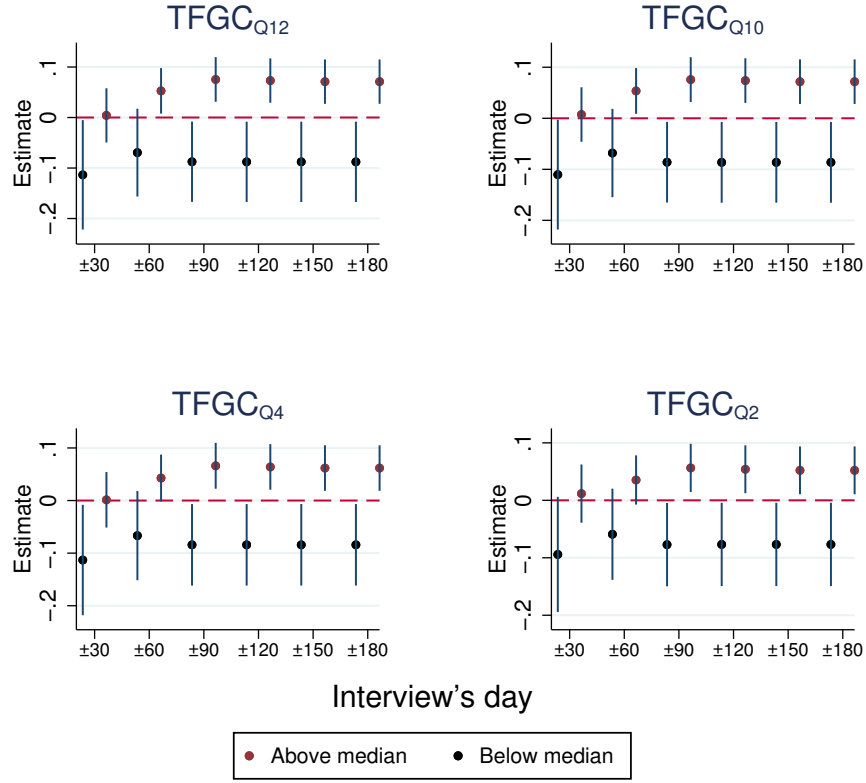


**Fig. 4** Strong social acceptance. Sample includes respondents interviewed in the  $x$  days before and after a disaster occurred in the region. To obtain a measure of strong social acceptance, we compute, for each region and ethnic group, the share of respondents who believe social acceptance a benefit for FGC practice. Above median denotes region  $x$  ethnic groups with strong social acceptance, and below median reflects region  $x$  ethnic groups with less social acceptance. The tightness of FGC measures are computed excluding the normative question “Is social acceptance a benefit for FGC?”. The measures are normalized to z-score.

requirement. We examine whether the effects of disasters differ for individuals in West Africa who report adhering to traditional religions.<sup>27</sup> Among many ethnic groups in the region, FGC is historically tied to ancestral religious practices. The results, presented in Figure 6, show that the coefficients are not statistically significant across any of the measures of FGC tightness. These findings offer little support for the religious coping hypothesis.

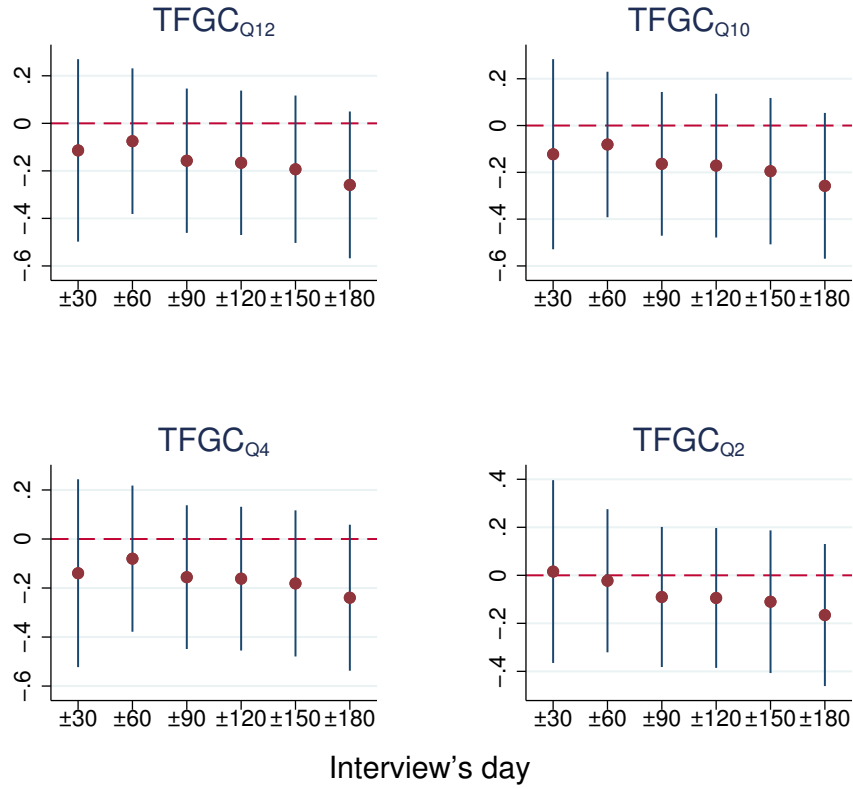
Third, natural disasters are typically followed by communal gatherings. Studies have found increased participation in collective activities, such as labor exchanges and

<sup>27</sup>The sample includes respondents from Burkina Faso, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria, and Senegal.



**Fig. 5** Strong kinship networks. Sample includes respondents interviewed in the  $x$  days before and after a disaster occurred in the region. 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. For all measures, reference group is defined based on a respondent's region  $\times$  gender  $\times$  historical ethnic group. To obtain respondents' historical ethnic groups, we combine GPS information with a digitized version of the map of ethnic boundaries taken from [Murdock \(1959\)](#). To measure respondents' kinship networks, we compute the kinship index presented in [Schulz et al. \(2019\)](#) using information from the Ethnographic Atlas ([Murdock, 1967](#)). Above median denotes historical ethnic homeland ethnic groups with strong kinship networks, and below median denotes groups with less kinship networks.

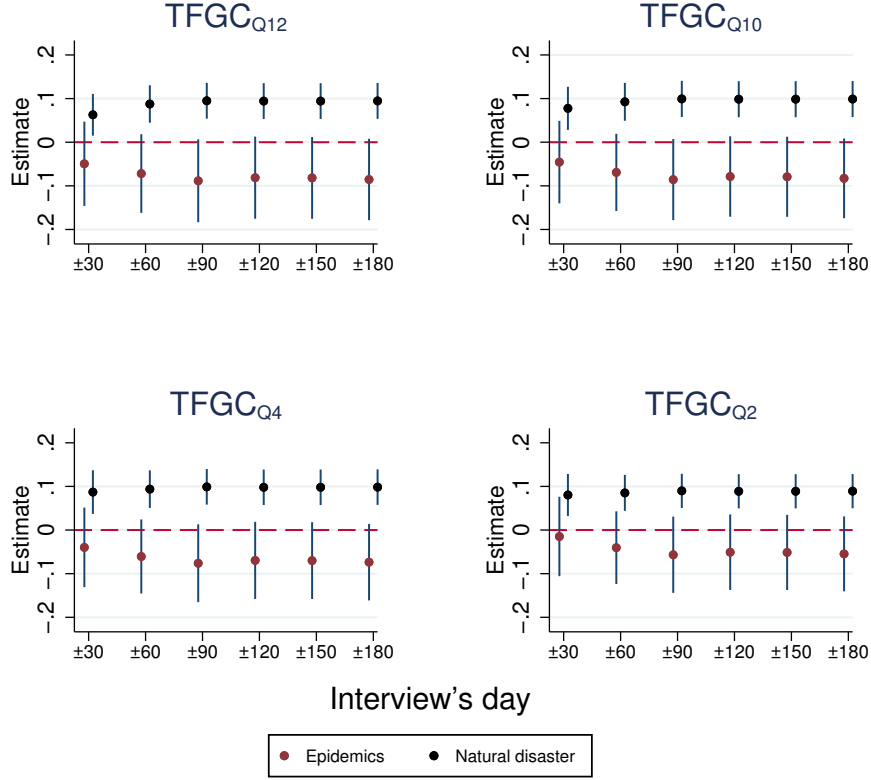
community road and facility maintenance, after disasters ([Keese, 2015](#); [Landmann & Vollan, 2024](#)), which serve as opportunities for socialization ([Baruzzi-Leicher, 1959](#)). Thus, the normative opinions about FGC may change simply as a result of more social interactions within the community. To test this mechanism, we examine whether the effect of disasters on the tightness of social norms differs between epidemics and other



**Fig. 6** West Africans practicing traditional religion. OLS estimates - Sample includes respondents in West Africa (i.e., Burkina Faso, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria and Senegal) who identify with the traditional religion and were 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<sub>Q12</sub> is computed using all 12 normative questions about FGC. TFGC<sub>Q10</sub> is computed using 10 questions; TFGC<sub>Q4</sub> 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<sub>Q2</sub> 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.

natural disasters. Since epidemics usually involve restrictions on social interactions, a larger effect of natural disasters compared to epidemics would support this hypothesis. The results of this heterogeneous analysis in the short-term are presented in Figure 7 and show that the effects on tightness are indeed driven by natural disasters. For this type of disaster, the estimates are consistently positive and statistically significant at 1% across all outcomes, showing that post-natural disaster respondents significantly

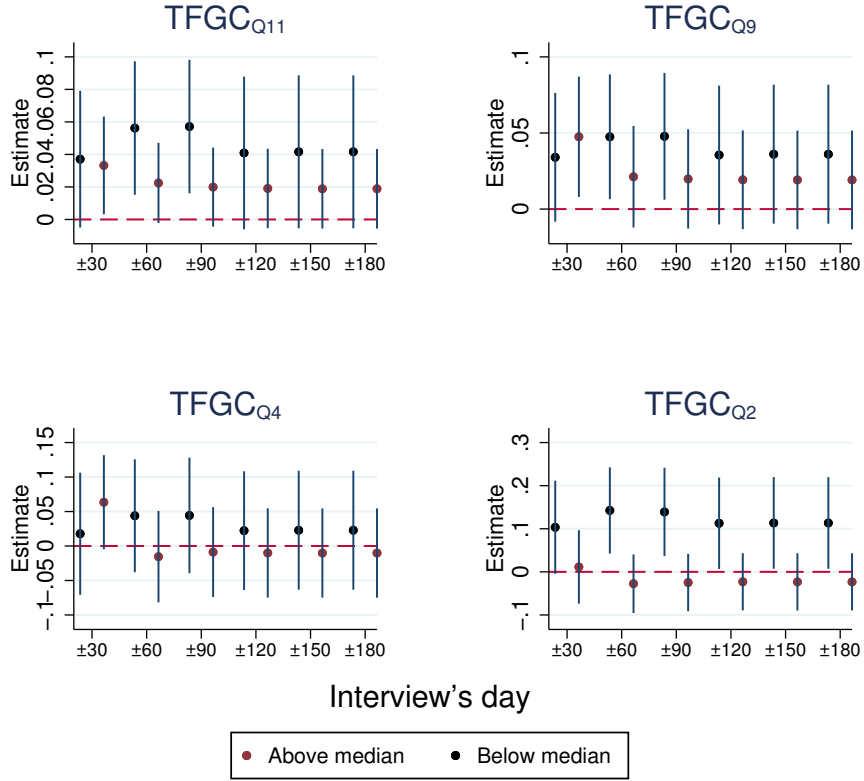
cling more to their group's FGC norm. On the other hand, we find no effects of epidemic outbreaks. The coefficients for this type of disaster are negative, although statistically indistinguishable from 0 at conventional confidence levels. These results are consistent with the hypothesis that social interactions following natural disasters play an important role in explaining the increased tightness of social norms.



**Fig. 7** Effect of the disaster by type of disaster. OLS estimates - the sample includes individuals interviewed in the  $x$  days before and after a disaster in the region. The tightness of FGC are based on different constructions. TFGC<sub>Q12</sub> is computed using all 12 normative questions about FGC. TFGC<sub>Q10</sub> is computed using 10 questions; TFGC<sub>Q4</sub> 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<sub>Q2</sub> is constructed based on 2 questions - support for FGC and FGC required by religion. The measures are normalized to z-score.

Finally, previous evidence has shown that disasters are followed by an increase in marriage as a coping strategy (Corno et al., 2020). Thus, one may argue that in communities where FGC improves marriage market outcomes, disasters may increase the prevalence of FGC. In line with this hypothesis, McGavock and Novak (2023) shows

that droughts increased the prevalence of FGC among ethnic groups that practice FGC during adolescence. While an increased tightness of FGC norms does not necessarily imply an increase in the prevalence of FGC, we test this hypothesis by examining the effect of disasters on the tightness of FGC norms for ethnicities that highlight improved marriage outcomes as an important benefit of FGC compared to those that do not. The results depicted in Figure 8 show that the effects are similar across both groups. If anything, they are stronger for respondents who assign less importance to this benefit. These results suggest that the impact of disasters on the tightness of FGC is not primarily driven by parents tightening their opinions about the practice to improve their daughters' marriage prospects in the context of economic hardship.



**Fig. 8** Better marriage prospects. OLS estimates - the sample includes individuals interviewed in the x days before and after a disaster occurred in the region. To obtain a measure of better marriage prospects, we compute, for each region and ethnic group, the share of respondents who believe better marriage prospects are a benefit for FGC practice. Above median denotes region x ethnic groups with strong marriage prospects, and below median reflects region x ethnic groups with less marriage prospects. The tightness of FGC measures are computed excluding the normative question "Is FGC required for marriage prospects?". The measures are normalized to z-score.

## 7 Conclusions

In this paper, we show how tightness to a harmful cultural tradition and norm - FGC - is affected by a particular adverse event: exposure to disasters. We take advantage of the fact that FGC is an interdependent action within one's reference ethnic group. This within-group interdependence becomes particularly important during economic downturns, as returns to social coordination may be higher, giving individuals a greater incentive to pursue cooperative behaviour. To the degree that cooperation generates positive externalities the behaviour of a family will be conditioned by the behaviour of other members within the group.

Using individual-level datasets conducted in a large sample of Sub-Saharan African countries that include FGC normative opinions of men and women, we conduct two sets of analyses. First, we study the short-term effects of disasters on the extent to which individuals' FGC normative opinions are similar relative to those of within-group members, which we adopt as our definition of FGC tightness. Second, we examine the long-term effects by exploring variations in individuals' past exposure to disasters across countries and birth cohorts, while controlling for country-, cohort- and life cycle-specific factors. We find that individuals who were exposed to disasters cling more tightly to their groups' FGC norms. This effect is particularly pronounced among women and individuals residing in rural areas. The impact is particularly strong when the disaster occurs during the transition from childhood to early adolescence. In general, our estimates are slightly larger (15.6%) than those previously estimated in the literature for non-harmful norms – such as trust, attitudes toward immigrants, taxes – typically around 13% (Winkler, 2021).

Our analysis of possible mechanisms suggests that key drivers of this effect may include increased payoff from cooperation and greater social interaction through communal gatherings within ethnic groups. Broadly, the results are consistent with the hypothesis that negative economic shocks increase the benefits of cooperative behavior, leading to a positive externality which gets internalized in the local group's shared set of culture (i.e., FGC norms). In contrast, we test and rule out alternative explanations for the observed convergence of individual FGC beliefs toward group norms, including increased religiosity and improved marriage prospects following economic shocks.

In all, our estimates shed light on three related issues. First, the results may help explain why some ethnic groups exhibit greater cultural homogeneity than others. When the FGC norm becomes tighter, that is, when there is less tolerance for deviation from the group norm, not necessarily an increase in the prevalence of the practice, it can constrain the range of acceptable attitudes and behaviors, thereby fostering cultural uniformity. Second, we document that individuals exposed to disasters become more rigid in their adherence to within-group FGC attitudes and less accepting of differing views, even over short time horizons. This tightening of norms is particularly important in contexts marked by rising polarization and inter-ethnic tensions, as it may exacerbate group boundaries and reduce willingness to engage with those who hold alternative views. Third, our findings offer a novel mechanism through which adverse events can foster greater within-group cooperation. By making adherence to

the FGC norm conditional on the behavior of other group members, individuals reinforce shared values and norms as a means of preserving group identity. In this context, FGC is not only a tradition, but also a tool to strengthen social cohesion under external threat.

**Supplementary information.** The online version contains supplementary material.

## Declarations

**Conflict of interest.** The authors have no competing interests to declare that are relevant to the content of this article.

**Author contribution.** All authors contributed to the manuscript

**Data availability.** All datasets used in the manuscript are publicly available

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