Rewarding Performance in Disaster Response: Evidence from Local Governments in Latin America

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Abstract

Given the increasing frequency of large-scale disasters, managing such emergencies is becoming an important aspect of politicians' performance in office. Models of electoral accountability posit that voter reward and sanctioning in re-elections incentivizes good performance. Yet little research on re-elections considers this new type of politician responsibility. The few studies examining electoral responses to disasters do so for one type of disaster at a time, mostly focus on economically advanced countries and, most importantly, tend to study voter responses to the existence of the disaster itself, rather than how politicians respond to it after the fact. Furthermore, most research examines the national level, but given the structure of decentralization in the Global South, local-level governments play a key role in responding to disasters by managing reconstruction and recovery. Our approach addresses each of these gaps by combining local-level electoral returns with detailed data on performance for a variety of natural catastrophes. We find that voters do reward politicians that effectively manage disasters, providing a blueprint for how to best incentivize disaster responsiveness going forward.

Keywords: disasters; electoral accountability; voter behavior; Latin America; local governance

1 Introduction

Large-scale disasters, whether due to health, weather or other natural catastrophes, are becoming more frequent, more intense, and more unpredictable across multiple sectors, dimensions and scales (FAO 2021). Natural disasters brought on by climate change, like fires and floods, have increased considerably. Between 2000 and 2019, more than 7000 major disasters were recorded, affecting 4.2 billion people, and causing 1.23 million deaths and around USD 2.97 trillion in economic losses globally (Centre for Research on the Epidemiology of Disasters 2020). Of course, the COVID-19 pandemic has brought an unprecedented humanitarian crisis, with six million confirmed deaths as of May 2022 (World Health Organization 2022).

Managing these large-scale emergencies will increasingly become part of the standard repertoire of government performance. In addition to providing public goods like education or roads, more and more governments will be responsible for the crucial role of responding to one-off events, from natural calamities like floods or fires, to public health crises like Ebola or Covid-19. At the local level, mayors are particularly important in driving the response to the disaster, managing recovery and reconstruction in the communities where they occur. In the case of democratically elected governments, these new responsibilities raise the empirical question of how voters judge the performance of public officials in addressing unexpected crises. In particular, will politicians' electoral fortunes be tied to how they manage the fall-out from these large-scale events after the fact?

Whether or not voters respond to disaster relief performance has important ramifications, not least of all because politicians may be motivated to improve their performance if they know their actions in office will be scrutinized when they seek re-election (Ashworth 2012). Given the increasing probability with which communities will have to tackle climate or health-related disasters, understanding how best to incentivize politicians to perform well in managing them takes on even greater importance.

However, existing research is ambiguous as to whether we should expect that politicians' performance in managing disasters would impact their re-election prospects. While a large body of political science literature studies electoral accountability, the majority of such work focuses on voter responses to two main aspects of local-level government performance: corruption (Arias et al. 2019; Bobonis, Cámara Fuertes & Schwabe 2016; Chong et al. 2015; Ferraz & Finan 2008, 2011; Larreguy, Marshall, & Snyder Jr 2020; Winters & Shapiro 2013) and public service provision (De la O 2013; De Janvry, Finan, & Sadoulet 2012; Linos 2013).[1] Yet there are theoretical and empirical reasons why voters' response to this new responsibility of local governments—managing large-scale weather and health related disasters—may operate differently than for the standard types

[1]There is of course a long literature on economic voting, or the tendency to reward or punish incumbents for economic performance, though this literature is almost entirely focused on presidential and congressional elections. We return to this literature below in a discussion of the mis-allocation of blame across government levels.

of performance typically studied. Responding to an exogenous shock is simply a different responsibility than, for example, recognizing the need for better healthcare then marshaling the complex financial, logistical, and human resources necessary to improve health outcomes. Relatedly, as exogenous shocks, few candidates campaign on a platform of being able to respond well to disasters. This means voters' assessment of incumbent behavior in terms of disasters is inherently less about compliance with campaign promises, and more about the politician's competence in responding to evolving community needs.

Nor does the existing work on voter behavior in the specific context of disasters provide a clear answer for how voters will evaluate politicians' performance in mitigating the fall-out from the disaster once it has occurred (Rubin 2020). Most of this research studies how voters react to the mere fact that a disaster took place, building on work studying voters' tendency to punish politicians for events beyond their control (Achen & Bartels 2016; Heersink, Peterson & Jenkins 2017; Quiroz Flores & Smith 2013). Without disaggregating for performance information, results for the electoral impact of disasters is mixed: in some cases politicians receive an electoral boost from presiding over a disaster (Bechtel & Hainmueller 2011; Eriksson 2016), while in other cases they are less likely to win re-election (Heersink, Peterson & Jenkins 2017; Quiroz Flores & Smith 2013), or there is no effect at all (Bodet, Thomas & Tessier 2016; Remmer 2014).

Only a smaller sub-set of this literature assesses how voters react not to the disaster itself, but to the government's performance in responding to it. Researchers have aimed to more explicitly disaggregate good and bad performance by using the provision of relief aid as a performance metric. Evidence suggests voters in geographic areas that received aid, or received more aid, responded by rewarding incumbent politicians (Gasper & Reeves 2011; Healy & Malhotra 2010; Fuchs & Rodriguéz-Chamussy 2014; Healy & Malhotra 2009; Cole, Healy, & Werker 2012; Masiero & Santarossa 2021). However, using the receipt of aid as a metric masks important variation in how individual politicians perform in terms of spending that aid. In many countries, particularly in the Global South, local public budgets depend on fiscal transfers that are allocated and distributed from the center, even though responsibility for actually spending the funds falls to the local government. As a result, the way that local politicians intervene in cases of disaster is not to acquire more funds, but to actively spend the funds they receive. This means that aid received does not actually capture local-level performance in responding to the disaster.

Instead, we use data on public spending in the aftermath of the disaster to capture a more direct measure of performance: whether local politicians effectively spend resources to respond to the public emergency. Studying if voters reward politicians who best spend their local budgets offers a more stringent test of whether the logic of electoral accountability governs voter response to performance in the specific case of large-scale disasters.

In particular, we study how voters in Chile and Peru respond to mayoral performance in managing the effects of a large-scale disaster taking place during their time in office, including a range of disaster types occurring across multiple government administrations. We use two different methodologies—difference-in-differences and a regression discontinuity design—to estimate the interaction between a municipality experiencing a disaster and the mayor's performance in managing the fall-out. Across both countries and both methods, we find that voters do reward incumbents who do a good job responding to the exogenous shock of a natural disaster during their term.

Importantly, our two countries share key contextual features that underpin our empirical strategy, particularly that mayors' role in disaster response is concentrated in overseeing reconstruction and recovery with funds sent from the center. However, we also chose these particular countries because they vary in important ways that help us evaluate the generalizability of our findings. Peru has low incumbent re-election on average, and a strong tendency towards voters rejecting re-election even when incumbents perform well (Weaver 2021). This makes Peru a "least likely" case of voters rewarding incumbents who perform well in disaster recovery. In contrast, Chile has a relatively high rate of incumbent re-election, making it an easier test case in the sense of voters being at least willing to consider re-electing incumbents who perform well. Using the same methodological approach in both countries, and generating the same findings, we can show that our results more likely reflect a generalized trend of voter response to managing crises, rather than a one-off phenomenon. Furthermore, we are better placed to extrapolate from our findings to understand the expected political impacts of public health crises like COVID-19 as well as the increasing number of natural disasters we can expect due to climate change.

In addition to our emphasis on performance as the mechanism via which voters respond to disasters, our paper makes an additional set of contributions to the literature on the electoral effects of natural catastrophes. With few exceptions (Gasper & Reeves 2011; Healy & Malhotra 2009; Quiroz Flores & Smith 2013), most empirical research has focused on either one specific large-scale disaster or on one disaster type.[2] In addition, most studies examine only one country at a time.[3] In contrast, we examine two countries—Chile and Peru—with different patterns of partisanship, electoral competition and institutional strength, and study multiple types of disasters across a long timeframe (2007-2016).

Furthermore, though most disaster research focuses on Europe and the United States,[4] it is Global South

[2]Most commonly, flooding or rain-related disasters (Gallego 2018; Bechtel, Michael & Hainmueller 2011; Cole, Healy & Werker 2012; Heersink, Peterson & Jenkins 2017; Bodet, Thomas & Tessier 2016; Eriksson 2016; Visconti 2022), followed by earthquakes (Acuña-Duarte & Salazar 2021; Masiero & Santarossa 2021; Visconti 2021), tsunamis (Rubin 2020), hurricanes (Remmer 2014), droughts (Fuchs & Rodriguéz-Chamussy 2014), and tornadoes (Healy & Malhotra 2010).

[3]Exceptions are Quiroz Flores & Smith (2013) and Remmer (2014), though in both cases, the analysis focuses on the country-level, with no sub-national variation, and without any inclusion of performance variation.

[4]Research has focused on Germany (Bechtel & Hainmueller 2011); the United States (Gasper & Reeves 2011; Healy & Malhotra 2009; Healy & Malhotra 2010; Heersink, Peterson & Jenkins 2017); Italy (Masiero & Santarossa 2021); Canada (Bodet, Thomas & Tessier 2016); and Sweden (Eriksson 2016), with Chile (Acuña-Duarte & Salazar 2021), Mexico (Fuchs & Rodriguéz-Chamussy 2014), and India (Cole, Healy & Werker 2012) as the only Global South countries studied.

countries that will be facing an increase in natural disasters due to the effects of climate change. In addition, there are important reasons to believe that in low-income countries, voter evaluations and political calculations might differ in ways that impact whether good disaster management will be rewarded. Developing countries generally face greater governance challenges, from weaker state capacity to higher levels of corruption (i.e., Olken & Pande 2019). Voters may thus expect less from their elected officials ex-ante and be more willing to reward good performance, as it contrasts more vividly with their prior expectations (Bhandari, Larreguy & Marshall 2019; Chong et al. 2015). Alternatively, low expectations and voter disdain for holding office may induce voters to be inclined to vote all incumbents out of office, even good performers (Weaver 2021).

Little research on the electoral consequences of disasters considers the most local level of governance. With some exceptions,[5] the majority of research studies national-level governments (Bechtel & Hainmueller 2011; Eriksson 2016; Fuchs & Rodriguéz-Chamussy 2014; Gasper & Reeves 2011; Healy & Malhotra 2009; Healy & Malhotra 2010; Heersink, Peterson & Jenkins 2017; Quiroz Flores & Smith 2013). However, focusing on the local level offers important insights into how disasters can and should be managed (Tselios 2022). Particularly in the Global South, the push to decentralize has meant that mayors are to a greater extent the locus of political life and of local public goods provision (Bardhan, Pranab & Dilip Mookherjee 2006). Furthermore, the political impact at the local level is probably much less related to preparing for the disaster in advance (Ashworth, Bueno de Mesquita & Friedenberg 2018; Gailmand & Patty 2019), and much more about how politicians respond after the disaster occurs. Large-scale disaster preparation would most likely be seen as under the purview of the national government, while disaster relief is managed locally. However, municipal-level studies are infrequent, and face limitations in their generalizability by studying only one state or one urban area at a time (Bodet, Thomas & Tessier 2016). Only Acuña-Duarte & Salazar's research (2021) on Chile and Masiero & Santarossa's work (2021) on Italy are similar to our own, including data on municipalities from across the entire country and across multiple elections. Where we add value is by combining this municipal-level focus with a study of more than one country and of multiple disasters at a time.

In the following section, we discuss how findings from existing research inform our expectations about whether voters will reward mayors who perform well in disaster response. Section 3 provides the necessary background on the two countries included in our study, Peru and Chile. Then, Sections 4 and 5 respectively describe the data and research design. Section 6 presents the main results, and Section 7 concludes.

[5]Cole, Healy & Werker (2012) study state-level elections in India; Gasper & Reeves (2011) study the county level in the US; and Bodet, Thomas & Tessier (2016) study neighborhoods within one metropolitan area in Canada.

2 Accountability, Voting Behavior and Disasters

Electoral accountability stems from a vertical contract between voters and elected officials, where voters evaluate the incumbents' performance in office in the current term when deciding whether to use their vote to reward or sanction incumbents when they seek a subsequent term (Ashworth 2012). Little empirical research robustly evaluates whether voters reward local-level politicians who perform well in the particular context of responding to disasters. Research on electoral accountability in terms of other types of performance, however, is useful in helping us predict how voters may respond to good performance when disasters occur. In particular, research has centered on two main factors that impact whether voters are willing and able to reward good performance: when they have accurate performance information and when that performance is sufficiently salient. Given that natural disasters are both highly visible and important to voters, we argue that mayors' performance in disaster recovery should induce voters to reward incumbents at the ballot box.

First, the idea that voters need accurate performance information has received much attention in the electoral accountability literature. Not only may incumbents want to actively hide their activities in office, as in the case of corruption, but low-information environments, weak media, low levels of education, and lack of internet access, as well as the simple fact that information about policy performance may be too complex to digest, are all reasons why voters may find it difficult to know how incumbents perform. Though by no means uniformly, research from a number of settings suggests that information constraints preclude electoral accountability, as initiatives to improve access to performance information led to voters' increased willingness to sanction poorly performing incumbents (Bobonis, Cámara Fuertes & Schwabe 2016; Ferraz & Finan 2008; Gottlieb 2016; De Janvry, Finan & Sadoulet 2012; Larreguy, Marshall & Snyder Jr 2019).

However, in the particular case of responding to disasters, it seems highly unlikely that voters would lack information about how the incumbent performed. For one, disaster relief is highly visible: unlike in other domains of politicians' action, voters are highly likely to observe first-hand how the incumbent is responding to the disaster, through such concrete and visible initiatives like cleaning up impacted areas and rebuilding damaged infrastructure. Thus it seems closer to studies on performance in areas such as conditional cash transfers (CCT), which are highly visible programs offering cash benefits to residents, and where voters have been found to reward mayoral incumbents for introducing or expanding the CCT social benefits program (De La O 2013; De Janvry, Finan, & Sadoulet 2012; Linos 2013).[6]

Other studies, however, have shown that even with perfect performance information, voters may still fail to act on that information at the ballot box (Arias et al. 2019; Bhandari, Larreguy & Marshall 2021; Chong et

[6]Research on the electoral effects of CCTs in terms of presidential elections has found more limited support, especially in Brazil (i.e., Pavão 2016; Zucco 2013).

al. 2015; Dunning et al. 2019). However, the theoretical explanations for why this occurs likely do not apply to the particular case of disaster management. One account centers on voter priors: the information provided may not be sufficiently different from what voters already believe to induce a change in vote choice (Arias et al. 2019; Bhandari, Larreguy & Marshall 2021; Chong et al. 2015). For example, voters may already believe all politicians are corrupt, so explicitly informing them about the malfeasance of their particular incumbent mayor is unlikely to change how they intended to vote. But disaster management only becomes salient in the event of a disaster, meaning that voters are unlikely to have strong priors about how *all* politicians would perform in responding to a public emergency.

Another reason providing information may not lead to sanctioning is because voters may have difficulty knowing exactly who is responsible for what type of government action, and thus may be unable to successfully attribute blame (Gélineau and Remmer 2006; Anderson 2006; Sances 2017; Martin and Raffler 2021). Most of this research on this problem focuses on economic voting and the mis-allocation of blame between the national and local levels. But blame for disasters is, we argue, not likely to fall prey to allocation problems. Intervening in disasters can largely be grouped into two types of activities. First, politicians can implement policies to prevent the fall out from disasters, such as strengthening building codes for earthquakes or enacting climate change mitigation measures. These are largely the purview of the national government, and so it may be possible voters would punish their mayors for shortcomings of their national politicians in this regard. The second, managing the fall out after a disaster occurs (our focus in this paper), could be under the domain of both national and local politicians. However, given that the provision of public goods and managing public works projects is a widely recognized domain of local mayors (Weaver 2021), it is not surprising that voters would attribute at least some responsibility to the local level for their reconstruction efforts after a disaster. Particularly because mayors rely on funding from the center, it may be possible voters punish local politicians for the national levels' under-allocation of resources. Conditional on receiving funds from the national level, though, those mayors who implement reconstruction projects are likely to be rewarded for their efforts.

A second set of explanations for voters' tendency to reward or punish focuses on the extent to which voters care about incumbent performance relative to other criteria. Even with perfect information, voters will only reward or punish based on the issues they care about the most (Edwards, Mitchell, & Welch 1995; De Vries & Giger 2014). This may explain why so much electoral accountability research focuses on corruption (Arias et al. 2019; Bobonis, Cámara Fuertes & Schwabe 2016; Chong et al. 2015; Ferraz & Finan 2008, 2011; Larreguy, Marshall & Snyder Jr 2020; Winters & Shapiro 2013), as it is assumed that such egregiously poor performance offers the easiest test of whether voters are willing to use their vote primarily to reward or punish performance. Similarly, evidence also suggests voters may be unwilling to reward good performance in one type of government

action if what they preferred was actually for politicians to focus on providing something else (Boas, Hidalgo & Torral 2019; Adida et al 2017; Burstzyn 2016). Voters may also prioritize other candidate characteristics, like partisanship (Asunka 2016; Eggers et al. 2014; Kayser & Wlezien 2011) or ethnicity (Adida et al. 2017; Carlson 2015) over incumbent performance.

However, as before, this set of explanations is most likely not applicable in the case of disasters. Given the huge personal and economic cost to voters of such emergencies, performance in responding to large-scale disasters should be the *most* likely to pass the saliency test in terms of electoral accountability.

Overall, then, we expect that voters should reward or punish incumbents on the basis of their performance in responding to disasters, because, first, information about that performance is highly visible and easy to understand. Second, disaster relief is likely to be a highly salient political issue, overriding other voter concerns related to different types of performance, policy areas, or even other candidate characteristics, like party or ethnic affiliation.

3 Local-level Governance and Disaster Response in Chile and Peru

Chile and Peru share certain local-level governance features which are key to our empirical strategy, namely the electoral system, extent of fiscal decentralization, and process for managing disasters after they occur. We discuss each of these in turn, before mentioning some important contextual differences that justify our case selection strategy.

In both countries, the most local level of government, and the level we study, is the municipality. There are 1647 municipalities in Peru (*municipalidad distrital*), and a 2002 decentralization law gave these governing units significant administrative autonomy for overseeing local affairs. For example, municipalities are responsible for managing local public services like providing water and irrigation, building schools and health clinics, and managing trash pick-up, as well as granting business licenses, generating municipal ordinances, and overseeing districts' yearly development plan. Similarly, Chile has 345 municipalities (*municipalidades*). Mayors have similar and significant local responsibilities as those in Peru, including planning and regulation, education, and urban services.

Both countries also have similar electoral systems at the local-level. Municipalities are run by mayors who are elected to four-year terms, along with a group of councilors (called *regidores* in Peru and *concejales* in Chile) who are proportionally allocated seats on the Municipal Council (*Concejo Municipal*) based on party vote share. Peruvian mayors could be re-elected indefinitely through the 2014 election (the last election included

in our dataset), though a 2015 law banned immediate re-election beginning with the 2018 electoral cycle. In Chile, there were no limits to the re-election of mayors during the period of our study (Argote 2021), though a 2020 law began limiting mayors to three terms in office beginning with the 2021 local election. In Peru, voting is required by law, with strong enforcement of the fines for not voting leading to relatively high voting rates (Carpio, Córdova, Larreguy & Weaver 2019). In Chile, voting was previously mandatory, but became voluntary in 2012.

Importantly for our study, in both settings, municipalities are reliant on transfers from the center as a large component of their local public budgets. In Peru, municipalities' budgets are determined by the Ministry of Economics and Finance (Loayza, Rigolini & Calvo-Gonzalez 2014). Despite their administrative autonomy, little revenue is generated at the local level, making municipalities reliant on transfers from the center for their functioning. In fact, only about 20% of local governments' budgets come from their own revenue, leaving 80% to be provided by the central government (Canavire-Bacarreza et al. 2012). In Chile, local revenue generation is higher than in Peru, though national-level transfers and subsidies still account for about 50% of municipal revenues (OECD 2019).

In both countries, disaster risk management remains centralized, both in terms of planning for disaster risk mitigation and in allocating funding to respond to disasters after they take place (French et. al. 2020; Valdivieso & Anderson 2017). In neither country are mayors able to declare a disaster on their own. Overall, this reduces the scope for mayoral intervention to mitigating the municipal-level impact of disasters once they occur. This is important as our empirical strategy measures municipalities' response to the public emergency, which we treat as an exogenous shock. In other countries, mayors themselves can declare a disaster in order to unlock additional funding; evidence from Brazil suggests mayors benefit electorally from doing so (Cooperman 2022). However in both Chile and Peru, it is the central-level that designates a disaster.

In terms of differences, Chile is a much more favorable environment for reelection, as mayors are more likely to be reelected than in Peru (55% of incumbents are rewarded with a subsequent term versus only 19% in Peru). The countries differ in a few other ways that also likely matter for voter behavior. Chile has one of the strongest party systems in Latin America, whereas Peru has one of the weakest (Mainwaring 2018). Chileans have a much higher reported level of trust in the local government (55.4%) compared to Peruvians (36.4%), who have the second lowest rate in all of Latin America (Cohen et al. 2017). Levels of corruption also differ: only 7.3% of survey respondents in Chile reported being asked to pay a bribe, whereas the rate among respondents in Peru was 29.6% (Cohen et al. 2017).

We consider Chile, then, an easier test of the contention that voters reward mayors for their performance in

responding to major disasters, while Peru is a harder test. Including both countries in our study allows us to explore the full range of settings in Latin America, thereby improving the generalizability of our results.

4 Data

For both Chile and Peru, we created a similarly structured dataset containing municipal-level information on elections and turnout, disasters, budgets and spending, socioeconomic outcomes, and geography. Every observation in the dataset is a municipality-year. For the regression discontinuity design in particular, we also created a candidate-level dataset of election returns, which includes all of the municipal-level control variables. For Peru, we include the mayoral elections held in 2010 and 2014, and for Chile, we analyze the 2008, 2012 and 2016 local elections. Table 8 in Appendix B presents the years of the study and the corresponding elections we cover.[7] Socioeconomic data covers poverty, education, and other related outcomes. Appendix A presents the full list of data and sources used for each country.

Table 1 presents basic descriptive statistics for our main variables related to disasters and re-election. The proportion of municipalities affected by major disasters is 6.6% and 7.8% for Peru and Chile respectively. In both countries, mayors who experienced a large-scale disaster in their time in office are, on average, less likely to win re-election than those that did not. We do not know, however, what is driving voter behavior in disasters, though in this paper we evaluate one major explanation: how the mayor performs in managing the disaster's aftermath.

Table 1: Descriptive Statistics for Main Disaster and Re-election Variables

	Peru			**Chile**		
Variable Name	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**
Incumbent Re-elected	12,867	0.190	0.392	3,101	0.554	0.497
Performance (Standardized)	12,760	3.38e-06	1	3,089	-5.51e-07	1
Disaster Occurred	12,867	0.066	0.248	3,101	0.078	0.268
Disaster (No) and Won reelection	12,013	0.195	0.396	2,858	0.558	0.496
Disaster (Yes) and Won reelection	854	0.114	0.318	243	0.514	0.501

Source: Own elaboration.

Our municipal-level treatment variable is defined as having at least one large-scale disaster in a given year during the mayor's term in office. The maps of Chile and Peru in Figures 1 and 2 depict municipalities with at

[7] As Table 8 shows, for election years, we exclude from the dataset any disaster that occurs during the months when mayors officially declare their intention to run and when the election is being held.

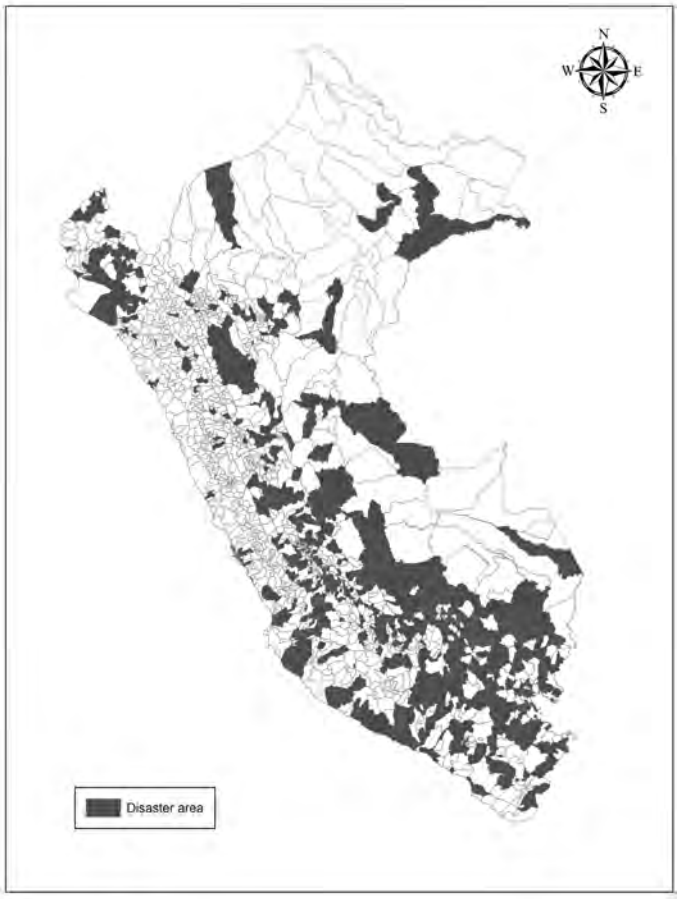
least one disaster across the full period we study (2007-2016). The maps highlight the large spatial variation of the disasters, showing how our analysis includes a wide swathe of the geographic area of each country.

Figure 1: Chile - Map of Disaster Occurrence Per Municipality Across the Years of the Study

Data: NASA and Centre for Research on the Epidemiology of Disasters. Note: Shaded areas indicate municipalities that had at least one disaster during the period we study (2008-2016).

Across both countries, we leverage all available data on disasters while also taking steps to ensure we only include large-scale public emergencies. In the case of Peru, we include all types of significant disasters that occurred in the period we study (2007-2014), which includes earthquakes, floods, landslides and droughts. Because we want to ensure we only include large-scale disasters, we identify a public emergency by the fact that

Figure 2: Peru - Map of Disaster Occurrence Per Municipality Across the Years of the Study



Data: Centre for Research on the Epidemiology of Disasters. Note: Shaded areas indicate municipalities that had at least one disaster during the period we study (2007-2014).

it was both officially declared a disaster area by the central government and was designated an additional budget fund for emergency management. Our binary measure of the occurrence of a disaster is therefore composed of two separate indicators: whether the disaster occurred; and whether it was accompanied by an additional budget transfer from the central level to react to the crisis and mitigate the disaster's effects. Using these two criteria, we identify 854 major disasters occurring across 516 municipalities.

For Chile, our dataset includes earthquakes, floods and volcanic eruptions, occurring across 159 municipalities, from 2008 to 2016. We include all floods and volcanoes that were officially declared emergencies by the National Emergency Office of the Ministry of the Interior (ONEMI), the agency in charge of planning and coordinating public and private resources for emergency and disaster response. In the case of earthquakes, we use the Modified Mercalli Intensity Scale in order to identify and then include only the most affected municipalities.

Unlike the Richter scale, which measures the strength of the earthquake at its source, the Mercalli Scale tracks the intensity of damage, thereby capturing variation in earthquake destructiveness across space. As Chile is a country prone to earthquakes, we want to ensure we only include municipalities where an earthquake was strong enough that it generated significant damage that required a large mayoral intervention to manage. We therefore code as having a disaster only those municipalities in which the intensity of the Mercalli Scale exceeds 7 degrees out of the maximum 10 the scale allows.

Our performance measures focus on mayoral spending. Given the legal framework for decentralization in Chile and Peru, mayors do not play a role in planning for disaster management prior to disasters occurring. Rather, their function is to implement the response to the disaster after the fact. We posit that voters will reward mayors who do a good job post-disaster by reducing the fall-out from the destruction by rebuilding and repairing damaged infrastructure, buildings, and roads. We therefore test our mechanism using budget data related to the extent to which mayors spend public funds in these areas after the disaster takes place.

For both Chile and Peru, we use municipal-level total per capita expenditure. We use inflation-adjusted values in order to compare results across years. We standardize the municipal expenditure variable (mean of zero and standard deviation of 1) to compare results across our two countries. We also include socioeconomic variables to control for the level of wealth of the municipalities.

5 Research Design

5.1 Difference-in-Difference Treatment Effect Approach

What we are interested in testing in this paper is whether voters reward local politicians who effectively manage the fall-out from natural disasters and punish those whose disaster response is insufficient. To do so, we use two separate methodologies—difference-in-difference and regression discontinuity—and check for consistency in the results to give us added confidence in the findings.

In the difference-in-difference design, we study the treatment effect of both having a natural disaster and spending public funds on the likelihood of being reelected. In other words, we estimate the interaction effect between the disaster and the mayor's performance in managing it. Due to the characteristics of our data, we use a two-way fixed effects difference-in-difference estimator with fixed effects for municipality and for time period. We estimate the model using standard errors that are clustered at the municipal level.

As described earlier, in both of our countries, our performance measures capture spending of public funds

to respond to the disaster. In Peru and Chile. the variable is total expenditure per capita, inflation-adjusted and standardized, to facilitate comparison across time and across the two countries.

According to the standard difference-in-differences literature, we estimate the following equation:

$$Won\ reelection_{it} = \beta_0 + \beta_1\ Disaster_{it} + \beta_2\ Performance_{it} + \beta_3\ Disaster \times Performance_{it} + \Theta X_{it} + \delta_i + \gamma_t + \varepsilon_{it}$$

where $Won\ reelection_{it}$ captures whether an incumbent mayor won re-election in district (i) and time (t); $Disaster_{it}$ is a binary variable indicating if a disaster took place in district (i) at time (t); $Performance_{it}$ is our spending measure in district (i) and time (t); $Disaster \times Performance_{it}$ is our treatment variable that captures the effect of spending in municipalities that were affected by a natural disaster; X_{it} are the set of covariates that may also affect whether an incumbent mayor wins re-election, which includes district-level variables related to demography, socioeconomic status, budgets, and political competition; δ_i are municipal-level fixed effects; γ_t are time fixed effects; and ε_{it} refers to the unobserved error. Heteroscedasticity and serial correlation are corrected, since the observations within each group may be correlated over time (Angrist & Pischke, 2009; Fredriksson & Oliveira, 2019).

Our coefficient of interest is β_3 which captures whether performance in disaster response is rewarded. If the coefficient is positive and significant, it would suggest that mayors who perform well in managing disasters have a higher probability of winning re-election than those who perform worse.

Because our treatment occurs in different years, we estimate the average treatment effect on the treated (ATT) with dummies for cross-sectional units and time periods as well as a treatment dummy. Overall, β_3 estimates an average difference, comparing the same unit across time as well as comparing different units, with and without treatment, at the same point in time. The aim is to regress the observed outcome on the treatment variables and a full set of group and time fixed effects. The core assumption of the two-way fixed effects difference-in-difference estimator is that any unmeasured determinants of the outcomes are either time invariant or group invariant (Cunningham, 2021). However, this approach may be too restrictive for our case, as the treatment (disaster) varies over time and may be heterogeneous (Borusyak & Jaravel, 2017; de Chaisemartin & D'Haultfœuille, 2020; Callaway & Sant'Anna, 2020; Goodman-Bacon, 2021), for example, if the effect varies across different disaster types, such as earthquakes versus landslides versus floods. While we attempt to control for variation in the disasters' intensity by only including disasters which are quite large in scale, still it is possible that the treatment varies in scope as well as type. Given these possible limitations, we also implement a regression discontinuity design, which we now describe.

5.2 A Regression Discontinuity Approach

Our second methodology is a regression discontinuity (RDD) design, modeled on the approach used to estimate incumbency advantage (Lee 2008), but modified to assess whether incumbents who faced at least one natural disaster during their term of office and performed well during the emergency were more or less likely to be re-elected. The RDD strategy particularly as applied to incumbency advantage first identifies candidates who barely won and barely lost the election in time *t*, then compares each groups' electoral outcomes in time *t+1*. By assuming that the small margins of victory in time *t* are random, we can treat the barely winning and barely losing candidates as largely the same, except for the fact that the winning candidates become the incumbents. By doing so, we can isolate the causal impact of incumbency on electoral outcomes in time *t+1*.

We adjust the RDD methodology slightly in order to estimate the incumbency effect particularly among mayors who experienced a disaster and either had high or low spending after the fact. Put differently, we evaluate if the effect of incumbency varies depending on spending after a disaster. If voters respond to good performance after a disaster by rewarding the incumbent, then we would expect to find that barely-winning incumbents who spend well after a disaster would enjoy an electoral premium. We study voter responses to disasters by examining two electoral outcomes in time *t+1*: whether the barely-winning incumbent won re-election; and the change in their vote share margin compared to time *t*.

The estimation uses a triangular kernel and an optimal bandwidth originally proposed by Imbens & Kalyanaraman (2011) and further developed by Calonico, Cattaneo, & Titiunik (2014a). This approach allows for the best prediction right at the cut-off. We calculate the optimal bandwidth with the Stata package 'rdrobust' developed by Calonico, Cattaneo, & Titiunik (2014b), which applies heteroskedasticity-robust standard errors and a bias correction. We present estimates for symmetric bandwidths in the main text, though as a robustness check, we also include estimates at different assymetric bandwidths in Appendix E.

In order to compare different levels of performance after the disaster, we disaggregate the spending variable into different percentiles, where each percentile k corresponds to a dummy variable that takes the value 1 if the municipal expenditure was at or above the k percentile and 0 otherwise. To estimate our two outcome variables, we subtract the two equations below, which assess the outcome among incumbents who barely won and had a disaster (Equation 1), with those that barely won and did not have a disaster (Equation 2), for the same level k performance spending. All variables are defined as above. In addition, vector Φ_i are the set of covariates that may also affect whether an incumbent mayor wins re-election, which include district-level variables related to geography, socioeconomic status, budgets and political competition.

$$Outcome_{i,t+1} = \beta_{0,i} + \beta_1(Vote\ Margin_{i,t} > 0) + f(Vote\ Margin_{i,t}) + \beta'_{\Phi}\Phi_i + \epsilon_i \quad \text{if } Disaster_{i,t} = 1 \text{ and } Performance_{i,t} > p_k \tag{1}$$

$$Outcome_{i,t+1} = \beta_{0,i} + \beta_1(Vote\ Margin_{i,t} > 0) + f(Vote\ Margin_{i,t}) + \beta'_{\Phi}\Phi_i + \epsilon_i \quad \text{if } Disaster_{i,t} = 0 \text{ and } Performance_{i,t} > p_k \tag{2}$$

As a robustness check, we analyse the electoral outcomes of incumbents who did not experience a natural disaster but had high performance in terms of public spending. This allows us to be sure that the outcomes in our main analysis are not being driven by performance on its own, but rather by spending in the specific case of the disaster. Estimates are reported using first-order polynomials estimated on either side of the threshold value as suggested in Imbens and Lemieux (2008).

6 Results

6.1 Performance Spending and Re-election: DID Results

Table 2 depicts the main results for our difference-in-difference analysis. Because we care principally about evaluating our mechanism—whether electoral outcomes in disasters depend on how politicians manage the fall-out of the disaster—our main result is the variable "Disaster X Performance (ATT)", presented in Row 3. The variable is an interaction term between having a disaster and the mayor's performance in responding to the disaster after it occurred. The fact that the coefficient is positive and significant across both countries suggests that in districts with a large-scale disaster, mayors with better public spending are more likely to win re-election compared to mayors who experienced a disaster and did not spend well.

Importantly, it is not the case that voters are rewarding any mayor who presides over a disaster. As Row 1 shows, municipalities that face a disaster are no more likely to win or lose re-election than those who do not. Instead, the impact on re-election only occurs in those municipalities in which the mayors spent well after the disaster.

By standardizing the performance variable, we can compare the effect size across both countries. As Table 2 shows, an increase of one standard deviation in the variable "Disaster X Performance" increases the probability

Table 2: Performance Spending and Re-election: DID Results

Variables	**Chile**	**Peru**
Disaster	-0.064	0.001
	(0.043)	(0.022)
Performance	0.399***	0.007
	(0.101)	(0.013)
Disaster X Performance (ATT)	0.086**	0.037**
	(0.0411)	(0.018)
Number of observations	2,404	12,733
Municipality and Year FE	Yes	Yes
Covariates	Yes	Yes

Note: Standard errors in parentheses, clustered by municipality.
***p<0.01,**p<0.05,*p<0.1.

of re-election by about 8.6% in the case of Chile and about 3.7% in the case of Peru.[8] This result is consistent with the descriptive statistics in Table 1, which show that the probability of re-election of mayors in Chile is 2.9 times higher than in Peru. As will be discussed further in the conclusion, this is not surprising given the generally low rates of re-election of Peruvian mayors. The fact that voters are rewarding mayors who perform well in responding to disasters, even in a difficult setting like Peru, where anti-incumbent sentiment is high (Weaver 2021), suggests that our findings can be extrapolated to many settings.

Finally, as Row 2 shows, without accounting for a disaster, on average having higher spending increases the probability of re-election in Chile, but not in Peru. This is also consistent with the fact that Peruvian mayors face a large incumbency bias that is difficult to overcome even with good performance (Weaver 2021).

Finally, Appendix C shows the results of our robustness checks to evaluate that the parallel trends assumption—a key assumption of the difference-in-difference design—holds. We demonstrate parallel trends in our outcome both graphically, as Figure 5 shows, as well as with an events study model, depicted in Figure 7. Both approaches demonstrate that the parallel trends assumption holds across both of our countries.

6.2 Performance Spending and Re-Election: RDD Results

The results from our second methodology, the regression discontinuity design, are consistent with the difference-in-difference approach. Table 3 presents our main results for Chile. Recall that our key variable of interest is the interaction term between disaster and performance. Rows 2-4 of Table 3 present the interaction between having a disaster and spending at or above three different percentiles: 25th, 50th and 75th. The likelihood of winning re-election in a disaster is higher for each of the three percentiles, and the magnitude increases as

[8]The results obtained are small in magnitude, which is probably because we estimate the average treatment effect on the treated (ATT), though in the RDD exercise, we estimate the Local Average Treatment Effect (LATE).

the percentile increases. For example, spending at or above the 25th percentile increases the probability of re-election in disaster-ridden municipalities by about 41%, compared to incumbents without a disaster but with the same level of spending, but the increase is about 68% when the spending is at or above the 75th percentile. These results are consistent with the difference-in-difference design, where voters gave an electoral premium to mayors who spent well after the disaster.

Table 3: Chile RDD results: Performance Spending, Re-election and Margin of Victory at t+1

Variables	**Chile**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Disaster x Performance (P25th)	0.414**	0.144				
	(0.187)	(0.177)				
Disaster x Performance (P50th)			0.542**	0.288		
			(0.218)	(0.200)		
Disaster x Performance (P75th)					0.677***	-0.246
					(0.240)	(4.286)
Number of observations	486	190	303	117	134	51
Bandwidth (Symmetric)	0.09	0.08	0.08	0.05	0.09	0.07

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

In the RDD design, we test an additional outcome variable, the change in voteshare between the elections in time t and $t+1$. In the case of Chile, there is no statistically significant effect of disaster spending on the margin of victory $t+1$. In other words, though incumbents are more likely to win, they are not necessarily more likely to do so by increasing their margin of victory in a statistically significant way. Instead, they are winning by having about the same margin of victory on average as they did in the previous election.

Tables 4 and 5 show the results for Peru. Because Peru has so many municipalities, we have enough observations to disaggregate the performance spending into finer categories. In addition to the 25th, 50th and 75th percentiles we estimate for Chile, we also present the interaction term with spending at the 90th and 95th percentiles. Table 4 shows that incumbents who spend at the 25th, 50th and 75th percentile level are actually punished at the ballot box. However, as Table 5 shows, mayors who ramp up their spending to the 90th and 95th percentile receive an electoral advantage. The difference in results compared to Chile is not surprising, given that on average Peruvian mayors face an extreme incumbency disadvantage (Weaver 2021), such that they need incredibly high performance to overcome voters' anti-incumbent bias. Also consistent with that research is that fact that, though voters are more likely to vote for the incumbent, as the increases in voteshare margin show, that increase in support is ultimately not enough to ensure incumbents actually win re-election, as the insignificant result for the 'won re-election' outcome variable shows. Overall, and as in the case of Chile,

the RDD results for Peru are consistent with those from the difference-in-difference design, lending additional support to our findings overall.

Table 4: Peru RDD results (1): Performance Spending, Re-election and Margin of Victory at t+1

Variables	**Peru**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Disaster x Performance (P25th)	-0.435***	-0.157***				
	(0.053)	(0.032)				
Disaster x Performance (P50th)			-0.441***	-0.048		
			(0.074)	(0.039)		
Disaster x Performance (P75th)					-0.470***	-0.056
					(0.097)	(0.046)
Number of observations	3,312	1,101	2,301	751	1,349	455
Bandwidth (Symmetric)	0.10	0.07	0.08	0.03	0.08	0.06

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

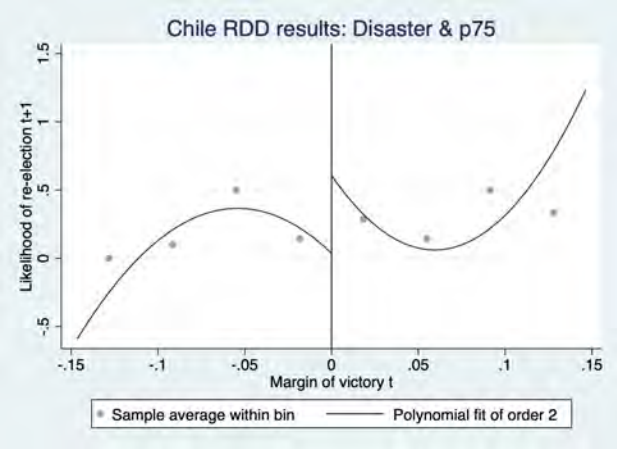
Table 5: Peru RDD results (2): High Performance Spending, Re-election and Margin of Victory at t+1

Variables	**Peru**			
Dependent Variable	Won	Margin	Won	Margin
Disaster x Performance (P90th)	0.119	0.171***		
	(0.153)	(0.062)		
Disaster x Performance (P95th)			0.153	0.249**
			(0.245)	(0.113)
Number of observations	583	186	295	100
Bandwidth (Symmetric)	0.05	0.03	0.04	0.03

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

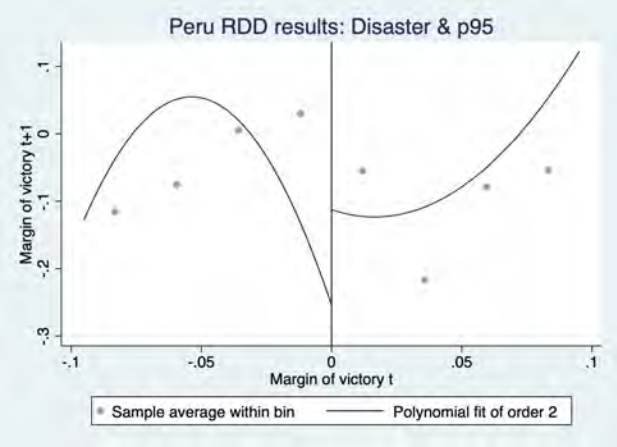
We also present these results graphically. Figure 3 shows the probability of reelection in Chilean municipalities that had a disaster and performance at the 75th percentile. The points to the left of the 0 vertical line represent the barely-lost challengers from time t whereas the points to the right represent barely-won incumbents. The large discontinuity shows that having a disaster and good performance generates a higher probability of reelection for incumbents. Similarly, Figure 4 depicts the results for Peru at the 95th percentile of spending performance, and shows a large positive premium for incumbents who perform well in disaster municipalities.

Figure 3: Chile: Likelihood of Reelection in Municipalities with Disasters and Good Performance (75th percentile)



Note: Graphs constructed with rdrobust and polynomial of order 2.

Figure 4: Peru: Margin of Victory in t+1 in Municipalities with Disasters and Good Performance (95th percentile)



Note: Graphs constructed with rdrobust and polynomial of order 2.

As a robustness check, we evaluate the impact of performance on incumbent re-election in the case of mayors that did not experience a disaster, in order to show that our results are driven by spending in the particular case of disasters, and not by spending overall. Tables 9 and 10 in Appendix D show the impact of performance across different percentiles on the probability of reelection of mayors with no disaster during their term of office.

In the case of Chile (Appendix D Table 9), spending at the 25th and 50th percentiles does increase the likelihood of barely-won incumbents being re-elected, but the magnitude of the coefficient is much lower than

in the case of spending in disasters (0.195 and 0.299 compared to 0.414 and 0.562 respectively). Spending at the 75th percentile has no impact on the likelihood of re-election in non-disaster municipalities.

Appendix D Table 10 presents the same results for Peru. Consistent with the presence of an extreme incumbency disadvantage (Weaver 2021), even incumbents who spend well are more likely to lose re-election and to decrease their voteshare margin compared to the candidates they originally barely beat (the challengers). This holds for all of the levels of spending. In contrast, in the specific case of municipalities that face disasters, voters do give an electoral premium to barely-won incumbents who perform well.

7 Conclusion

Responding to large-scale emergencies, be they related to health, weather or other natural disasters, are increasingly a key domain of government action. Particularly due to the effects of climate change, we know that large-scale disasters will only worsen. What we are unsure about, however, is their potential political effects. In particular, given that politicians will be increasingly responsible for mitigating the impact of these catastrophes, it would be useful to know the extent to which voters will reward or punish politicians for the way they manage disasters.

A relatively large literature on electoral accountability could offer insights, though the results are mixed in terms of the extent to which voters actually do reward or punish incumbents for their behavior in office. Furthermore, relatively few studies ask whether voters sanction for performance specifically in terms of responding to a large-scale disaster, and at the most local level of government, leaving the empirical question largely unanswered.

We tackle this puzzle using a robust estimation strategy that treats natural disasters as exogenous, then estimates how voters respond to politicians' performance in managing these shocks. In particular, we use both a difference-in-difference and regression discontinuity design to estimate voter sanctioning of disaster-related performance. We offer compelling evidence that voters reward mayoral incumbents who effectively manage the fall-out from large-scale disasters. In both Chile and Peru, using data from multiple electoral periods and a range of types of natural disasters, we find that mayors who ran for re-election after facing a disaster during their term in office were much more likely to win re-election if they performed well in spending public funds to respond to the disaster.

Furthermore, the extent of our analysis across geography, time and type of disaster provides support for our contention that voters' response to good disaster management would likely extend to settings outside of those

we study. This is especially true given our results hold across two very different countries: Peru and Chile. These countries share institutional features that are key to our empirical strategy, namely the structure of local governance, mayoral re-election, reliance on the central government for funding, and decentralized disaster response. Where they differ is in voters' tendency toward rewarding incumbents. Chile offers an easier test of the prospect of electoral sanctioning, given that about two-thirds of incumbents who run for re-election are successful. In contrast, Peru offers a hard test in the sense that incumbents face extreme bias and a large incumbency disadvantage (Weaver 2021), with only about half the rate of victory as their Chilean counterparts. As such, if voter sanctioning for disaster response works here, that suggests the theory has high explanatory power and should work in many other cases as well.

PUT THIS INTO THE INTRO ALSO Our findings have implications for how we understand democratic accountability, particularly at the most local level of government. Our paper highlights the importance of considering how voters respond differently to distinct aspects of performance. Given that natural disasters are on the rise, it is crucial to study how voters respond to them, rather than inferring voter behavior based on accountability studies focused on other aspects of performance. Furthermore, the paper helps qualify the research on voters' "irrational" sanctioning of politicians for outcomes beyond their control. While it may seem from first glance at the data that voters punish politicians when a disaster occurs, our more nuanced analysis shows that actually voters are sophisticated in evaluating politicians for what they can control—their response to the exogenous shock.

In addition, these results and their generalizability have important policy implications for how we think about incentivizing quality government responses to disasters. As we can only expect such large-scale disasters to rise, we need to understand voters' expectations of, and responses to, politicians' efforts to manage the fall-out from these catastrophes. Of particular importance is knowing whether or not voter sanctioning of poor performance may offer a mechanism via which politicians can be incentivized to focus their energy and attention on offering relief and rebuilding after disasters occur. Our results suggests that electoral dynamics offer an important incentivizing tool to ensure governments respond well to the ever increasing numbers of local disasters occuring under their watch.

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Appendices

A Descriptive Statistics for Chile and Peru

Table 6: Descriptive Statistics - Peru

	Peru				
Variable	**Description**	**Obs.**	**Mean**	**Std. Dev.**	**Source**
Dnsdd	Population density	12,867	434.072	2364.007	Census
rural	Rural population (%)	12,833	0.537	0.304	Census
altr	Altitude	12,849	2448.136	1439.597	MINEDU
lttd	Latitude	12,849	-10.961	3.566	MINEDU
Vtdff	Margin of victory	12,849	0.092	0.090	JNE
prcvts	Winning voteshare (%)	12,867	0.352	0.101	JNE
prtcpcn	Voter turnout (%)	12,867	0.864	0.045	JNE
trnsfOTpc	Discretionary transfers per capita	12,867	901.027	1432.865	MEF
trnsfORpc	Per cap. transfer, regular resources	12,867	264.109	586.418	MEF
nativ	Indigenous population (%)	12,833	0.307	0.358	Census
educ	Avg. years of education	12,833	5.676	1.493	Census
wrk	Population employed (%)	12,833	0.284	0.114	Census
hdi	Human development index	12,849	0.266	0.090	UNDP
emp	Number municipal employees	11,904	30.874	107.099	RENAMU
costa	Muni. located on the coast	12,849	0.402	0.490	Census
sierra	Muni. located in Andes Mountains	12,849	0.472	0.499	Census
selva	Muni. located in Amazon Rainforest	12,849	0.124	0.330	Census

Source: Own elaboration. Census: 2007 Peruvian census. MINEDU: Ministry of Education.
JNE: National Elections Board (*Jurado Nacional de Elecciones).* MEF: Minsistry of Economics and Finance.
UNDP: United Nations Development Program.
RENAMU: National Registry of Municipalities *(Registro Nacional de Municipalidades)*

Table 7: Descriptive Statistics - Chile

	Chile				
Variable	**Description**	**Obs.**	**Mean**	**Std. Dev.**	**Source**
gdppc	Real GDP per capita	3,101	869.444	2906.143	BC
gttlpc	Total expenditure per capita	3,089	332.184	562.058	SINIM
trnscmn	Community transfers per capita	3,088	2.337	4.943	SINIM
pmu	Discretionary transfer from the national level	2,760	238249.2	365039.2	SINIM
grwth	GDP growth rate	3,101	0.029	0.040	BC
rrhh	Human resources expenditure / total expenditure	3,089	28.916	7.503	SINIM
dnsdd	Population density	3,001	873.598	2637.774	INE
efcc	Efficiency in commercial tax collection	2,929	82.548	13.165	SINIM
defct	Budgetary deficit	3,089	99.098	80.649	SINIM
p1mun	Percentage of winning votes	3,101	52.418	10.761	SERVEL
exprnc	Mayor's experience	3,101	5.484	4.840	SERVEL
mcrzn	North, central, south or southern macro-area	3,105	2.462	0.804	INE
consjls	Municipal councillors	3,101	6.320	0.873	SERVEL
listprtd	List of political parties	3,101	3.306	0.744	SERVEL
partdpltc	Competing political parties	3,101	4.967	0.914	SERVEL

Source: Own elaboration. BC: Central Bank of Chile *(Banco Central de Chile)*.
SINIM: National Municipal Information System *(Sistema Nacional de Información Municipal)*.
INE: National Statistical Institute *(Instituto Nacional de Estadisticas)*.
SERVEL: Electoral Service of Chile *(Servicio Electoral de Chile)*.

B Timing of Data Included in Chile and Peru

Table 8 depicts the years included in our study, and indicates which year of the administrative term the data and re-election matches up to. In the case of Peru, we include 2 re-elections: 2010 and 2014. For Chile, we include 3 re-election contests: 2008, 2012 and 2016. Note that for election years, we exclude from the dataset any disaster that occurs during the months when mayors can officially declare their re-election bid as well as the time period of the election itself.

Table 8: Period of Analysis and the Electoral Cycle in Chile and Peru

Peru			**Chile**		
Years	**Political Cycle**	**Months**	**Years**	**Political Cycle**	**Months**
2007	1st year	Jan.-Dec.	2008	Election year	Jan.-Jul.
2008	2nd year	Jan.-Dec.	2009	1st year	Mar.-Dec.
2009	3rd year	Jan.-Dec.	2010	2nd year	Jan.-Dec.
2010	Election year	Jan.-Jul.	2011	3rd year	Jan.-Dec.
2011	1st year	Jan.-Dec.	2012	Election year	Jan.-Jul.
2012	2nd year	Jan.-Dec.	2013	1st year	Mar.-Dec.
2013	3rd year	Jan.-Dec.	2014	2nd year	Jan.-Dec.
2014	Election year	Jan.-Jul.	2015	3rd year	Jan-Dec.
			2016	Election year	Jan.-Jul.

Source: Own elaboration.

C Difference-in-Difference Robustness Checks: Parallel Trends Assumption

A key assumption behind the difference-in-difference design is that the treatment and control groups exhibit "parallel trends" in the outcome variable prior to treatment. Figure 5 demonstrates how the parallel trends assumption holds across both of our countries. The plot shows the likelihood of winning re-election for control and treated municipalities before and after the election year, where treated municipalities are defined as having experienced a natural disaster at any time before the election year. As the graph shows, control and treated municipalities exhibit the same pre-treatment trends in both countries.

Figure 5: Parallel Trends: Likelihood of Re-election

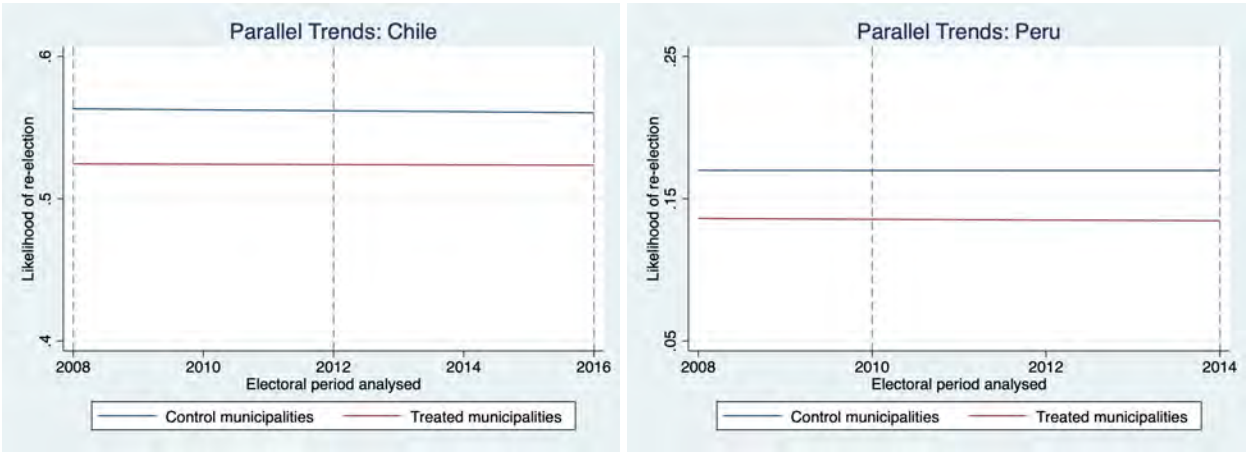
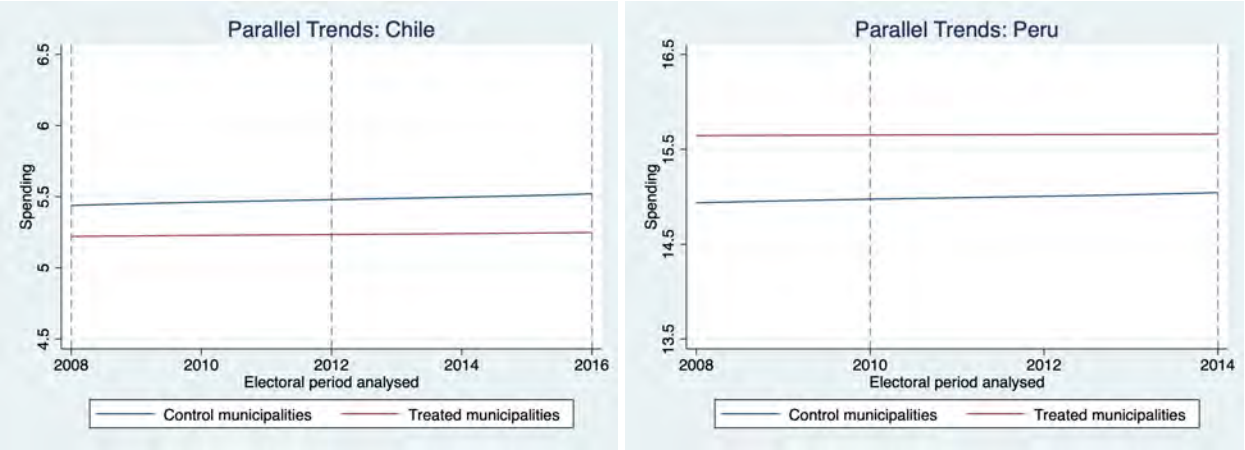


Figure 6 displays trends for the other key variable in our study, total spending, for control and treated municipalities for the time period. As with our treatment outcome, the plot displays that the parallel trends assumption holds in both countries.

Figure 6: Parallel Trends: Spending



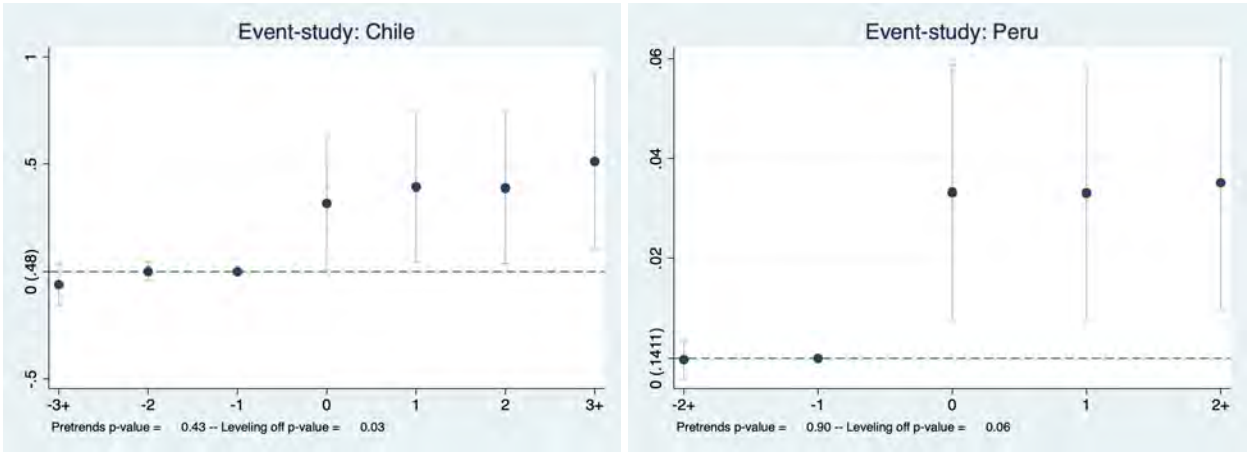
We also asses the parallel trends assumption using a second methodology, an event study model which, unlike difference-in-difference, is saturated with leads and lags based on the time of treatment (Cunningham, 2020). We estimate the following model:

$$Won\ reelection_{it} = \gamma_t + \gamma_i + \sum_{\tau=-q}^{-1} D_{it} + \sum_{\tau=0}^{m} D_{it} + \Theta X_{it} + \varepsilon_{it} \quad \text{if } Disaster_{i,t} = 1$$

$$\text{and } Performance_{i,t} > p_k$$

In this specification, treatment occurs in year 0, and q leads, or pre-treatment effects, and m lags, or post-treatment effects, are included. D_{it} is the treatment of both having a natural disaster and spending public funds on the likelihood of being reelected. Figure 7 illustrates the results of the model, visually demonstrating whether there are differences between the treatment and control groups in the pre-treatment period. The graph shows that the pre-treatment coefficients are almost on the zero line, and their standard errors are very small, suggesting that the difference between the two groups before treatment is zero. It is only after treatment, which occurs at time 0, that the groups diverge. Thus this second methodology also supports our contention that the parallel trends assumption holds in both of our countries.

Figure 7: Parallel Trends: Likelihood of Re-election



D Regression Discontinuity Design (RDD) Robustness Checks: Results in Non-disaster Municipalities

In order to discount the possibility that our results are driven by voters' response to performance in general, rather than to performance in disasters specifically, Tables 9 and 10 show the impact of spending on electoral outcomes only among municipalities that did not face a natural disaster. In the case of Chile, while there is a positive relationship between performance and re-election for the 25th and 50th percentiles, the effect size is much lower in magnitude than it was in the municipalities with a disaster (.195 and .299 compared to .414 and .562 respectively). The impact of performance in non-disaster municipalities is not significant at the 75th percentile, in contrast to the positive and significant results for mayors presiding over a disaster. In Peru, the likelihood of re-election is negative on average for all performance levels in non-disaster municipalities (Table 10). This is in contrast to the case of mayors with disasters, where higher spending improved their electoral prospects. Overall, across both countries, these results suggest that there is an electoral premium to performance that is specific to disasters, rather than to performance more broadly.

Table 9: Chile RDD Results in Municipalities With No Disaster

Variables	**Chile**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Performance (P25)	0.195*	0.088				
	(0.106)	(0.068)				
Performance (P50)			0.299**	0.114		
			(0.116)	(0.200)		
Performance (P75)					0.207	0.05
					(0.168)	(0.066)
Number of observations	1391	530	887	373	665	197
Bandwidth (Symmetric)	0.10	0.16	0.16	0.11	0.16	0.13

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

Table 10: Peru RDD Results in Municipalities With No Disaster

Variables	**Peru**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Performance (P75)	-0.241***	-0.066**				
	(0.057)	(0.024)				
Performance (P90)			-0.456***	-0.194***		
			(0.094)	(0.041)		
Performance (P95)					-0.931***	-0.421***
					(0.087)	(0.046)
Number of observations	3604	1257	1423	482	731	232
Bandwidth (Symmetric)	0.09	0.10	0.06	0.05	0.03	0.05

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

E Regression Discontinuity Design (RDD) Robustness Checks: Results with Asymmetric bandwidths

In the main text, we present our results using optimal symmetric bandwidths, so as a robustness check, here we demonstrate how the results are the same even when allowing for the optimal bandwidths to be asymmetric, meaning having different values above and below zero. The final row in each of the tables shows the bandwidth used, and in addition to the results being consistent, in some cases, the optimal bandwidth is symmetric, even when allowing for an assymetric bandwidth to be identified.

Starting with the case of Chile, Tables 11 and 12 show the RDD results with asymmetric bandwidths, both for municipalities that experienced natural disasters (Table 11) and for those that did not (Table 11). The results are consistent with the symmetric bandwidths presented in Table 3 in the main text and Table 9 in Appendix D, respectively. For example, the estimation with asymmetric bandwidths indicates that municipalities with a natural disaster and a high level of expenditure (75th percentile) had on average a 52% probability of being re-elected, which is consistent with Table 3 (estimation with symmetric bandwidth in the main text), which shows that the probability of re-election is 67% for municipalities with a disaster and high performance (75th percentile).

Table 11: Chile RDD results: Disaster and Performance with Asymmetric Bandwidths

Variables	**Chile**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Disaster x Performance (P25)	0.275*	0.127				
	(0.155)	(0.171)				
Disaster x Performance (P50)			0.278	0.273**		
			(0.185)	(0.114)		
Disaster x Performance (P75)					0.520**	0.240
					(0.208)	(3.515)
Number of observations	486	190	303	117	134	51
Bandwidth (Asymmetric)	0.12-0.11	0.07-0.08	0.10-0.09	0.05-0.05	0.08-0.09	0.07-0.07

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

We conduct the same analysis for the case of Peru, and find that our results also hold. Tables 13, 14, and 15 present the RDD results using asymmetric bandwidths, both for municipalities that experienced natural disasters (Tables 13 and 14) and for municipalities that did not experience a disaster (Table 15). The results are consistent with the RDD results using symmetric bandwidths, as shown in Tables 4 and 5 in the main text and Table 10 in Appendix D.

Table 12: Chile RDD Results in Municipalities With No Disaster: Asymmetric Bandwidths

Variables	**Chile**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Performance (P25)	0.193**	0.065				
	(0.089)	(0.061)				
Performance (P50)			0.280**	0.095		
			(0.09)	(0.069)		
Performance (P75)					0.097	0.072
					(0.134)	(0.059)
Number of observations	1301	530	887	373	665	197
Bandwidth (Asymmetric)	0.16-15	0.08-0.10	0.16-15	0.09-0.11	0.12-0.12	0.10-0.13

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

Table 13: Peru RDD results (1): Disaster and Performance with Asymmetric Bandwidths

Variables	**Peru**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Disaster x Performance (P25)	-0.423***	-0.144***				
	(0.047)	(0.027)				
Disaster x Performance (P50)			-0.434***	-0.091***		
			(0.065)	(0.030)		
Disaster x Performance (P75)					-0.456***	-0.078**
					(0.085)	(0.039)
Number of observations	3,312	1,101	2,301	751	1,349	455
Bandwidth (Asymmetric)	0.1-0.08	0.09-0.07	0.08-0.07	0.04-0.03	0.08-0.08	0.06-0.06

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

Beginning with Table 13, we see that mayors who presided over a disaster were less likely to win re-election at the 25th, 50th, and 75th percentile performance levels, just as in Table 4 in the main text. The main difference is that these mayors were also more likely to have a lower voteshare margin in time $t + 1$ using assymetric bandwidths, while the voteshare margin variable was insignificant for two of the performance levels using symmetric bandwidths.

Table 14 examines mayors who with much better spending (90th and 95th percentiles) in disaster-struck municipalities. The results are the same as in Table 5 in the main text. In both cases, mayors with high spending are more likely to improve their voteshare relative to the previous election, though the increase is not enough to make them more likely to win. As we discussed in the main text, this result is not surprising, given the extreme anti-incumbent bias Peruvian mayors face (Weaver 2021).

Finally, Table 15 presents the results using assymetric bandwidths among those municipalities that did not experience a disaster. The results are consistent with those estimated using symmetric bandwidths, presented in Table 10 in Appendix D. In both cases, incumbents are both more likely to lose and more likely to have a lower voteshare margin at the three performance spending levels (25th, 50th and 75th percentiles).

Table 14: Peru RDD results (2) High Performance Spending: Disaster and Performance with Asymmetric Bandwidths

Variables	**Peru**			
Dependent Variable	Won	Margin	Won	Margin
Disaster x Performance (P90)	0.073	0.174***		
	(0.133)	(0.047)		
Disaster x Performance (P95)			0.094	0.210***
			(0.216)	(0.095)
Number of observations	583	186	295	100
Bandwidth (Asymmetric)	0.05-0.05	0.03-0.03	0.05-0.04	0.037-0.037

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.

Table 15: Peru RDD Results in Municipalities With No Disaster: Asymmetric Bandwidths

Variables	**Peru**					
Dependent Variable	Won	Margin	Won	Margin	Won	Margin
Performance (P75)	-0.226***	-0.082***				
	(0.052)	(0.0022)				
Performance (P90)			-0.389***	-0.155***		
			(0.073)	(0.035)		
Performance (P95)					-0.809***	-0.380***
					(0.074)	(0.026)
Number of observations	3,604	1,257	1,423	482	731	232
Bandwidth (Asymmetric)	0.09-0.09	0.08-0.07	0.06-0.06	0.06-0.05	0.03-0.03	0.05-0.05

Note: Robust standard errors in parentheses ***p<0.001,**p<0.01,*p<0.05.