



"Gimme Shelter": The Role of  
Democracy and Institutional Quality  
in Disaster Preparedness

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# **“Gimme Shelter”: The Role of Democracy and Institutional Quality in Disaster Preparedness\***

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## **Abstract**

Natural disasters cause suffering for millions of people around the globe every year and as climate change unfolds the likelihood of natural catastrophes is increasing. While weather shocks, such as earthquakes, tornadoes, and floods are beyond our control, a governments' capacity to protect populations largely determines the degree of human suffering in disasters. Democracies, with freedom of speech, broad public participation and representation, are believed to protect their populations better than non-democratic regimes. However, democratic institutions are insufficient for securing protection from disasters in contexts of corruption, poor planning and public administration incompetence. We argue that the effect of democracy on the extent of human suffering in disasters is contingent on the ability of governments to implement their tasks or the quality of implementing institutions. We test this interaction hypothesis using time series cross-sectional data from the Varieties of Democracy project, the Quality of Government dataset and data from the Center for Research on the Epidemiology of Disasters. The results show that more democracy is associated with fewer people being affected by natural disasters only in settings where institutional quality is high. When institutional quality is low, more people seem to suffer in democracies than in authoritarian states.

## Introduction

Natural disasters affect millions of people around the world every year. While governments cannot prevent earthquakes or tornadoes from happening, it is in governments' power to adopt and implement policies that can reduce the devastating consequences from natural disasters for the people. Yet, the extent of human suffering differs substantially and systematically between countries, indicating a great variation in how well countries are prepared to protect the population when an adverse weather event strikes. The aim of this paper is to explore the sources of this variation.

Coping with natural disasters is one of the key functions of the state as a part of its task to provide security to its citizens. This involves extensive provision of public goods, such as early warning systems, shelters, roads, healthcare centers and other necessary infrastructure designed to ensure the safety of the population in an emergency situation. Two sets of political processes stand out as particularly important in determining the extent of public goods provision: processes shaping how people's demand for public policies is articulated, that is regime type, and processes shaping the supply of public goods, that is quality of public policy implementation. Democratic institutions, through which state leaders are held accountable to their constituents, are believed to create more incentives for leaders to deliver public goods and ensure security for the population than institutions in authoritarian regimes (Schmitter and Karl 1991; Acemoglu and Robinson 2005). There is a lot of variation, however, in how democracies perform. Just as with authoritarian states, they can also be dominated by special interests and distribute protection unequally; they can be inefficient and corrupt, which can hamper long-term policy undertakings, such as building up a country's readiness to cope with exogenous shocks (Bueno de Mesquita 2003; Diamond 2007). Therefore, governments' ability to implement vulnerability reduction policies and their *capacity* to deliver public goods and services to all entitled recipients is also crucial for developing disaster preparedness.

Both democracy, which helps bring people's demands for disaster prevention onto the political agenda, and state capacity, which is necessary to supply public goods and fulfill those demands, are widely acknowledged in the literature on disaster prevention as political sources of disasters (Wisner et al. 2004; Keefer et al. 2011; Kahn 2005; Lewis 2011). We move the previous arguments forward and stress that neither of the factors is sufficient for minimizing the count of people affected by natural disasters. We claim that the effects of democracy and the quality of implementing institutions on public goods provision – as demand and supply parts of the political system – are dependent on one another and interact in the production of vulnerability.

Preparation for emergency situations, such as natural disasters, requires dealing with the uncertainty of the future and long-term planning, which is only possible in those political systems where politicians are committed to serve the long-term interests of the people. Without facing the immediate consequences of their actions, short-sighted politicians have an incentive to underinvest in such long-term commitments as disaster prevention and undersupply public goods. The necessity of long-term planning and forward thinking makes disaster preparation a good test of how well the state works for its citizens.

We test our hypothesis on the interaction between democracy and institutional quality empirically on the global sample using data from the Center for Research on the Epidemiology of Disasters, the Variety of Democracy project and the Quality of Government dataset. The findings reveal that the effect of democracy on disaster outcomes is contingent on the institutional quality that shapes the implementation of public policy programs, while the level of equality in a democracy in turn moderates the effect of institutional quality on the number of people affected by disasters.

The paper proceeds as follows. The next section provides a brief overview of the existing theories on the political roots of vulnerability and introduces the study's theoretical model. After this, we introduce the data and method of the study. The results section describes the main findings of the paper, while the final section offers conclusions.

## **I. Theoretical background**

To avoid conceptual confusion, we, first and foremost, distinguish the concepts of natural hazards, natural disasters and vulnerability. When severe and extreme weather events, such as earthquakes, hurricanes, volcanic eruptions and droughts affect people's livelihood, they become natural disasters (WMO 2015). Outside of their relationship to humans, these hazardous events can be simply seen as nature merely taking its course (O'Keefe et al. 1976). Proneness to suffering the severe consequences of natural hazards depends on vulnerability, a set of conditions that influences people's capacity to "anticipate, cope with, resist and recover from the impact of a natural hazard" (Wisner et al. 2004, 11). The key to reducing vulnerability is preparation for hazardous weather events and disaster prevention rather than mitigation of the consequences of disasters. As the effects of adverse weather events unfold quickly, the most effective way to minimize damage is to be ready for them. Well-functioning early warning systems that can for example stop railways and plants, open emergency exits, and trigger alarms; the presence of roads with clearly marked routes that can facilitate and speed up evacuation, the

availability of shelters, and the prevalence of strong structures made of robust building materials can be lifesaving (Schulz 2015). While specific conditions, such as the number of storm shelters or the existence of regulations concerning the robustness of buildings, are specific outcomes of political decisions, the roots of vulnerability lie in the political and economic processes that shape governments' decisions to invest in disaster prevention and their ability to implement disaster prevention programs (Wisner et al. 2004; Brooks et al. 2005). In this paper we focus on these root causes of vulnerability, as these should be the primary targets in the process of vulnerability reduction.

## **Disaster prevention as a public good**

Ensuring public safety and security from natural disasters involves the provision of public goods, including the mapping of hazard areas, construction of preventive measures, such as dykes or levies, establishment and maintenance of early warning systems, reliable public infrastructure, evacuation roads, health centers and shelters (Raschky 2008, 630; Schulz 2015).

Pure public goods are non-excludable in consumption and are non-rivalrous (Ostrom and Ostrom 1977). However, access to public goods can be restricted to certain groups in polities with high levels of inequality or where favoritism is common. Healthcare centers, roads and shelters may be built in some regions but not in others; they may be available to some groups of citizens and not others. Information on the impending natural hazard can be made available only in those regions that have the infrastructure necessary for receiving such information.

Where a national government has its power base in a few cities, it may try to reinforce its support following a disaster by spending a good deal on improved housing in those cities, while such allocation of resources actually increases the vulnerability to hazards of the rural dwellers. Thus, locational decisions by the state bureaucracy redistribute vulnerability in society (Wisner and Luce 1993, 134).

## **Democracy and natural disasters**

Democratic institutions help the public articulate its demand for public goods, while elections in democracies provide citizens with the power to replace political leaders that do not fulfill their expectations, thereby creating incentives for political leaders to deliver. In order for political commitment aimed at disaster prevention to appear, people have to recognize disaster as a political scandal, and politicians who fail to adopt the necessary disaster preventive measures should face the possibility of lower popular support in the next elections, thus diminishing their

chances of getting reelected (De Waal 1997). Relying on larger groups for support than authoritarian leaders, democratically elected governments are also believed to provide more public goods and to larger populations than autocrats (Deacon 2009; Bueno de Mesquita 2003; Lake and Baum 2001).

An essential condition for the public to hold politicians accountable through elections is free and full access to information, which is an attribute of democracy, and which allows the public to assess the government's actions. Freedom of expression and association give civil society organizations the opportunity to mobilize and put pressure on leaders who fail to organize effective disaster prevention and planning or to unite in adaptation efforts to prevent potential disasters themselves (Congleton 2006; Aldrich and Crook 2008). Freedom of speech also ensures the existence of credible information, to which governments can respond, while necessary warning information can help individuals make more risk-aware decisions when a hazard event strikes (Raschky 2008). Amartya Sen (1990), who initiated influential research on the capacity of governments to prevent famines and other disasters, underscored the benefits of democratic regimes:

The diverse political freedoms that are available in a democratic state, including regular elections, free newspapers and freedom of speech, must be seen as the real force behind the elimination of famines. Here again, it appears that one set of freedoms – to criticize, publish and vote – are usually linked with other types of freedoms, such as the freedom to escape starvation and famine mortality

However, democracies, just like authoritarian regimes, can be rather unequal, with partisan politics in play. Parties may often tailor policies to reward their supporters, privileging certain groups in the distribution of amenities, while the size of constituencies determines whether these rewards favor inequalities or diminish them (Bueno de Mesquita 2003). Selective provision of public goods leaves certain groups of the population, divided by age, gender, class, religion or ethnicity, underprivileged and with limited access to power, structures and resources. Marginalization of groups increases social inequalities in the degree of exposure to disaster risk and makes vulnerability unequally distributed across society. Such unequal distribution can be reflected in the density of infrastructure available for populations, for example the number of shelters and emergency centers provided (Cutter et al. 2003; Wisner and Luce 1993). Equal civil liberties, such as freedom of association and expression and equal political participation and representation in decision-making bodies, increase the influence of different social groups over policymaking and policy implementation and therefore increase the likelihood that public goods



will be universally supplied (Isham et al. 1997; Lindberg et al. 2014, 160).

Numerous empirical findings have shown that democracy is indeed associated with lower numbers of people being affected by disasters. Kahn (2005) reports significantly higher death tolls in less democratic countries. Keefer et al. (2011), investigating how earthquake propensity results in different mortality rates arising from earthquakes in different regimes, find that democracies are on average better prepared for earthquakes than authoritarian states. Cohen and Werker (2008) conclude that the responsiveness of governments to populations and the absence of intrastate conflict are prerequisites for creating effective policies for disaster preparedness. Inequality and the absence of power sharing are also emphasized in numerous case studies as sources of vulnerability to natural hazards (Allen 2006; Mustafa 1998; Pelling 1998; Nakagawa and Shaw 2004; Trench et al. 2007).

In sum, previous research has suggested that democracy incorporates mechanisms that can increase disaster preparedness. However, as many cases show, democratic processes do not ensure effective disaster prevention (see e.g. Congleton 2006; Lewis 2008; Dyson and Elliott 2010). While democracy can be a powerful and robust tool in the creation of measures against natural disasters, “being robust is not the same thing as being effective or efficient” (Congleton 2006, 21). Free media, political participation and representation are important for accountability and broadening the outreach in protection, but they are not sufficient for actually delivering political promises to people in low institutional quality settings, i.e. where there is a prevalence of corruption, poor planning and incompetence of public administration.

## **Institutional quality and natural disasters**

The quality of public administration and institutions shaping implementation of public policies determines governments’ capacity to perform their tasks and supply public goods (Bäck and Hadenius 2008; Skocpol 1985). Bureaucratic or administrative capacity, prevalence of corruption and general obedience to laws, all affect the implementation of public policies, and therefore to a large extent determine the success or failure of implementation of disaster prevention programs (Skocpol 1985; Evans 1995).

Poor institutional quality may directly result in ineffective distribution of public funds and lack of protective measures (Athey and Stern 2000; Raschky 2008, 630). Inefficient administrations with low bureaucratic capacity create few incentives for bureaucrats to actually implement laws and governmental decisions, leading to incompetence, poor planning and error (Huber and McCarty 2004). Corrupt bureaucrats and politicians can appropriate public funds directed for public goods provision, which eventually results in poorly functioning infrastructure,

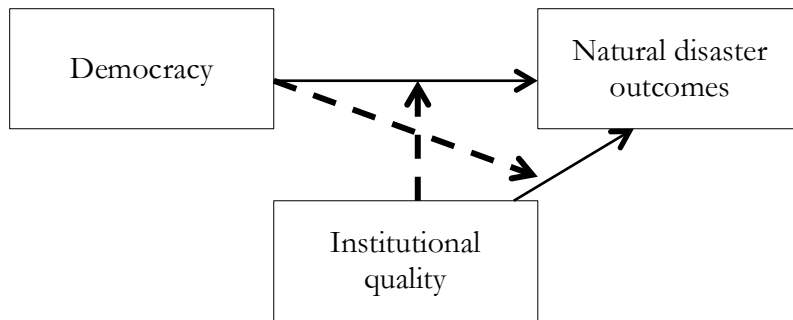
bad roads, lack of warning systems, and insufficient quality of shelter and healthcare support (Lewis 2011). Corruption can interfere in the enforcement of building codes in the construction of houses, creating opportunities for underinvestment into stronger and more durable materials (Kahn 2005; Lewis 2008).

Empirical research on the effect of political institutions on disaster prevention is dominated by case studies, while large-N generalizable analyses are scant. Raschky (2008) finds that higher government stability, which he uses as a proxy for governments' ability to remain in office and carry out its declared programs, and better investment climate, which is a measure for property rights, decrease human and economic damage from disaster. Findings by Kahn (2005) also suggest that higher rule of law, government effectiveness and control of corruption are associated with fewer human fatalities as a result of a disaster. Keefer et al. (2011) show that non-corrupt systems are better prepared to deal with the consequences of earthquakes than corrupt regimes.

## **Democracy, institutional quality and natural disasters**

Thus the literature on the political sources of disasters revolves around two main sets of political processes: those that shape how the demand for public goods and disaster prevention is articulated and those that shape the supply of public goods to the population, in particular, the implementation of disaster prevention programs. While democratic processes help bring the demands and preferences of the public onto the political agenda, quality of government, encompassing well-functioning bureaucracy and lack of corruption in the public sector, ensure the supply and delivery of public goods.

The theoretical and empirical literature on the political economy of disasters and disaster preparedness shows that both democracy and institutional quality are important in determining the vulnerability of countries to natural disasters. We move the previous arguments forward and claim that democracy and institutional quality, as two indispensable parts of a political system, cannot be considered separately when talking about the provision of public goods (Povitkina 2015). While the level of democracy shapes how decision-making is done in a polity and to some extent determines how broad the circle of interests represented in the government is, institutional quality determines whether the decisions actually get implemented and reach the public. Democracy and institutional quality can thus be considered complementary to each other in their effect on public goods provision. Previous studies have also hypothesized that state capacity can substitute for the lack of democracy and is particularly important for public goods provision in authoritarian regimes (Hanson 2015; Knutsen 2013).



**Figure 1. Democracy, institutional quality and natural disaster outcomes<sup>1</sup>**

## Illustrating interaction through case examples

Findings from numerous case studies exemplify the mechanisms through which the interactive relationship unfolds. A free media – which is an attribute of a democratic regime – paying strong attention to events both during and after the disaster, can emphasize public policy failures, stir severe public unrest and turn disaster into a political scandal, as happened during Hurricane Katrina in New Orleans in the U.S.A.<sup>2</sup> and a series of disasters in Turkey in the 1990s. In New Orleans, numerous press conferences, organized to hold politicians accountable, revealed a lack of communication between different levels of government and the absence of local preparedness for emergencies. In Turkey, media criticism of the “inefficient”, “incompetent” and “inexperienced” emergency planning of the government raised public awareness about poor disaster preparedness and helped increase efficiency of disaster response after the Bingol earthquake in 2003 (Mitchell and Page 2005, 27). The attention, however, came after the disaster occurred and the emergency response had failed, and only improved preparedness for future adverse events.

In an authoritarian state, media voices can be suppressed to avoid criticism of government actions during the disaster; criticism which could undermine regime legitimacy. Moreover, the media can be used to present government performance in a favorable light or blame exogenous shocks rather than poor planning. In the aftermath of the Sichuan earthquake in 2008, in which thousands of children lost their lives due to the unreliable construction of school buildings, the

<sup>1</sup> We acknowledge that institutional quality and democracy level are also related, which can be depicted by arrows between the respective boxes on Figure 1, and which would imply mediation. However, the relationship between the two is not the main focus of the study and we do not explore the mediation effect, instead focusing on the moderation effects of both.

<sup>2</sup> According to our data, the US is a democracy with high institutional quality, however, as the example of Hurricane Katrina illustrates, there can be a lot of variation in the extent of human suffering within countries as well. To explore subnational variation, however, is beyond the scope of this paper.

Chinese government was portrayed as “responsible, empathetic, effective, and oriented toward the public” (Landry and Stockmann 2009, 12). Reporting focused primarily on government rescue operations, presenting Chinese military and high-ranking officials as heroes, leaving poor planning and lack of enforcement of building codes hidden from public attention.

While in authoritarian states such as China, the government can engage in mitigation efforts to safeguard their legitimacy and cover poor planning, in cases like Haiti, the myopic behavior of corrupt leaders both led to disastrous consequences and prevented the effective response. When the country was hit by a powerful earthquake, disaster was difficult to avoid due to nonexistence of sound building codes and proper inspections, the absence of the necessary warnings and evacuation calls immediately after the earthquake, and the general lack of preparation for emergencies (Fierro and Perry 2010).

While democracy mechanisms, such as a free media that is able to criticize the government’s actions and an engaged civil society that can help people mobilization when hazardous weather events strike, undoubtedly help to lower the number of disaster victims, low quality of public administration diminishes the positive effect of these factors on disaster preparedness. Poor planning, incompetence and inefficient response, as in the case of Katrina, and severe corruption in the construction sector, which lead to unreliable building structures, as in the case of Turkey, counterbalance the positive effects that democratic processes can have on disaster preparedness.

As numerous case studies show, democracy is not sufficient for disaster prevention and can still result in many casualties. High institutional quality is not expected to be a sufficient condition either, as in authoritarian states, even if infrastructure is present, it can be available to only some groups within the society, leaving other groups marginalized with little or no access to public goods (Deacon 2009). In either case the state is not expected to have a high enough level of preparedness to protect populations, as both aspects are crucial for reducing vulnerability.

Following the discussion, our hypotheses to test are:

*H<sub>1</sub>: The effect of democracy on disaster outcomes is contingent on institutional quality.*

*H<sub>2</sub>: The effect of institutional quality on disaster outcomes is contingent on the level of democracy.*

## II. Method

To test our hypotheses and explore how the interplay between democracy levels and institutional quality affects the total number of people who suffer the consequences of natural disasters, we use the within-between estimation technique recently developed by Bell and Jones (2015) and based on earlier suggestions by Bartels (2008), Rabe-Hesketh et al. (2005) and Mundlak (1978). The within-between model recognizes the hierarchical structure of the data and simultaneously accounts for variation between the countries and developments over time within states. The model allows for the use of random effects by addressing the issue of correlated errors between the two levels of estimation (cross country and over time) through mean centering of time-varying variables and simultaneous inclusion of their country means. Following the Bell and Jones (2015) guidelines, we calculate deviations from the country means for each independent variable and use them instead of the raw values together with the country means. The model can be summarized in the following equation:

$$y_{it} = \beta_0 + \beta_1(x_{it} - \bar{x}_i) + \beta_2\bar{x}_{it} + \beta_3z_i + (u_i + e_{it}) \quad (1)$$

where  $i$  stands for country, and  $t$  – for year;  $\beta_0$  is an intercept,  $x$  is a vector of independent time-varying variables, while  $z$  is a vector of time-invariant variables;  $u$  is an error of the between equation, while  $e$  is an error in the within-equation.

## III. Data

In measuring our dependent variable, we rely on the data from the International Disaster Database, gathered by the Centre for Research on the Epidemiology of Disasters (Guha-Sapir et al. 2016). The database is compiled from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies. We use the information on the total number of people affected by natural disasters per year and weight it by the number of disasters registered within the countries for that year. This allows us to build a measure of the average number of people that get affected per disaster in each country. For an event to be coded as a natural disaster by EM-DAT, it has to meet at least one of the following criteria: 1) 10 or more people are reported killed, 2) 100 or more people are reported affected, 3) declaration of a state of emergency, 4) call for international assistance. People are treated by the database as “affected” if they required urgent help during the emergency period, for example, needed food, water, shelter, sanitation or medical assistance. The data are positively skewed as there are (fortunately) substantially more cases where fewer people suffered the consequences of

disasters than there are cases with extensive damage. To improve model fit and distribution of residuals we log-transform the variable.<sup>3</sup>

Our measure of institutional quality is an aggregated Quality of Government (QoG) Index taken from the International Country Risk Guide, which consists of three indicators: corruption, law and order and bureaucracy quality (ICRG 2014). The corruption indicator measures the prevalence of corruption within polities in different forms, including patronage, nepotism, job reservations, tit-for-tat exchanges, unofficial party funding and close connections between politics and business. The indicator on law and order measures the strength and capabilities of the legal system, as well as public obedience with the law. The measure of bureaucratic quality is a proxy for the capacity of a bureaucracy to perform its tasks independently from political influence, and also taps into the issues of meritocratic employment of bureaucrats. We use an aggregate index to measure institutional quality because we believe all composite parts matter in disaster preparedness and can disrupt the positive effect of democracy. The original index varies from 0 to 1, where higher values stand for higher institutional quality. We rescale the index to take values from 0 to 10 for easier interpretation.

We incorporate the discussion on detrimental effects of inequality for disaster outcomes in democracies into our hypothesis and measure democracy using the egalitarian democracy index, taken from the Varieties of Democracy project<sup>4</sup> (Coppedge et al. 2016b; Sigman and Lindberg 2015). First, the index accounts for the level of electoral democracy in a country, capturing freedom of association and expression, the extent to which elections in countries are free and fair, whether suffrage is universal and whether the executive is elected through popular elections or through popularly elected legislature. However, additionally to the minimal components of democracy, the index reflects the distribution of social benefits and power across different social groups, defined by class, sex, religion and ethnicity. It accounts for power distribution according to socioeconomic position, social group and gender within countries, equal access to education and health, share of budget allocated to public/common goods as opposed to particularistic distribution, the share of welfare programs that provide universal rather than means-tested benefits, respect for civil liberties across social classes, social groups and across the territory as well as the extent to which citizens have equal access to justice (Sigman and Lindberg 2015). Thus the egalitarian democracy index captures a “thick” rather than “thin” definition of

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<sup>3</sup> After reducing our sample to the years for which all data on the independent variables are available, our dependent variable did not contain any zero observations; therefore only cases when people did suffer the consequences of disasters are included.

<sup>4</sup> Varieties of Democracy is an international research collaboration with institutional homes at the Varieties of Democracy Institute at the University of Gothenburg and the Kellogg Institute for International Studies at the University of Notre Dame. The Principal Investigators are Michael Coppedge, John Gerring, Staffan I. Lindberg, and Svend-Erik Skaaning.

democracy and better reflects democratic processes as a demand-side of the political system. The index varies from 0 to 1, with higher values corresponding to higher levels of democracy and egalitarianism. We rescale the index to take values from 0 to 10.

By choosing egalitarian aspect of democracy as our main independent variable, we take into account inequalities within the society and can avoid using GINI coefficient and ethnic fractionalization, which are usually used as control variables. The Varieties of Democracy data have an advantage over other existing measures of democracy due to the transparent aggregation and data collection processes. The data coding involved 2500 country experts, who provided estimates of regime characteristics for each country-year (Pemstein et al. 2015).<sup>5</sup>

Our main control variables include gross domestic product (GDP) per capita, measured in constant 2005 US dollars (Heston et al. 2012), population size, taken from the Maddison project (Bolt and van Zanden 2013), population density, collected from the World Bank Development indicators (WB 2014) and number of disasters happening in a country per year. Richer countries are expected to have more resources to build the necessary infrastructure; in countries with larger populations, more people are expected to suffer the consequences from a disaster, while densely living populations are expected to be more vulnerable (Donner and Rodríguez 2008). We control for the number of disasters per year to account for the frequency of disasters occurring in a country. Countries that are constantly hit by disasters may not have enough time to recover and prepare before the next hazardous event. Another argument brought up and tested in the literature, however, is that countries that have higher disaster propensity will put more effort into preparing for a disaster and therefore will suffer less in general (Keefer et al. 2011; Neumayer et al. 2014). Including disaster occurrence also accounts for any effects that geography can have on the number of adverse weather events, and therefore in the between-part of the equation we do not add any more geographical control variables.<sup>6</sup> In the within-part of the equation we include the year fixed effects to control for the effect of the disasters that hit a number of countries simultaneously.

The models have successfully passed the standard regression diagnostics: residuals on both levels of analysis are normally distributed in the final models, no strong multicollinearity is

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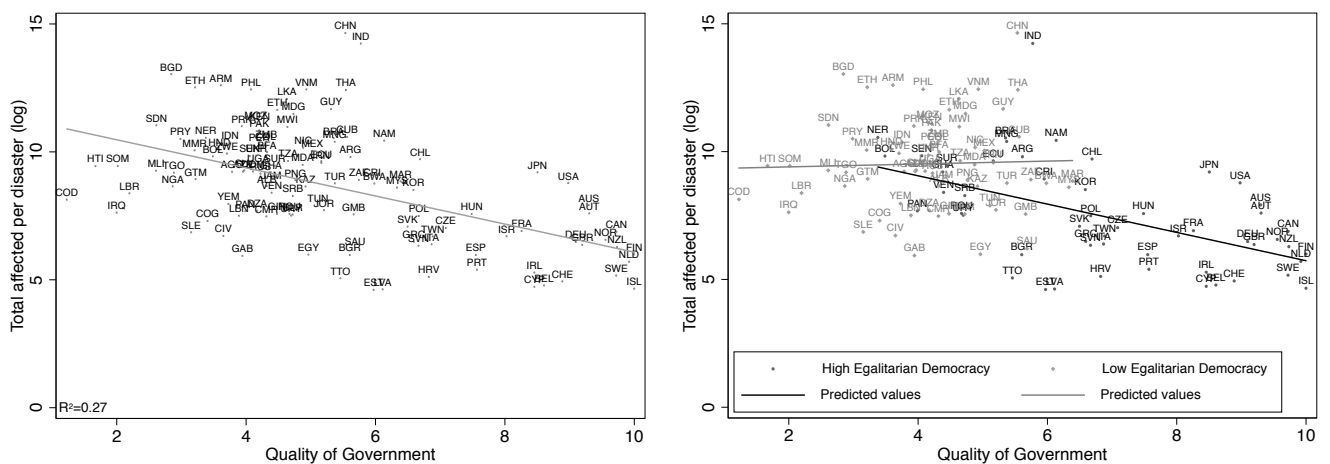
<sup>5</sup> The problem with the Varieties of Democracy data is that it is not available for many well-performing authoritarian cases, such as Singapore, Bahrain, Qatar and Kuwait, which are informative to include into the sample for comparison. We, nevertheless, perform robustness checks also using the Freedom House/Polity IV democracy indicator developed by Hadenius and Teorell (2005), which provides the estimates of democracy for these countries. No measures of egalitarianism, however, are available for those states; therefore we cannot compare models with and without these countries included.

<sup>6</sup> In the additional runs we checked for the effect of country's land area, country's geographical position using the measure of latitude, and additionally included a dummy variable for Small Island Developing States, a group of low-lying coastal countries that are recognized to be particularly vulnerable. However, after the inclusion of the disaster frequencies, their effects are insignificant and therefore we do not include them into the final model.

detected in the models without interaction effects and no extreme outliers seem to affect out results after we make all data transformations reported in the Data section. Summary statistics and correlation between all the variables are reported in Appendix A.

## IV. Results

The scatterplot on Figure 2<sup>7</sup> illustrates a bivariate relationship between institutional quality and the total number of people affected per disaster. The graph on the left shows simple linear prediction, which explains 27% of the variation in the dependent variable between the countries. In the graph on the right, we divided the sample of countries into those that score higher than the average<sup>8</sup> on the egalitarian democracy index and those that score lower, and plotted separate predicted lines for each of the groups. Institutional quality seems to be associated with lower number of people suffering the consequences of disasters only in countries scoring above the average on the Egalitarian democracy index (marked in black). In authoritarian states and democracies with undeveloped egalitarian values (marked grey), there does not seem to be a difference between countries with relatively higher and relatively lower institutional quality.



**Figure 2. Quality of Government and the number of people affected in disasters**

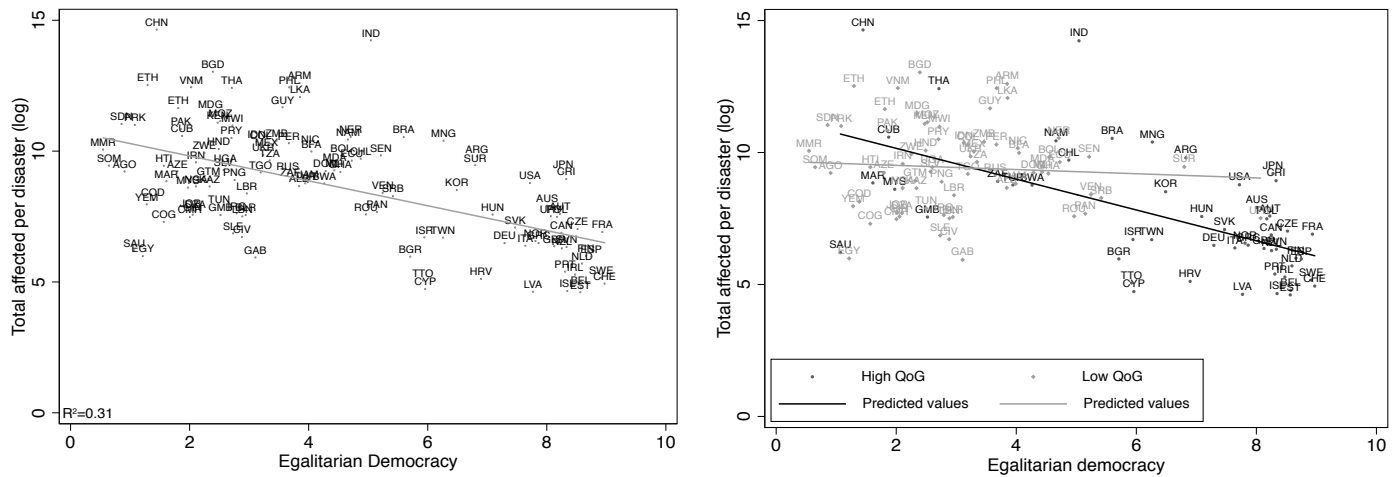
Similarly, Figure 3 presents a bivariate scatterplot between egalitarian democracy and the number of people affected per disaster. The graph on the left is a linear prediction and it explains 31% of the variation in the dependent variable between the countries, as indicated by the  $R^2$ . In the graph on the right, we divided the sample into countries that score above the

<sup>7</sup> Figure 2 is built on the average values of the variables across the time periods available per country.

<sup>8</sup> The average on Egalitarian Democracy in our sample is 4.5 on a 0-10 scale, which is about the level of Moldova.



average on the Quality of Government Index<sup>9</sup> (in black) and countries that have scores below the average (in grey). The pattern is similar to the one in Figure 2: higher democracy seems to be associated with lower number of people suffering the consequences of disasters only when institutional quality is high. When institutional quality is low, democracy does not seem to be associated with the number of disaster victims.



**Figure 3. Egalitarian Democracy and the number of people affected in disasters**

We proceed to explore these patterns further by formally testing the interactive relationship and adding the selected control variables to account for other factors that have shown to be important in predicting the amount of people getting affected by disasters in the previous research.

Table 1 presents the results of Equation (1).<sup>10</sup> The between and within-parts of the equation are separated into different sections within the table. Between-estimation is based on the analysis of the variance between the countries, while within-estimation uses the over-time variance within the states. Models 1 and 2 show that higher institutional quality and higher democracy are associated with fewer people suffering the consequences of natural disasters and the effects are rather large. Technically, moving one unit on the democracy scale is associated with a 56.5%<sup>11</sup> decrease in the number of people affected. Similarly, a one unit increase in institutional quality is associated with a 67.5%<sup>12</sup> decrease in the number of people affected.

<sup>9</sup> The average on Quality of Government in our sample is 5.35 on a 0-10 scale, which is the level of Turkey.

<sup>10</sup> We include both within- and between- part in the same table, despite the fact that the results in the within-part are insignificant, because they are a part of the same equation and cannot be separated.

<sup>11</sup>  $100(e^{0.448}-1)=100(1.5652-1)=56.5$

<sup>12</sup>  $100(e^{0.516}-1)=100(1.6753-1)=67.5$

**Table 1. The effect of egalitarian democracy and quality of government on the number of people affected per disaster**

	Model 1	Model 2	Model 3	Model 4
<b>Between-part</b>				
Egalitarian democracy	-0.448*** (0.061)		-0.135+ (0.080)	0.471** (0.157)
QoG		-0.516*** (0.069)	-0.008 (0.104)	0.578** (0.202)
Egal.Democracy*QoG				-0.106*** (0.027)
GDP per capita (log)			-0.721*** (0.154)	-0.751*** (0.143)
Population density (log)			-0.084 (0.098)	-0.089 (0.088)
Population size (log)			0.078 (0.110)	0.110 (0.104)
Frequency of disasters			1.554*** (0.301)	1.523*** (0.284)
<b>Within-part</b>				
Egalitarian democracy	0.051 (0.072)		0.045 (0.093)	0.045 (0.095)
QoG		0.095 (0.061)	0.069 (0.069)	0.043 (0.074)
Egal.Democracy*QoG				-0.063 (0.090)
GDP per capita (log)			-0.352 (0.252)	-0.355 (0.252)
Population density (log)			1.495 (1.183)	1.555 (1.184)
Population size (log)			-0.264 (1.108)	-0.297 (1.111)
Frequency of disasters			0.305** (0.110)	0.298** (0.109)
Constant	10.723*** (0.343)	11.485*** (0.414)	14.413*** (1.521)	11.554*** (1.659)
Observations	1,958	1,958	1,958	1,958
Number of countries	125	125	125	125
R <sup>2</sup> between	0.310	0.270	0.571	0.608
R <sup>2</sup> within	0.000	0.001	0.045	0.046
R <sup>2</sup> overall	0.107	0.076	0.286	0.314
Year FE	no	no	yes	yes

Robust standard errors in parentheses, \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. DV: Average number of people affected per disaster per country per year.

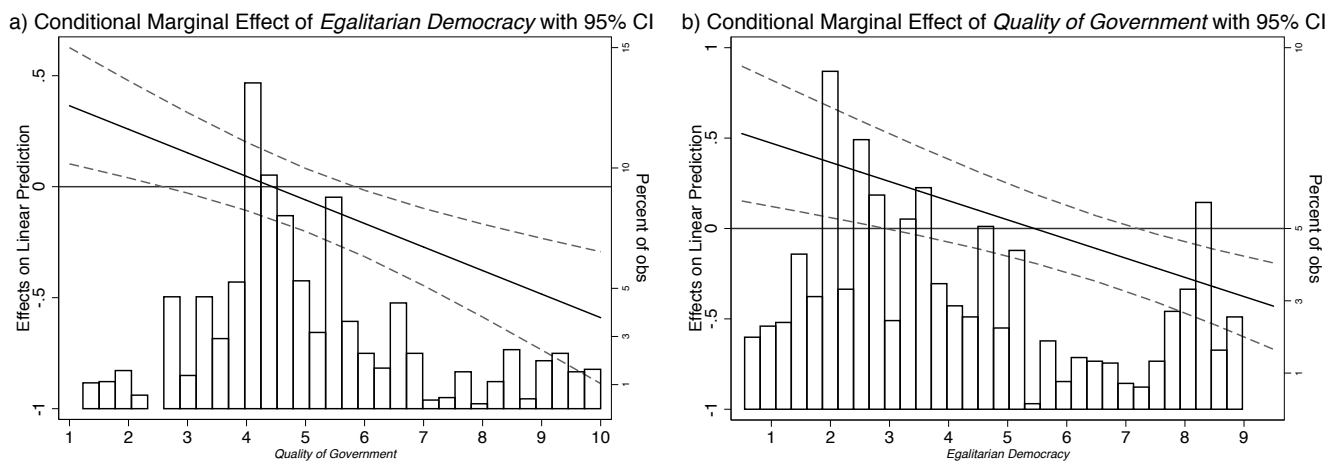
The significant interaction term in Model 4, however, implies that the effects of these two important aspects of political systems on disaster outcomes are not linear but dependent on one another. The interaction model explains around 4% more of the variance in the dependent variable between countries than does the model where the effects are assumed independent (Model 3), as shown by the change in the  $R^2$ . The negative sign of the interaction coefficient implies that the variables decrease each other's effect on the number of disaster victims when the effects are positive and increase each other's effect when the effects are negative.

The results are true for the between-country sample, while results from the within-estimation for the interaction effects are insignificant. This can stem from the fact that the variables are rather stable over time. Democracy and quality of government change rather slowly and therefore might not necessarily change over the time period of the study. Additionally, once infrastructure for disaster response is built, it can remain in place for years, even if political changes occur. In such a case the results will not reflect the relationship, which makes it difficult to analyze changes over time in our variables in the first place. The analysis of differences between countries around the world, however, is based upon historically accumulated experiences, which led to the current situation and can offer the basis for an informative comparison.

We proceed by examining the conditional marginal effects of democracy and quality of government on the number of people suffering the consequences of natural disasters in greater detail by analyzing marginal effects. As the results only seem to explain the relationship between the indicators across countries not developments over time within states, we only build graphs for the between-sample. Figure 4 depicts the interactive relationship between institutional quality and egalitarian democracy in their effects on total number of people affected by natural disasters (logged). In the graphs, the vertical axis on the left shows the magnitude of the marginal effect, while the vertical axis on the right is for the frequency distribution and indicates the distribution of cases in the sample for the variable on the horizontal axis.

Figure 4a shows that among countries with low institutional quality, scoring below 3 on a 0 to 10 scale of institutional quality, which is at the level of Bangladesh, in more democratic countries, results in a higher number of people affected by natural disasters than in less democratic states. The histogram on the graph shows that these countries comprise around 8% of our sample. However, when institutional quality reaches the level of 6 on the 0 to 10 scale, which is the level of Poland, democracies with higher egalitarian values seem to outperform less democratic regimes and democracies where egalitarianism is less developed. More egalitarian democracy is associated with fewer people suffering the consequences of disasters the higher the

level of institutional quality. The countries above the threshold of 6 on the Quality of Government index comprise 22% of the sample.



**Figure 4. Conditional marginal effects of egalitarian democracy (a) and quality of government (b) on the number of people suffering the consequences of natural disasters**

Figure 4b shows that among countries scoring more than 7 on a 0-10 egalitarian democracy scale (which is at the level of Hungary) and therefore having high levels of egalitarian democracy, countries with higher institutional quality have a lower number of people affected in natural disasters than democracies with lower institutional quality, and the effect is stronger in countries where egalitarian democracy values are more developed. The histogram overlaying the graph specifies that these cases comprise about 18% of the global sample. In countries that score below 3, which is the level of Thailand and Iraq (30% of all states) the effect of institutional quality on the number of people affected by disasters is surprisingly positive, implying that authoritarian states and highly unequal democracies that score higher on institutional quality witness more people being affected by hazardous weather events than in countries with lower institutional quality. The result implies that higher quality of government does not help to better protect populations against natural hazards, if a country is authoritarian and/or highly unequal.

As a general pattern, democracy and institutional quality are shown to exert complementary effects: at low levels of institutional quality, when more democracy is associated with more disaster victims, the increase in quality of government mitigates the negative effects of democracy<sup>13</sup>. When institutional quality is high and more democracy is associated with fewer

<sup>13</sup> When interpreting these effects, one has to keep in mind what “more democracy” means in the low institutional quality contexts. As the political system is corroded with corruption, lack of rule of law and poor-functioning public administration, more democracy is likely to mean a step towards elections rather than a step towards inclusiveness

disaster victims, a further increase in institutional quality intensifies this relationship, implying that countries with higher quality of government and higher levels of democracy significantly outperform democracies with lower institutional quality.

## **Robustness checks**

To check for the robustness of our results we performed our analysis using different dependent variables, weighting number of people affected per disaster by the population size and land area. To capture dynamic effects, we also tried including lagged dependent variables in the within-part of the equation and lagging each independent variable by one year. The results from the between-part remain robust, while results in the within-part remain insignificant. We also tried adding different geographical control variables, namely land area, latitude and SIDS dummy. Additionally, we used the Freedom House/Polity IV democracy indicator that does not account for inequalities as an independent variable and included different measures of inequality, such as subcomponents of the egalitarian democracy index (v2x\_egal from Coppedge et al. (2016a)) or GINI index as controls.<sup>14</sup> The results remain robust to all these specifications (see Appendix C). Conditional marginal effects plots, with the results from the robustness checks, are available upon request.

## **Discussion and conclusions**

The goal of this paper has been to investigate the interplay between democracy and quality of government for countries' ability to cope with natural disasters. The level of democracy and spread of egalitarian values determine equality in political representation and access to political power, and therefore, influence the size of the population entitled to receive public goods. At the same time, the state's capacity to implement policies and deliver the results defines how the decisions to distribute public goods are implemented and whether they are implemented at all.

The study compares how the countries around the globe respond to adverse weather events and how levels of political equality interact with institutional quality in preventing severe consequences from natural disasters for the people. The results support theoretical expectations

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or higher redistribution. The possible explanations to this result are provided further in the discussion section referring to the cases of Haiti and China.

<sup>14</sup> We are aware that lack of data for well performing authoritarian regimes on the variables measuring egalitarianism and the GINI index variable is a weakness in our models. However, as our theoretical argument, and thus our scientific contribution, is based on the importance of egalitarianism for disaster preparedness, we find it essential to model inequalities in our analysis.

that the effect of democracy on natural disaster outcomes depends on countries' ability to implement tasks and deliver public services. Higher quality of government is associated with substantively lower numbers of people affected by natural disasters only in those countries where egalitarian democracy is strongly developed. For example, people suffer less in democracies with high institutional quality such as Sweden, Iceland or the Netherlands than in democratic Slovenia, where institutional quality is lower. Among authoritarian regimes and highly unequal democracies, quality of government does not seem to help disaster preparedness.

The positive effect of democracy on disaster outcomes has similarly been shown to be dependent on a country's institutional quality. More democracy seems to favor disaster preparedness only when institutional quality is high, or as our model indicates, has reached a level on a par with that of Poland. Strikingly, among countries where institutional quality is low, i.e. lower than the level of Bangladesh, more democratic countries seem to suffer more from natural disasters than do less democratic states. This finding can be explained by the case study evidence from Haiti and China: in both cases, it is probable that poor planning and lack of sound building codes in construction is likely to cause widespread damage. However, in myopic democratic regimes with low quality of government, administrative inefficiency tends to prevail during emergency evacuations and results in higher numbers affected, while autocrats can try safeguarding their legitimacy by providing stronger emergency support.

The findings imply that only countries that experience both high quality of government and the egalitarian benefits of democracy have a significantly fewer number of people affected by natural disasters than the rest. Neither democracy nor high quality of government taken separately seems to be a sufficient condition for disaster preparedness among political sources of vulnerability. More democracy can be even more detrimental than less in contexts with pervasive corruption, incompetent and inefficient bureaucracies and the lack of rule of law. These findings, however, do not imply that democracy is unimportant, but rather that its positive effects should be seen as dependent on the capacity of public administration to implement their tasks and deliver efficient disaster prevention.

This paper contributes to the literature on the political economy of disasters and public goods provision and offers empirical evidence as to the interconnection between democracy, which shapes the decision-making processes and the degree of inclusiveness of the political system, and quality of government, which shapes implementation practices in the delivery of public goods and services, in disaster preparedness. Given that the number of natural disasters is likely to grow in the near future (Parry et al. 2007), understanding disasters as a political problem and recognizing institutional factors as political sources of vulnerability can help direct actions

aimed at reducing people's suffering in disasters more efficiently. Future research should explore the interactive mechanism of democracy and the quality of public administration in terms of its effect on disaster preparedness through case studies, establishing the causal links between these factors more firmly.

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## Appendix A

**Table A.1. Summary statistics of variables used in the analysis**

Variable	Obs	N of countries	Mean	Std. Dev.	Min	Max
Total affected per disaster	1,958	125	300516	1345243	0.25	28900000
Total affected per disaster (log)	1,958	125	9.23	3.01	-1.39	17.18
Disaster frequency	1,958	125	3.90	4.54	1	37
Disaster frequency (log)	1,958	125	0.97	0.82	0	3.61
Egalitarian Democracy (resc)	1,958	125	4.14	2.47	0.40	9.14
QoG Index (resc)	1,958	125	5.10	2.08	0.56	10
GDP per capita	1,958	125	8100.73	9705.41	143.38	55158.41
GDP per capita(log)	1,958	125	8.30	1.25	4.97	10.92
Pop.density	1,958	125	112.66	153.32	1.46	1178.50
Pop.density(log)	1,958	125	3.99	1.31	0.38	7.07
Population	1,958	125	70279.17	186595.40	7.36	1324353
Population(log)	1,958	125	9.99	1.44	2	14.10

**Table A.2. Correlation between variables used in the analysis**

	Total affected per disaster (log)	Dis.freq. (log)	Egal. Dem.	Dem. (F.H/Polity IV)	QoG Index	GDP /capita (log)	Pop. density (log)	Pop.(log)
Total affected per disaster (log)	1.00							
Disaster frequency (log)	0.29	1.00						
Egalitarian Democracy	-0.31	0.04	1.00					
Democracy(F.H/Polity IV)	-0.21	0.07	0.83	1.00				
QoG Index	-0.24	0.06	0.68	0.53	1.00			
GDP per capita(log)	-0.33	0.09	0.70	0.58	0.71	1.00		
Pop.density(log)	0.09	0.18	0.02	0.03	0.02	0.02	1.00	
Population(log)	0.29	0.63	-0.06	-0.09	0.08	0.08	0.31	1.00

## Appendix B. Countries included in the analysis

Albania	Greece	Pakistan (1971-)
Algeria	Guatemala	Panama
Angola	Guinea	Papua New Guinea
Azerbaijan	Guyana	Paraguay
Argentina	Haiti	Peru
Australia	Honduras	Philippines
Austria	Hungary	Poland
Bangladesh	Iceland	Portugal
Armenia	India	Romania
Belgium	Indonesia	Russia
Bolivia	Iran	Saudi Arabia
Botswana	Iraq	Senegal
Brazil	Ireland	Serbia
Bulgaria	Israel	Sierra Leone
Myanmar	Italy	Slovakia
Belarus	Cote d'Ivoire	Vietnam
Cameroon	Jamaica	Slovenia
Canada	Japan	Somalia
Sri Lanka	Kazakhstan	South Africa
Chile	Jordan	Zimbabwe
China	Kenya	Spain
Taiwan	Korea, North	Sudan (-2011)
Colombia	Korea, South	Suriname
Congo	Lebanon	Sweden
Congo, Democratic Republic	Latvia	Switzerland
Costa Rica	Liberia	Thailand
Croatia	Madagascar	Togo
Cuba	Malawi	Trinidad and Tobago
Cyprus (1975-)*	Malaysia (1966-)	Tunisia
Czech Republic	Mali	Turkey
Dominican Republic	Mexico	Uganda
Ecuador	Mongolia	Ukraine
El Salvador	Moldova	Egypt
Ethiopia (-1992)	Morocco	United Kingdom
Ethiopia (1993-)	Mozambique	Tanzania
Estonia	Namibia	United States
Finland	Netherlands	Burkina Faso
France (1963-)	New Zealand	Uruguay
Gabon	Nicaragua	Venezuela
Gambia	Niger	Yemen
Germany	Nigeria	Zambia
Ghana	Norway	

\*for the methodology on the divisions of country-years, see Teorell et al. (2016)

## Appendix C. Robustness checks

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<b>Between-part</b>						
Egalitarian democracy	0.486** (0.159)	0.471** (0.157)	0.413** (0.140)	0.492** (0.159)		
Democracy(FH/PolityIV)					0.547*** (0.142)	0.858** (0.307)
QoG	0.574** (0.212)	0.578** (0.202)	0.531** (0.172)	0.587** (0.198)	0.753** (0.246)	1.078* (0.500)
Egal.Democracy*QoG	-0.103*** (0.028)	-0.106*** (0.027)	-0.097*** (0.024)	-0.110*** (0.028)		
Democracy(FH/PolityIV)* QoG					-0.101*** (0.026)	-0.163** (0.055)
Egalitarianism (v2x_egal)					-0.135 (0.088)	
GINI-index						0.006 (0.020)
<b>Within-part</b>						
Egalitarian democracy	0.045 (0.095)	0.045 (0.095)	0.003 (0.080)	0.045 (0.095)		
Democracy(FH/PolityIV)					-0.040 (0.056)	-0.087 (0.089)
QoG	0.039 (0.074)	0.043 (0.074)	-0.049 (0.072)	0.043 (0.074)	0.053 (0.071)	0.088 (0.111)
Egal.Democracy*QoG	-0.062 (0.090)	-0.063 (0.090)	-0.104 (0.073)	-0.062 (0.090)		
Democracy(FH/PolityIV)* QoG					-0.043 (0.045)	-0.089 (0.097)
Egalitarianism (v2x_egal)					0.055 (0.094)	
GINI-index						-0.015 (0.026)
LDV			0.147*** (0.042)			
Constant	3.012 (2.016)	16.159*** (1.659)	9.664*** (1.597)	11.988*** (2.933)	10.889*** (1.732)	6.981* (2.999)
Observations	1,958	1,958	1,442	1,958	1,966	602
Number of countries	125	125	114	125	126	105
Year FE	yes	yes	yes	yes	yes	yes

Note: Robust clustered standard errors in parentheses, \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Model 1. DV: number of people affected per disaster per capita. Model 2. DV: number of people affected per disaster per sq.km. Model 3. DV: number of people affected per disaster. LDV included. Model 4. DV: number of people affected per disaster. Land area, a dummy for Small Island Developing States and a measure of country's latitude are added in the list of control variables. Model 5: DV: number of people affected per disaster. Freedom house/Polity is used as a measure of democracy instead of Egalitarian democracy index and egalitarian aspect included as control. Model 6: DV: number of people affected per disaster. Freedom house/Polity used as a measure of democracy instead of Egalitarian democracy index and GINI index included as control. Coefficients on the control variables GDP per capita, population size, population density and frequency of disasters per year are excluded from the table. Coefficients on Land area, SIDS dummy and latitude in Model 4 are excluded from the table.