VULNERABILITY OF SMALL ISLAND DEVELOPMENT STATES

Does good governance help?

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ABSTRACT

Small island states have in recent decades been identified as particularly vulnerable to natural disasters and climate change. Violent winds, floods, and draughts have had severe consequences for millions of people and currently present an increasingly significant challenge for development and poverty alleviation in small islands. However, although islands tend to have similar geographical features, natural hazards produce widely different outcomes in different island states, indicating great variation in resilience. While some islands seem to cope and adapt fairly well, others suffer tremendously. That is the impact of natural hazards of the same physical magnitude ranges from going more or less unnoticed or causing only small disturbances to resulting in severe catastrophes. The overall objective of this paper is to explore the suggested sources of this variation further. More specifically, with the point of departure in theories about how institutions and social contracts affect collective action and adaptive capacities, this paper sets out to investigate how political institutions such as democracy, corruption, and government effectiveness impact the overall resilience of island states. While claims over the importance of institutions are well abound in the literature, there is a serious lack of systematic empirical accounts testing the validity of such claims. This shortcoming is addressed by this study's quantitative, time series cross-sectional analysis using data from the International Disaster Risk database and the Quality of Government dataset.

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Introduction

Small island developing states (SIDS) are generally held to be particularly vulnerable to natural hazards and disturbing weather events. Development challenges associated with exposure to natural hazards – e.g., loss of lives, livelihoods and shelter – has even prompted the proclamation of 2014 as the year of SIDS. Due to their geographical location in hazard-prone regions, but also their relative isolation, limited physical size, and a concentration of population along coastal zones, policy makers and scholars argue that SIDS require special attention and support in adapting to increasingly severe weather events. However, despite a generally dismal outlook, similar natural hazards in fact produce widely different outcomes in different countries, indicating great variation in vulnerability. While some SIDS seem to cope and adapt fairly well, others suffer tremendously. That is, the impact of natural hazards of the same physical magnitude ranges from going more or less unnoticed or causing only small disturbances to resulting in severe catastrophes (Adger et al., 2005). The overall objective of this paper is to explore the sources of this variation further. This is done by critically reviewing existing literature on island states and vulnerability, and then testing if the claims put forward in this literature are empirically valid. While the empirical focus is on SIDS, the paper certainly has the potential to also shed light on issues of disaster risk reduction and adaptive capacity more generally.

The paper proceeds as follows. The next section provides a brief overview of extant claims about factors exacerbating or reducing the impacts from extreme weather events. The main drivers and buffers are then summarized and scrutinized empirically. Controlling for the physical magnitude of natural hazards, the empirical part investigates the association between the impacts of hazards (number of people killed or affected) and the factors held to increase or reduce the risk of such impacts. While the literature identifies a number of such factors, empirical tests are scarce.

Vulnerability and natural hazards

A natural hazard is normally defined as a potentially damaging physical event or weather phenomenon that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. For example, hazards often result in disease outbreaks, weather-related and geophysical events including floods, high winds, landslides, droughts or earthquakes, economic

volatility, or conflict-related shocks such as outbreaks of fighting or violence (DFID, 2011, UNISDR, 2012). The impact of natural hazards on human wellbeing has in recent years been unprecedented. Earthquakes, violent winds, floods, and droughts have had severe consequences for millions of people worldwide, presenting an increasingly significant challenge for development and poverty alleviation. For example, in 2010, natural hazards affected more than 200 million people, caused nearly 270.000 deaths, and resulted in 110 billion USD in damages. In 2011, the first famine of the 21st Century occurred as drought hit the Horn of Africa (DFID, 2011). Storms alone have in the last decade killed roughly 175.000 people and affected approximately 400 million (ADW, 2012). But how come hazards result in effects of so vastly differing scale in different countries? For example, while the earthquake on March 22nd 2011 in Christchurch, New Zealand, with a moment magnitude of 6.3, claimed the lives of 187 victims, an earthquake in Haiti at the beginning of 2010, with a strength of 7, led to 220.000 casualties. Similarly, when Hurricane Andrew, a powerful category 5 storm, struck Florida in 1992, 23 people lost their lives. An equivalent tropical typhoon in Bangladesh in 1991, on the other hand, resulted in over 100.000 deaths (Adger et al., 2005). How can we understand this?

In general, whether or not a hazard turns into a disaster, a "serious disruption of the functioning of a community or a society causing widespread human, material, economic, or environmental losses which exceed the ability of the affected community/society to cope using its own resources" is argued to depend on the vulnerability of a system or society (IISD, 2006). There are certainly plenty of definitions of vulnerability. In fact, already in 1981, Timmerman (1981) posited that "vulnerability is a term of such broad use as to be almost useless for careful description at the present, except as a rhetorical indicator of areas of greatest concern". Similarly, Liverman (1990) argued that vulnerability "has been related or equated to concepts such as resilience, marginality, susceptibility, adaptability, fragility, and risk", and Füssel (2007) adds "exposure, sensitivity, coping capacity, criticality, and robustness" to this list. Nevertheless, although turned into somewhat of a buzzword and being subjected to significant conceptual stretching, definitions tend to converge around a definition similar to the one put forward by IPCC: "The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity". In a similar vein, Wisner – a pioneering scholar within risk management – argues that vulnerability is "the characteristics of a person or

group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard" (Wisner, 2004).

While several definitions exist, there is hence a general consensus that natural hazards do not cause disasters by themselves. "It is the combination of an exposed, vulnerable, and ill-prepared population or community with a hazard event that results in a disaster" (Shaw et al., 2010, p. 2). Disaster vulnerability determines a society's ability and capacity to cope with disturbances and moderate the outcome to ensure benign or only small-scale negative consequences (Manyena, 2006). More than discussing various definitions of the term vulnerability, a lot of research has focused on assessing the factors determining levels of vulnerability. To start with, there has for quite some time been a clear move towards trying to take the 'naturalness' out of natural disasters. And while the research field still suffers from under-theorization and a lack of causal, much less predictive, factors, some causal claims and roots of vulnerability have been suggested (Roe and Schulman, 2012).

First, there is a large literature suggesting that vulnerability is determined by social and structural factors such as levels of inequality, marginalization, and social injustice. Schröter et al. (2005) illustrate this through the example of a famine, and argue that it is more informative to look at the social, economic, and political marginalization of individuals and groups as the causes of that famine rather than focusing on the physical stress of the system as the cause for famine, such as drought. This example in turn follows the work of Amartya Sen (1981, 1990), who initiated an influential research agenda on the capacity of different political systems to deliver freedom from famine and other disasters. According to this literature, a political contract model of disaster prevention involves a political commitment from the government, recognition of the disaster as a political scandal by the people, and lines of accountability from the government to the people that enable this commitment to be enforced. In addition, repression of freedoms of expressions and association is argued to prevent civil society organizations from mobilizing to protest against or prevent potential disasters. It is also argued that the reverse case is clear: human rights abuses are invariably an intimate part of disaster creation (De Waal, 1997).

According to Sen's original argument about famines: "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" (Sen, 1990). That is, democratic institutions are held to ensure that credible information exists and that governments respond to this information in a timely and effective manner. According to this logic, freedom of speech gives civil organizations a critical role calling to account those politicians and administrators who are failing to respond. In turn, elected representatives are expected to have a powerful incentive to respond: their positions depend upon popular support and a member of parliament who allows a famine or other disasters to occur in his or her constituency is likely to face serious difficulties in getting re-elected (De Waal, 1997).

Second, there is a lot of research on how environmental mismanagement and collective action failures severely worsen vulnerability. For example, research on ecosystem services shows that well-managed ecosystems act as strong buffers against harsh weather events. On the contrary, loss of biodiversity or environmental degradation increases the severity of natural hazards significantly. The reasons for why some societies or communities manage their ecosystems more sustainable than other in turn point to factors such as social capital and trust as crucial (Adger, 2003). Similarly, the common property research tradition shows that norms of trust and reciprocity can seriously reduce the risk of ending up in so called social dilemmas or tragedy of the commons situation (Ostrom, 1990, Agrawal, 2001).

Insights from this research tradition in turn lead us to the *third* category of potential explanations to variation in natural-hazard impact, i.e. governance and institutional and organizational features. This category in fact captures many of the claims accounted for above. The common property resource tradition for example emphasizes the importance of social, political, and economic organizations with institutions as mediating factors that govern the relationship between social systems and the ecosystems on which they depend (Dolésak and Ostrom, 2003). In addition, the research focusing on social marginalization and injustice clearly highlight the importance of governance and functioning political institutions. In the growing adaptive capacity literature, there is hence an emerging consensus about the integral role that institutions, governance, and management play in determining a system's ability to adapt to climate change and severe weather events (Yohe and Tol, 2002, Ivey et al., 2004, Brooks et al., 2005, Haddad, 2005, Engle and Lemos, 2010, Agrawal, 2008, Brown et al., 2010, Eakin and Lemos, 2006, Gupta et al., 2010). As Lebel et al. (2010, p. 132) put it, "reality is often much more political than the technical descriptions of disaster". Characteristics of the political system are hence said to reduce vulnerability, and thus directly affect the number of people

killed and affected by natural hazards (Adger et al., 2005). Micro-mechanisms such as individuals' decisions to engage in long-term investment in housing and infrastructure as well as taking stewardship of ecosystem's buffering capacities, and their ability for voice and participation are, for example, held to depend on political order and institutional organization.

Taking our point of departure in this institutional argument, we aim to test the role of institutions on vulnerability. Previous attempts to empirically investigate the influence of political institutions on vulnerability are scant. Kahn (2005) finds that in countries with lower income inequality, higher levels of democracy and good institutions, including high regulatory quality, voice and accountability, rule of law and better control of corruption fewer people die as a result of natural and industrial disasters. Similarly, Raschky (2008) shows that government stability and higher investment climate result in lower human and economic losses.

Our hypothesis to test is:

H1. Higher institutional quality leads to fewer casualties as a result of natural disasters.

The next section spells out the empirical strategy for investigating how institutional features affect vulnerability.

Data and method

In order to test the validity of the claims put forward in the existing literature, this study aims to look closer at the association between the impact of natural hazards and factors held to act as a buffer and moderate the effects. That is, the empirical analysis sets out to investigate whether or not islands experiencing milder impacts are relatively well equipped in terms of the factors held to reduce vulnerability? The choice of small developing island states is motivated by the fact that they constitute a hard test of the explanatory power of previous claims. Many SIDS face special disadvantages associated with small size, insularity, remoteness, and proneness to natural disasters. In some instances natural disasters threaten the very survival of some small islands. Investigating variation in impact within this natural-hazard prone group of countries hence gives us the leverage to test the strength of the generic claims about adaptive capacity and vulnerability.

We keep the test simple and focus on establishing whether there is any association between the proposed explanatory factors and outcomes in terms of number of people killed or affected by natural hazards. In short, we will aim to find the evidence of whether countries with stronger institutions and more robust governance systems have fewer people killed or affected by adverse weather events?

Of course, the validity of the results depends on how we measure and operationalize our concepts of interest. As regards the dependent variables – number of people killed or affected by natural hazards – we rely on the data from International Disaster Database, gathered by Centre for Research on the Epidemiology of Disasters. The database is compiled from various sources, including the UN agencies, non-governmental organisations, insurance companies, research institutes and press agencies (EM-DAT, 2014).

Since the study is explorative, we test our hypothesis on all indicators available in the database: number of people killed, injured, affected[1] and remained homeless after the disaster, as well as total number of people affected, which is a sum of all people injured, homeless and affected. We also perform tests for the number of disasters overall, and a total damage from them, measured in thousands US dollars. All dependent variables are log-transformed in order to improve distribution of the residuals.

The explanatory variables include government effectiveness, developed by the World Bank[2], the level of democracy which is a combined score of measures by Freedom House and Polity IV, suggested by Hadenius and Teorell (2005), GDP per capita and population, both taken from Penn World Trade statistics (Heston et al., 2012), geographical position of a country from La Porta et al.

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[1] People coded as "affected", if they required urgent help during the emergency period, for example, needed food, water, shelter, sanitation or medical assistance EM-DAT (2014) *The OFDA/CRED Internatioanl Disaster Database*: Université Catholique de Louvain, Brussels (Belgium). Available at: www.emdat.be (Accessed: 14 April 2014).
[2] We also tested the results with the alternative measures of intuitional quality – International Country Risk Group indicator of Quality of Government ICRG (2014) *A Business Guide to Political Risk for International Decisions* New York: The PRS Group. International Country Risk Guide. and World Bank's Control of Corruption WB (2014) 'World Development Indicators, the World Bank' (Accessed: 26 March 2014).. However, the coverage of SIDS countries by ICRG data is rather narrow (the data are only available for 11 countries), which makes regression analysis problematic, while the Control of Corruption produced few significant results in the multivariate models. This can be explained by the fact that the measure of corruption is too narrow for making inferences about the capacity of government to reduce vulnerability.

(1999)[3], amount of development aid received, taken from World Bank Development Indicators (WB, 2014) and a time trend.

The main independent variable, government effectiveness, captures "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies." (Kaufmann et al., 1999). Therefore, apart from bureaucratic quality and effectiveness of public administration the indicator includes outcomes of government actions, such as provision of public goods. The measure of government effectiveness is often criticized for being too broad and including outcome variables into the composed indicator. However, in our case its use is appropriate, since it includes all the composites necessary to evaluate governments' readiness to cope with natural disasters, protect its populations and provide public goods that decrease vulnerability, such as, e.g. infrastructure.

Democracy indicator controls for freedom of expression, strength of civil society and human rights, while GDP per capita captures economic abilities of the state to invest into the necessary infrastructure, which can decrease vulnerability. Population size is expected to positively correlate with vulnerability, while the measure of a country's geographical position accounts for the proneness to certain weather conditions as well as helps to control for the unobserved unit heterogeneity.

We use data available across countries and over time in order to increase sample size and obtain more precise estimates[4]. By employing time series cross-section analysis we have to deal with a number of problems inherent to panel data. Since we perform our analysis exclusively for the sample of vulnerable countries, adverse weather events happen more or less independently from previous occurrences and therefore, we expect little serial correlation within the data. Indeed, Langrage multiplier tests confirmed that autocorrelation is not a problem in most of our models, except for the models where numbers of people injured and killed are treated as dependent variables. This indicates that the values of these variables are not independent from the values in previous disaster-years. In the models where autocorrelation is not a problem and there is no need to include lagged dependent variable, which complicates interpretation of the results, we can make use of the pooled

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[3] We also considered including other control variables into the model, namely inequality and levels of social trust. However, there are not enough observations on SIDS in the available data sources for these variables to produce any meaningful results.
[4] Comparing to cross-section analysis

OLS approach with panel corrected standard errors suggested by Beck and Katz (1995). This methodological technique uses all variation in the data for the analysis.

The equation to be estimated is:

$$lnY_{it} = \alpha + \beta_j X_{jit} + e_{it} \qquad (1)$$

where i denotes country, t – year, j – number of independent variables, lnY_{it} is a natural logarithm of the dependent variable, α is an intercept, X_{it} stands for the vector of independent variables and e is an error term.

In the models for the number of people injured and killed as dependent variables, we perform Prais-Winsten regressions with panel corrected standard errors, which corrects for first-order auto-correlation in the data. All models successfully passed through standard regression diagnostic.

Results and Discussion

First, we run bivariate regressions between government effectiveness and various natural disaster outcomes. The results are presented in Table 1 and show that government effectiveness is significantly and negatively correlated with total number of people affected by the disasters (Model 1), number of adverse events classified as natural disasters (Model 2), number of people affected by the disasters (Model 5) and number of people remained homeless (Model 6). The results indicate that countries with more effective governments have lower number of people affected by disasters, lower number of people remained homeless and even lower number of adverse events classified as natural disasters.

TABLE 1, THE EFFECT OF GOVERNMENT EFFECTIVENESS ON DISASTER OUTCOMES[5]

VARIABLES	(1) Total affected (log)	(2) Number of disasters (log)	(3) Number of Killed (log)	(4) Number of Injured (log)	(5) Number of Affected (log)	(6) Number of Homeless (log)	(7) Damage in USD (log)
Government Effectiveness	-0.507***	-0.301***	-0.086	-0.042	-0.493***	-0.142***	0.225
	(0.149)	(0.037)	(0.065)	(0.094)	(0.154)	(0.044)	(0.169)
Constant	1.709***	0.384***	0.040*	0.031	1.635***	0.189***	1.359***
	(0.113)	(0.027)	(0.021)	(0.031)	(0.113)	(0.057)	(0.202)
Observations	194	194	194	194	194	194	194
R-squared	0.043	0.146	0.011	0.001	0.040	0.022	0.006
Number of countries	35	35	35	35	35	35	35

Panel corrected standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1. Models 3 and 4 are Prais-Winsten regression to correct for autocorrelation.

In the next step we investigate the results further, introducing explanatory factors into the model. Table 2 shows that only some of the results are robust to the inclusion of control variables. Countries with higher government effectiveness seem to have lower number of people affected by natural disasters (Model 5 and 1) and lower number of adverse events classified as natural disasters. The effect of government effectiveness on the number of people killed and remained homeless after the disaster is also negative and significant. The number of people killed and injured seems to be instead affected by the democracy levels. Higher democracy scores are associated with fewer fatalities and less injuries as a result of disasters. More advanced democracies also experience less damage from the natural adverse events, expressed in monetary terms.

While Models 2, 3 and 4 seem to be explained relatively well by the selected explanatory factors, R-squared in Models 1, 5, 6 and 7 remains low, implying that there are also other factors explaining variation in the dependent variables that are not included into the models.

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[5] In the robustness checks we ran the same models with the indicator Control of Corruption from the World Bank and ICRG indicator of Quality of Government. For the indicator of Corruption control results remain similar as for government effectiveness, however it's affect on the size of economic damage becomes negative and significant at 10%. As for the ICRG QoG indicators, the results were only significant in bivariate regressions and lost their statistical significance after the inclusion of control variables. However, these indicators are available for smaller number of countries than government effectiveness and therefore, insignificant results can be explained by smaller sample size.

TABLE 2, THE EFFECT OF GOVERNMENT EFFECTIVENESS ON DISASTER OUTCOMES

VARIABLES	(1) Total affected (log)	(2) Number of disasters (log)	(3) Number of Killed (log)	(4) Number of Injured (log)	(5) Number of Affected (log)	(6) Number of Homeless (log)	(7) Damage in USD (log)
Government Effectiveness	-0.661**	-0.307***	-0.069*	-0.039	-0.684**	-0.156*	-0.396
	(0.296)	(0.063)	(0.039)	(0.041)	(0.299)	(0.082)	(0.339)
Democracy	-0.050	0.009	-0.018**	-0.041***	-0.047	-0.026	-0.133*
	(0.068)	(0.016)	(0.009)	(0.014)	(0.068)	(0.046)	(0.069)
GDP per capita (log)	0.451*	0.110**	0.136***	0.178***	0.455*	0.088	0.867***
	(0.265)	(0.051)	(0.040)	(0.050)	(0.263)	(0.070)	(0.319)
Population (log)	0.277***	0.186***	-0.072***	-0.127***	0.272***	0.088**	-0.030
	(0.080)	(0.025)	(0.024)	(0.023)	(0.082)	(0.044)	(0.094)
Latitude	3.325	1.091***	0.164	0.258	3.667*	0.097	8.251***
	(2.195)	(0.325)	(0.376)	(0.396)	(2.057)	(0.619)	(1.938)
Aid flows	1.648***	0.421***	1.928***	2.418***	1.467***	0.159	1.504**
	(0.503)	(0.163)	(0.292)	(0.283)	(0.561)	(0.369)	(0.675)
Year	-0.003	0.011**	-0.005	-0.003	0.007	-0.034***	-0.009
	(0.034)	(0.006)	(0.005)	(0.006)	(0.036)	(0.011)	(0.038)
Constant	1.495	-24.965**	9.610	6.245	-19.198	67.432***	12.547
	(68.703)	(11.467)	(9.476)	(10.928)	(72.631)	(22.681)	(76.715)
Observations	176	176	176	176	176	176	176
R-squared	0.261	0.513	0.701	0.776	0.243	0.123	0.211
Number of ccode	34	34	34	34	34	34	34

Panel corrected standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. Prais-Winsten regression in models 3 and 4 in order to correct for autocorrelation.

Although the correlation between government effectiveness and the number of disasters might seem puzzling at first glance, the relationship can be explained by the nature of the disaster defini-tion. In order for an adverse event to be classified as a disaster, it has to fulfill certain criteria: at least 10 people have to be reported killed, 100 people reported affected, there should be a call for international assistance or there should be a declaration of a state of emergency (EM-DAT, 2014). Such effect of the adverse event depends to a certain extent on the vulnerability of the populations and territories and the degree to which they are prepared to face the consequences of such adverse events. Dangerous weather events might simply not be classified as disasters due to lower impact

exerted by them, while lower impact may be caused by better readiness to the event and higher government effectiveness.

On the other hand, however, the correlation can simply reflect endogeneity problem between dependent and independent variables. It is reasonable to expect, for instance, that higher number of disasters and higher probability to get affected by a disaster can decrease the incentives for the political leaders to act long term and invest in high quality of institutions.

To explore the causality further, we investigate the effect of the frequency of natural disasters on the government effectiveness by running a stepwise regression, starting from the focal relationship, and consequently adding relevant controls, which have been found to affect institutional quality in the previous research. We lag the value of natural disasters by one year, making sure that disasters take place before the change in institutional quality or government effectiveness, as we operationalize it. Other time-varying independent variables are also lagged by one year. To estimate the size of the effect, we utilize the between-within estimation, suggested by Bell and Jones (2015). The method explores both variation between the countries and developments within the states simultaneously. Technically, it is a modified random effects model, which, unlike regular random effects model, satisfies the assumption that errors and independent variables are uncorrelated.

The results show that the number of adverse events classified as natural disasters has a negative significant effect on government effectiveness, even after controlling for other explanatory factors. The result is true for both within- and between- variation. This implies that the more natural disasters happen within a country, the less effective the government of this country becomes. At the same time, countries with higher frequency of natural disasters have lower government effectiveness than countries, which are hit by the adverse weather events less frequently. The model explains 83.7% of the variation in the dependent variable between countries and 20.9% of the variation within countries. Thus the model mostly explains differences between nations, not within-states changes.

TABLE 3. THE EFFECT OF THE FREQUENCY OF NATURAL DISASTERS ON THE GOVERNMENT EFFECTIVENESS

VARIABLES	Model 1	Model 2
Within-effects part		
Frequency of disasters	-0.020***	-0.020**
	(0.008)	(0.010)
Democracy		0.097***
		(0.035)
GDP per capita		0.010
		(0.027)
Year		0.003
		(0.010)
Between-effects part		
Frequency of disasters (mean)	-0.619***	-0.437***
	(0.175)	(0.138)
Democracy (mean)		0.014
		(0.030)
GDP per capita (mean)		0.094***
		(0.013)
Year (mean)		-0.140***
		(0.034)
Latitude		-3.074**
		(1.251)
British colony		-0.233
		(0.151)
Ethnic fractionalization		0.599
		(0.387)
Constant	0.677*	278.306***
	(0.384)	(68.003)
Observations	104	101
R2 overall	0.255	0.777
R2 between	0.253	0.837
R2 within	0.023	0.209
Number of countries	23	21

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All independent variables in the within-effects part are lagged 1 year. The results are robust to the inclusion of year dummies instead of the yearly trend in fixed effects part; in between effects part, the results are robust to the inclusion of regional dummies.

Conclusions

The aim of the paper has been to investigate whether those vulnerable countries that have higher government effectiveness are better equipped to face the consequences from adverse events and thus have lower number of people affected by the disasters than countries with low institutional quality.

The results confirmed our expectations, indicating that countries with higher government effectiveness tend to have lower number of people killed and affected by natural disasters and more specifically, lower number of people remained homeless – a factor which is unambiguously dependent on the ability of governments to mitigate the effect of an adverse event. The analysis also led to an unexpected result, showing that more effective governments tend to have lower number of adverse events classified as natural disasters on the whole.

This finding made us extend our tests to study endogeneity problem in a greater detail. The analysis revealed that the number of disasters a country faces per year could in turn affect government effectiveness. This finding requires a deeper qualitative investigation of the mechanisms behind the relationship, but our interpretation is that political leaders in countries constantly hit by natural disasters have low incentives to invest into long-term projects, such as building the necessary infrastructure, which could reduce vulnerability. Instead they tend to focus on short-term benefits they can obtain from being in office and maximize their gains. Such behavior reduces institutional quality, capacity of governments to perform their tasks and, as a result, government effectiveness.

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Appenix 1

TABLE 4, DESCRIPTIVE STATISTICS FOR NATURAL DISASTERS

Variable	Obs	Mean	Std. Dev.	Min	Max
Number of disasters	559	1.636852	1.273722	1	9
Number of people killed	559	76.23601	367.7729	0	5900.012
Number of people injured	559	.5451807	9.794085	0	229.566
Number of people affected	559	1.076955	24.42606	0	577.521
Number of homeless	559	70.60627	349.1789	0	5900
Total number of people affected	559	4.552785	39.6164	0	835
Total damage from disasters	559	67.78075	421.0132	0	8000

TABLE 5, SUMMARY STATISTICS FOR INSTITUTIONAL VARIABLES

Variable	Obs	Mean	Std. Dev.	Min	Max
Quality of Government	188	.4458235	.1794442	.1018519	.9166667
Control of Corruption	194	-.2036062	.8042136	-1.81587	2.355545
Government effectiveness	194	-.3688318	.7855291	-2.247716	2.170863
Democracy	461	6.893209	2.875027	.3042909	10

Appendix 2: The list of countries under investigation

1. Cape Verde
2. Micronesia
3. Barbados
4. Dominica
5. Bahamas
6. St Lucia
7. St Vincent and the Grenadines
8. Grenada
9. Dominican Republic
10. Vanuatu
11. Samoa
12. Jamaica
13. Trinidad and Tobago
14. Seychelles
15. Fiji
16. Papua New Guinea
17. Tonga
18. Guinea-Bissau
19. Haiti
20. Maldives
21. Cuba
22. Tuvalu
23. Nauru
24. Marshall Islands
25. St Kitts and Nevis
26. Mauritius
27. Kiribati
28. Palau
29. Belize
30. Antigua and Barbuda
31. Sao Tome and Principe
32. Suriname
33. Solomon Islands
34. Guyana
35. Timor-Leste
36. Comoros
37. Singapore