# Voter Response to Natural Disaster Aid: Quasi-Experimental Evidence from Drought Relief Payments in Mexico

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and

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ABSTRACT

The paper estimates the effects on presidential election returns in Mexico of a government climatic contingency transfer that is allocated through rainfall-indexed insurance. The analysis uses the discontinuity in payments that slightly deviate from a pre-established threshold, based on rainfall accumulation measured at local weather stations. It turns out that voters reward the incumbent presidential party for delivering drought relief compensation. The paper finds that receiving indemnity payments leads to significantly greater average electoral support for the incumbent party of approximately 7.6 percentage points. The analysis suggests that the incumbent party is rewarded by disaster aid recipients and punished by non-recipients. The paper contributes to the literature on retrospective voting by providing evidence that voters evaluate government actions and respond to disaster spending.

Keywords: Disaster Spending, Voting, Regression Discontinuity, Political Accountability.
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## 1. **Introduction**

Are there electoral returns to government disaster aid? This is a central question in terms of political accountability in democratic societies and has recently attracted scholarly attention in political economy.

Identifying the effect of government transfer policies --such as disaster relief-- on individual political behavior is a challenging task. A growing literature provides empirical evidence of a positive electoral effect of government provision of economic benefits (Manacorda, Miguel and Vigorito 2011; Pop-Eleches and Pop-Eleches 2009; Litschig and Morrison 2012; Rodriguez-Chamussy 2014). However, assessing voter response to compensation received after a natural contingency imposes additional difficulties. In effect, empirical studies trying to test voter responsiveness to disaster aid face at least three types of problems. First, the targeting of relief action and resources may not be exogenous as politicians might target public resources towards swing voters or channel resources to core supporters as a reward for their loyalty. Second, even when the natural shock producing adverse effects for the population may be exogenous, the extent of the damages and losses is potentially endogenous as vulnerability to natural catastrophes may differ among localities and populations. Finally, there are several confounding factors interacting with government disaster spending (media coverage, actions of NGOs and volunteer aid) and some of these may cancel out estimates of a potential effect of relief transfers.

In this paper we use a quasi-experimental approach to provide evidence on the electoral effect of government economic transfers as compensation for the damage caused by a natural shock: severe drought on rain-fed agricultural regions. Exploiting the discontinuity in payment of a government funded climatic contingency aid program in Mexico, we show that voters reward the incumbent presidential party for delivering drought relief compensation. Our estimates suggest 7.6 additional percentage points for the presidential incumbent's share of votes in those electoral sections that received government transfers six to nine months before the election.

Our study builds on the empirical literature about electoral accountability and retrospective voting by providing at least two key contributions. First, we analyze a specific policy that provides indemnity payments to small-scale farmers if the amount of accumulated rainfall within a specific time period falls below an exogenous and pre-established threshold. This allows the use of a quasi-experimental approach --using regression discontinuity design-- to credibly identify causal effects of government transfers on electoral results. Moreover, studying the case of the Mexican Weather Indexed Insurance (WII) allows us to compare voter response in areas that have similar and comparable levels of vulnerability. Second, we collected, constructed and use electoral data at the lowest aggregation level: the electoral section. As already described, the multiple confounding factors that potentially make it difficult to identify an effect of disaster spending even with the use of panel data are minimized in our setting as we use small units of analysis and compare electoral outcomes of a single election. To the best of our knowledge, this is the first study that exploits the key features of a weather-indexed insurance scheme using GIS methods to produce a complete dataset allowing the empirical test of voter response to government disaster spending.

Evidence in the context of developing countries is very limited with the exception of India (Cole, Healy and Werker, 2012). Our findings complement the existing literature and are consistent with the results in previous studies for the US context (Healy and Malhotra 2009, Chen 2013) and Germany (Bechel and Hainmueller, 2011).

Some have argued that voters are not collectively rational as they often respond to situations that are beyond politicians' control such as economic crises or natural disasters. For example, Achen and Bartels (2004) --using historical data from the US-- find that voters punish incumbent governments for shark attacks and droughts, as long as they can find some "psychologically appealing connection" linking disaster and government.[2] Similarly, Cole, Healy and Werker (2012) --using the quality of the monsoon rains as an exogenous shock to welfare-- examine voters' decisions in state elections in India and confirm that elected officials fare worse when natural disasters strike. They show that, on average, incumbent parties that run for reelection get punished for bad weather, losing more than three percent of the vote for each standard deviation that district level rainfall deviates from its optimum level. However, they also confirm that incumbents fare better when they respond to disasters with emergency relief: disaster relief increases lead to voters' rewards.

[2] They focus on American historical electoral politics in the early 20th century and use the particular case of President Wilson's reelection.

Bechtel and Haimuller (2010) explore the short and long-term electoral returns to disaster aid using the 2002 Elbe flooding in Germany as a natural experiment. Their findings extend previous results by Healy and Malhotra (2009) who show that voters reward incumbents for disaster relief but not for the more efficient disaster preparedness spending.

Our paper also relates to a different set of literature using quasi-experimental methods to show electoral response to government transfers. In general, these aim at providing empirical evidence in support of leading political economy theories that focus in trade-offs between consumption and political ideology. For example, Manacorda, Miguel and Vigorito (2011) estimate the causal effect of government transfers on political support for the incumbent party using data from Uruguay's conditional cash transfer program called PANES. Arguing that PANES' assignment near the threshold was as "good as randomly assigned", they find that beneficiaries were between 25 and 33 percentage points more likely than non-beneficiaries to favor current government. In addition, they find that the effect of government transfers on political support is significantly larger among poorer households and among those near the center of the political spectrum as they are less attached to extreme political ideologies. In a similar study, Pop-Eleches and Pop-Eleches (2009) analyze the case of a Romanian program that awarded low income families with school age children vouchers for purchasing new personal computers and find that it had a significant impact on political attitudes and electoral behavior. In particular, voucher recipients were more likely to report vote intention in upcoming elections, and governing parties reaped most of the benefits of increased participation. They also find some evidence of vote switching from the main opposition party to the current incumbents and this effect was substantially stronger in towns where the governing parties controlled the local government.

This paper is structured as follows: Section 2 briefly describes the electoral context in Mexico and the Weather Index Insurance program. Section 3 presents the data. Section 4 discusses the statistical methodology and presents the main results. Finally, section 5 discusses the implications of the results found from the perspective of the study of political behavior and voter responsiveness to relief aid after a natural disaster.

## 2. The Context

Weather shocks are one of the main causes of rural households' income fluctuations, which often destroy assets and translate into changes in consumption levels. In particular, drought periods can have significant environmental, agricultural, health, economic and social consequences. Additionally, these shocks tend to affect poor rural households in a much harsher way as they are not only closer to subsistence, but tend to live in more vulnerable locations and are particularly dependent on the weather as agriculture is their main source of income.

According to the Mexican Ministry of Agriculture, around 80 percent of catastrophic risks in Mexican agricultural settings are caused by droughts. Consequently, in 2003 the Mexican Federal Government, through the Ministry of Agriculture, introduced a Weather Index Insurance (WII) scheme. The insurance's objective is to support small-scale farmers (i.e. owning 20 hectares or less) that "suffer atypical climatic contingencies, particularly droughts, get reincorporated into their productive activities". Insurance coverage is exclusively provided by Agroasemex, a national insurance institution formed in 2001, and insures what the Ministry of Agriculture considers the country's main crops produced under rain-fed agriculture: maize, beans, sorghum and barley.

Agroasemex acknowledges the relation between soil quality, crop growth and accumulated rainfall to design WII's schemes, tailoring policies for specific crops and regions to maximize the correlation between drought-induced harvest failure and indemnity payments. WII's coverage universe consists of crops that use rain as the main humidity input, and indemnity payments are provided if rainfall at any of the three stages that conform the production season fall below the pre-established threshold measured in millimeters through local weather stations. National and State governments provide resources from their annual budgets to purchase insurance premium. Individual farmers do not have to pay in order to get rainfall index insurance. They become automatically enrolled if they live within the insured regions (usually several kilometers around the specific weather station).

Although WII was designed as individual producer insurance for small-scale farmers, it could be argued that Agroasemex in fact insures federal and state governments' budgets. In other words, Agroasemex's WII serves as a state government budget risk management tool since it allows annual budget planning to minimize the risk of catastrophic expenditure should severe droughts occur. Nevertheless, Agroasemex's WII affects individual producer's behavior: even when farmers pay nothing to get insurance coverage (premiums are paid through a direct government subsidy), they become automatically insured and get verbally informed about their coverage status through officials at the Program for Direct Assistance in Agriculture (PROCAMPO) regional offices (Rural Development Support Centers (CADER) or in the "Ventanillas Autorizadas" depending on plot location and county).

Evidence of farmer's program awareness was provided by the Ministry of Agriculture in 2009 through WII's program external evaluation written by a local based University. The document describes that a subset of randomly selected farmers were surveyed and asked about their awareness and knowledge of WII. Among those who were interviewed, 98% knew about WII's existence, and over 80% said they would be willing to pay in order to get insurance against droughts if the government did not provide it.

To elaborate the way in which weather index insurance works, we use two counties of the state of Guanajuato and for the case of maize production in Figures 1.a. and 1.b. Agroasemex offers the following contract for insuring maize in the selected counties (Apaseo el Alto and Salamanca): the first period, also known as the sowing period, runs from May 15 to July 5; the second period, known as the growing or flowering period, goes from July 6 to August 20; and the third, or harvesting period, from August 21 to October 31. The minimum amount of accumulated rain above which Agroasemex does not provide indemnity payments --known as the trigger threshold-- equals 43, 80 and 60 millimeters for the end of the first, second and third periods, respectively. There were no indemnity payments in Apaseo el Alto, since accumulated rainfall was higher than the minimum thresholds at the end of each and every period of 2005. However, indemnity payments were provided in 2005 for maize production in the county of Salamanca as accumulated rainfall was lower than the sowing end-period's minimum threshold. To get this information, Agroasemex takes advantage of existing and publicly available rainfall information from weather stations of the National Water Commission. Although there are more than 5,000 weather stations in the country, WII only uses a subset since not every weather station attains international standards and have more than 25 years of daily information, necessary to predict rain patterns.

WII was first piloted in five counties of the Mexican state of Guanajuato in 2003. In the following years, it expanded to other counties and states reaching more than 15% of the country's rain-fed agricultural land in 24 states in 2008 (close to 1.9 million hectares). The first year in which Agroasemex made indemnity payments was 2005 when it reached 15 states.

In 2005, the year previous to the elections for President, 478,000 farmers in 107 municipalities were covered by WII and 115 weather stations were used for rainfall measurement. A total of US $9,553,000 in claims was paid. WII operational guidelines state that the minimum payout is US $82 per hectare for up to 5 hectares of land per farmer, which implies a maximum payout of $410 per farmer.[3]

## 3. Data

The smallest unit of analysis for which information on drought relief payments and electoral data can be matched is the "electoral section". An electoral section is a geographical unit grouping poll stations with an average of a thousand voters registered. By using GIS techniques we are able to match electoral sections in municipalities covered by the WII program to rainfall based on the geographic location on the weather stations.

The data used for the analysis come from four main sources. First, we use administrative data from de Ministry of Agriculture regarding WII's coverage. These data include municipality level coverage information in terms of weather stations used, insured crops (maize, beans, sorghum and barley), number of hectares insured, value of insured production, value of the premium paid, and indemnity payments (in case a drought occurred). It is worth clarifying that this information is available and used at the weather station/municipality levels. To be explicit, we have information regarding the number of hectares covered --as well as value of production and premiums paid-- by weather station for each crop in each municipality. There are cases in which there is more than one

[3] Hazell et al (2010).

weather station in the municipality, and we have information at the weather station. Similarly, there are cases in which one weather station --located close to a municipality boarder-- provides information to insure crops in more than one municipality. In these cases, we have information of the number of hectares covered --as well as value of production and premiums paid-- by each weather station in each municipality. The second source of data is the National Water Commission; the data consist of daily rainfall measures in millimeters for every weather station in the country from January 2004 until December 2008. Third, we use the geographic location data of electoral sections obtained from the Department of Cartography of the Federal Electoral Institute. Finally, data on the outcomes of Presidential elections in 2000 and 2006 by electoral section are public from the Federal Electoral Institute (IFE) website. In addition to these, we use complementary information on socio-demographic characteristics of municipalities from the 2000 Population Census and the 2005 Short Census or *Conteo*, publicly available from the National Institute of Statistics (INEGI) website.

Combining these data, we construct a dataset with the electoral section as the unit of analysis. We first identify the municipalities covered by the WII program and the weather stations used for each municipality. Municipalities in Mexico vary largely in size and population. In order to identify insurance coverage of beneficiaries that live close to the electoral sections -within each municipality- we use the distance from the weather station as a criterion to select electoral sections in our dataset. Using a 2006 GIS map of electoral sections, we calculate the distance from the weather station to the nearest frontier of the geographic polygon of an electoral section. For those cases in which more than two weather stations serve a single municipality we use the distance from the electoral section to the nearest weather station. Finally, we construct our dataset including only those electoral sections that are within a defined maximum distance from the weather station. Using the map of the State of Guanajuato, Figures 2.a and 2.b illustrate with an example the process of constructing the dataset.

We need to limit our analysis to the electoral units in the vicinity of the weather stations based on two reasons: First, to ensure that we are studying units that in fact contained insurance beneficiaries and, second, to minimize measurement error given that as the distance from the electoral section to the weather station increases, the probability of difference between the rainfall measure and the real conditions in the field increases (spatial basis risk). To define the benchmark distance for selection we identify the distance at which two criteria are simultaneously met: a) There is no overlap of weather stations in order to avoid a case in which the same unit would be matched with rainfall data twice, thus duplicating one observation and, b) Each municipality covered by the WII program would have at least one electoral section included in our dataset.

Our dataset contains 1,198 electoral sections located at a maximum distance of the defined benchmark distance of 2,131 meters from the corresponding weather station. For approximately 10% of these observations we are not able to match the results of the 2000 Presidential elections since the map of electoral sections was modified between 2000 and 2006. We therefore use for the analysis 1,038 units comparable for the two elections. Summary statistics are described in Table 1. We observe that 30% of the observations received monetary compensation for drought during the 2005 agricultural season.

The share of votes for the incumbent party is the key dependent variable; it is calculated as the number of votes obtained by the incumbent party relative to the total number of valid votes casted in each electoral section.

The measure of rainfall is normalized using the threshold established for insurance payments. Figure 3 shows each unit's rainfall deviation from the thresholds and whether or not drought relief compensation was received in 2005. As we can observe, all electoral sections covered by the government program did receive the payment when accumulated rainfall at the end of the sub-period fell below the established threshold. Conversely, those units that were covered by the program but had rainfall levels above the threshold did not receive any payment.

## 4. Empirical Strategy and Results

In 2005, the Mexican Federal Government, after receiving indemnity payments from Agroasemex, delivered more than 9 million US dollars in drought compensation payments. Provided that the Weather Index Insurance program was designed to allocate indemnity payments according to a strictly defined pre-established rainfall cutoff, we employ a regression discontinuity (RD) design to compare outcomes across electoral sections that were covered during 2005 by the insurance program and had similar levels of rainfall but differed in whether they experienced government aid in the form of a monetary transfer or not. This enables us to address the possibility of omitted variable bias between recipients of relief compensation and their counterparts who experienced a drought but did not qualify for compensation.

The basic regression model used through the analysis is given by equation (1):

$$Vote_i = \delta BelowCutoff_i + f(rainfall_i) + \beta X_i + \varepsilon_i \quad (1)$$

where $Vote_i$ represents the electoral outcome of interest --the share of votes for the incumbent party-- in the electoral unit $i$. $BelowCutoff_i$ is an indicator variable equal to 1 if the accumulated rainfall during each sub-season[4] is less than the minimum cutoff for the program, and 0 otherwise. The main coefficient of interest in the analysis is δ, which indicates the effect of being in an area that corresponds to receiving government aid after a drought on the relevant outcome. The term $f(rainfall_i)$ denotes a smooth function of rainfall, which is the forcing variable in the context of this regression discontinuity design.

Finally, $X_i$ includes a set of control variables such as a dummy for each state, municipality average per capita income, average temperature measured by weather station, distance from the electoral section to the weather station, distance to the nearest river and distance to the *cabecera*.[5] Although units on each side of the discontinuity experienced similar rainfall levels, it is important to include these control variables since they are not necessarily geographically located next to each other. Table 1 shows that units in which payments were disbursed are located in wealthier municipalities but all other characteristics do not appear to be statistically different for electoral sections below and above the cutoff. Particularly, the average share of votes for the Presidential incumbent in the previous election --year 2000-- is not statistically different for the two groups.

[4] It is worth mentioning that every indemnity payment was triggered due to lack of sufficient rainfall within the sowing sub-season.
[5] "Cabecera" refers to the Municipal seat. It generally corresponds to the biggest town in the municipality and the better connected in terms of transportation and information.

To get a sense of the way in which observations are distributed on each side of the discontinuity, we consider Figure 4, which plots the level of rainfall normalized to the defined threshold in each electoral section and the corresponding share of votes for the incumbent in the 2006 Presidential elections. The non-parametric regression line jumps down at the discontinuity suggesting an effect of the drought compensation payment on voting behavior. In order to explore the significance and magnitude of this apparent effect we first specify a linear model of $f(rainfall_i)$ and we allow it to vary on either side of the discontinuity.

Table 2 shows the results of estimating Equation (1) using OLS. Column (1) presents the results when no controls are used in the estimation. The coefficient for *cutoff* remains positive and stable as we add controls. Column (2) shows the estimates when we include a set of dummy variables for each state. Column (3) presents the results when we include also controls at the electoral section level such as altitude, distance from the weather station, distance to the nearest river and distance to the "cabecera". Finally, Column (4) presents the estimates when controls at the municipal level are introduced. These specifications indicate a statistically significant effect of government disaster spending on the share of votes for the Presidential incumbent party. The magnitude of the coefficient decreases slightly once we control for the state and the characteristics of the electoral units and municipalities. With the full set of controls, our estimate suggests that receiving drought compensation had an effect of approximately 7.6 percentage point increase in the share of votes for the incumbent party.

***Potential concerns on the validity of the RD estimates***

In this section we discuss potential concerns for the validity of our main results and perform a number of tests to check their robustness. As a first validity check, we estimate Equation (1) for the pre-treatment election outcomes of 2000. If unobservable characteristics of the units receiving drought compensation were explaining electoral support for the incumbent, we might observe a discontinuous variation in the pre-treatment variable at the cutoff. Table 3 shows that there is no evidence of a difference in the share of votes for the incumbent in the 2000 elections for President. The coefficient for the below-cutoff variable is not statistically significant in the specification with the full set of controls. Therefore, estimates in Table 3 support the causal interpretation of an electoral response to government disaster spending suggested by the coefficient of 7.69 in Table 2.

An important assumption underlying the RD design is that producers are not able to manipulate the forcing variable. In our particular case, potential manipulation would have to be on the measurement of rainfall at the local weather stations, which seems extremely unlikely. Location and operation of weather stations were set many years before the specific insurance program we are analyzing and are independent of it. In 2005 and 2006, a total of 3,363 weather stations operated in the Mexican territory from which, 1200 under the coordination and supervision of the National Water Commission (CONAGUA). Furthermore, before paying any indemnities, CONAGUA is required to certify the weather data, which are sent to the international reinsurers. The Weather Index Insurance scheme is based on the fact that there is little reason to believe that the individual producer has better information than the insurer about the underlying index, and therefore little potential for adverse selection. One of the advantages of using the Mexican WII to test voter response to disaster spending is precisely the fact that under this scheme information asymmetries are minimized, as the producer cannot influence the realization of the weather index.

Another crucial assumption under regression discontinuity analysis is that the function of rainfall --which is the variable determining the disbursement of a government drought assistance-- has been correctly specified. Our primary specification is a linear model in rainfall estimated using OLS. Alternative polynomial functions are also estimated for robustness as shown in Table 4. From visual examination of the relationship plotted in Figure 4 we are able to determine a discernable discontinuity at the cutoff. The non-parametric graph suggests a linear relationship in the vicinity of the cutoff. Nonetheless, given the number of inflexion points in the plot, we test for higher-order polynomial functions including quadratic, cubic and fourth power terms in our specification. Table 4 shows that the coefficient of interest remains stable and the interactions are not statistically significant in columns (1) to (3). Column (4) shows that a fourth power polynomial function's results are significant and in this case the magnitude of the effect jumps to 10.1 percentage points. Figure 4 suggests however that the slope of the relationship on either side of the threshold is the same for levels of rainfall in the vicinity of the cutoff.

In order to explore the relationship at the discontinuity we narrow the window of analysis to include only units that experienced almost the same rainfall levels and provide yet another robustness check for our main specification. Table 5 shows that estimation of Equation (1) using observations on a window of 30mm and 20mm of rainfall around the threshold results in statistically significant coefficient estimates of 6.5 and 6.9 respectively.

Figure 4 describes the relationship between rainfall and electoral outcomes for the incumbent party and it is consistent with previous findings in the literature. Consistent with Achen and Bartels (2002) the slope appears to be positive for electoral sections on the right hand side of the threshold suggesting that voters punish the incumbent for adverse conditions --i.e. in this case drought. The slope of the regression line is near zero for higher levels of rainfall. The econometric results confirm the discontinuity observed at the threshold.

Overall our findings provide strong evidence of an electoral reward for the federal incumbent party in electoral sections where government disaster aid was supplied. The magnitudes of the effects are consistent with the existing literature and in terms of the WII program figures for 2005. For Germany, Bechtel and Hainmueller (2010) estimate an immediate electoral gain of about 7 percentage points for the incumbent party in areas affected by flooding and their estimates suggest that 25% of this effect is carried to elections 3 years later. Cole, Healy and Werker (2012) find evidence suggesting that voters only respond to government relief efforts during the year immediately preceding the election. According to their estimates, an average increase in disaster spending will gain about half percentage point of vote share for the incumbent party.

The actual number of registered voters in each electoral section is not available from the data. However, we know that on average, an electoral section has about 1,000 voters registered. Therefore, our analysis implies that there was an average effect of approximately 76 additional votes for the incumbent party in an electoral section close to a weather station that actually registered rainfall below the pre-established threshold. Given the nature of the government transfer, it is plausible that more than one vote is gained by beneficiary household. Nonetheless, our estimates are consistent with the aggregate sum of indemnities paid even if only one individual per household changes her vote.

***Mechanisms***

In principle, there is no theoretical reason to expect an effect of disaster spending on electoral turnout. In the Political Science literature, a consistent finding is that bad weather conditions at the time of an election significantly reduce participation. However, here we analyze weather conditions six to nine months before the day of the Presidential elections. The relationship between economic conditions and participation is more complex and evidence goes in both senses. For example, Pop Eleches and Pop Eleches (2009) show that individuals located just below the income cutoff (end thus eligible for the transfer program they analyze) were significantly more likely to declare an intention to vote in the next election than survey respondents just above the cutoff. Similarly, De la O (2013) finds that cash transfers in Mexico increased turnout among voters that benefited from the program for a long period, but finds no effect among beneficiaries enrolled six months before the election. Moreover, Chen (2013) finds that hurricane aid awards in the US increased turnout among the incumbent party's supporters but decreased turnout among the opposition party's voters.

In order to test for this, we estimate the basic regression model outlined in Equation (1) but this time using the total number of votes cast in the 2006 in electoral section *i* as the dependent variable. Table 6 shows no evidence of an effect for the units that are geographically close to weather stations that received the government monetary transfer. This analysis indicates that higher voter support for the incumbent party in those sections close to weather stations that received drought compensation cannot be explained statistically by recipients of disaster aid voting relatively more or by non-recipients voting relatively less. Even though the coefficient is not statistically significant, its magnitude is not small and provides additional information to help constructing boundary conditions for the interpretation of our main effect.

To complement the analysis we test for an effect on the share of votes of contender political parties. Table 7 describes the results of estimating Equation (1) using the share of votes for the two main contestant political parties -PAN and PRD- and other small parties. We find negative and statistically significant coefficients for all specifications. Taken together, the results in Tables 2, 6 and 7 suggest an electoral reward for the incumbent party in electoral sections below the cutoff and a punishment in electoral sections above the rainfall threshold.

Under the most conservative interpretation of our results, the positive and significant effect of disaster aid on the share of votes for the incumbent would be driven by abstention among supporters of the contender parties in electoral sections close to weather stations that received drought compensations. Under the interpretation at the other extreme, the main effect is driven by a combination of voters switching towards the incumbent party in electoral sections close to weather stations that received drought compensations and a higher participation toward contender parties in electoral sections close to stations that did not receive payments.

## 5. Conclusions

Empirical evidence of voters' response to disaster relief expenditures and preparedness initiatives is remarkably scant, especially for developing countries. This paper contributes to the literature on retrospective voting providing evidence that voters evaluate government actions and respond to disaster spending.

To evaluate the causal effect of government disaster spending on the electoral outcomes for the incumbent party, we take advantage of two fundamental aspects. First, we use a quasi-experimental approach exploiting the discontinuity in payment of a government climatic contingency aid program in Mexico. Second, we use GIS techniques to match data on drought relief payments, rainfall and electoral outcomes at the most disaggregated unit of analysis –the electoral section – reducing measurement error and potential confounding factors.

We find that living within a short distance to a weather station that received drought compensation increased the share of votes for the presidential incumbent party. The result is robust to including controls at the state, municipality and electoral section levels as well as fourth-order polynomial terms for the forcing variable and narrowing the window of analysis around the threshold.

Consistent with previous findings for the case of Germany, our estimates indicate that receiving drought compensation within six to nine months prior to the election had an effect of approximately 7.6 additional percentage points in the share of votes for the incumbent party. Results of our analysis suggest that recipients of disaster aid reward the incumbent party and non-recipients punish it voting in higher proportion for contestant parties.

Analyzing the case of a WII scheme not only provides an exceptional framework for the econometric identification of the effect, but also reveals an important interpretation of our results: Voters reward the incumbent party for disaster relief transfers under an insurance design. We are not able to identify whether voters reward the incumbent for insurance enrollment itself; however, the results in this paper imply that politicians may find it attractive to implement insurance programs that are more efficient than relief spending funded from fiscal resources.

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## 7. Tables and Figures

**Figure 1.a. Example of a county where no payments where disbursed.**

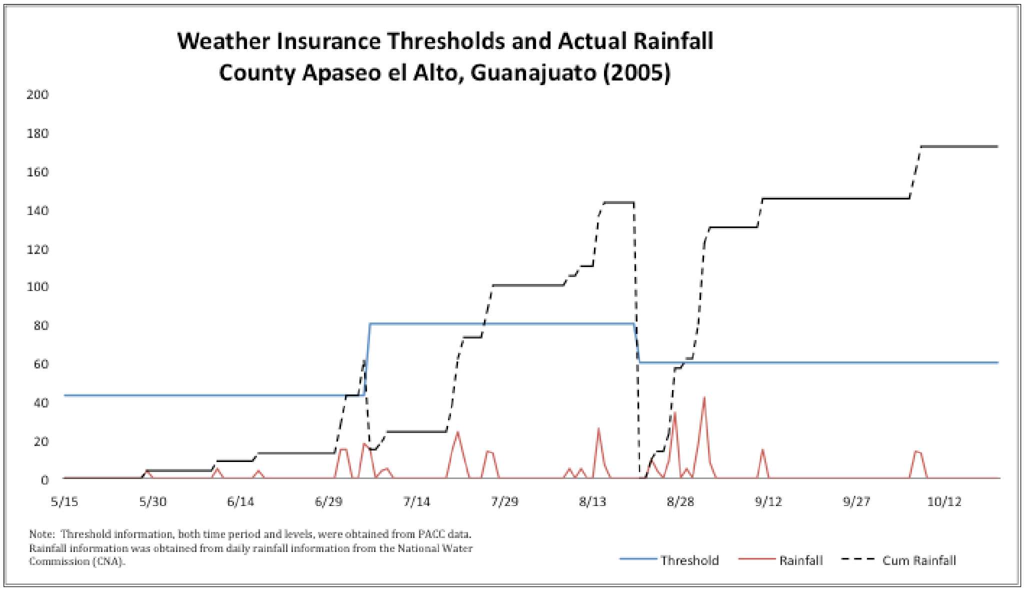


**Figure 1.b. Example of a county where payments were disbursed.**

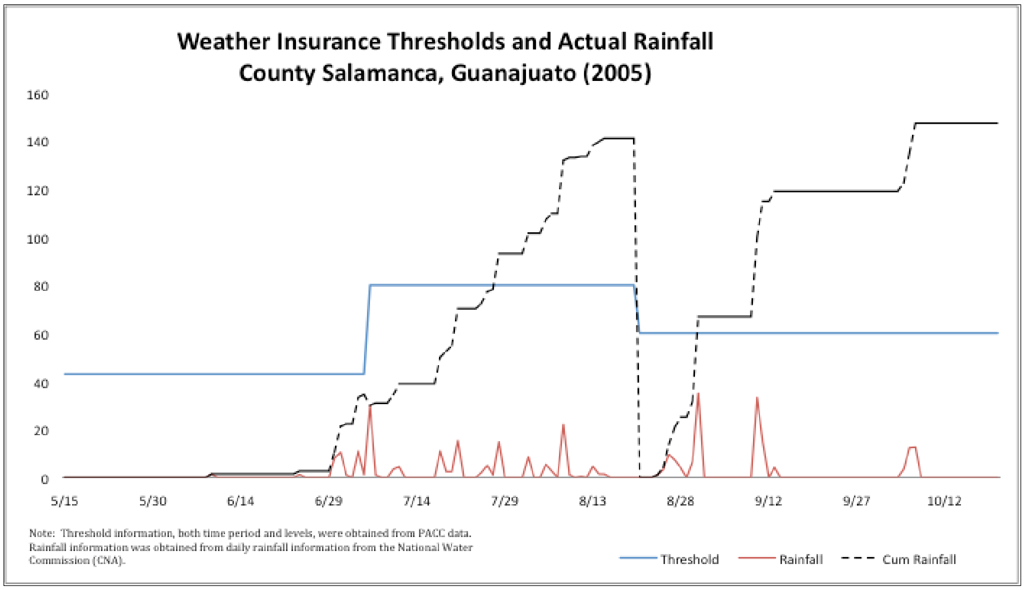

**Figure 2a. Map of municipalities covered by the WII and location of weather stations, example using the State of Guanajuato**

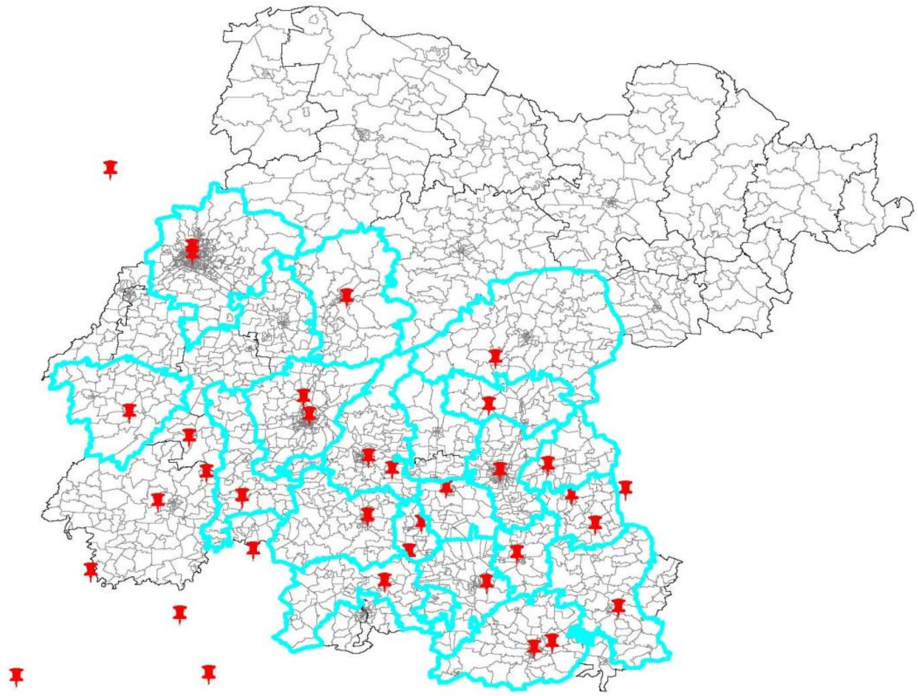

**Figure 2b. Map of electoral sections included for the analysis, example using the State of Guanajuato**

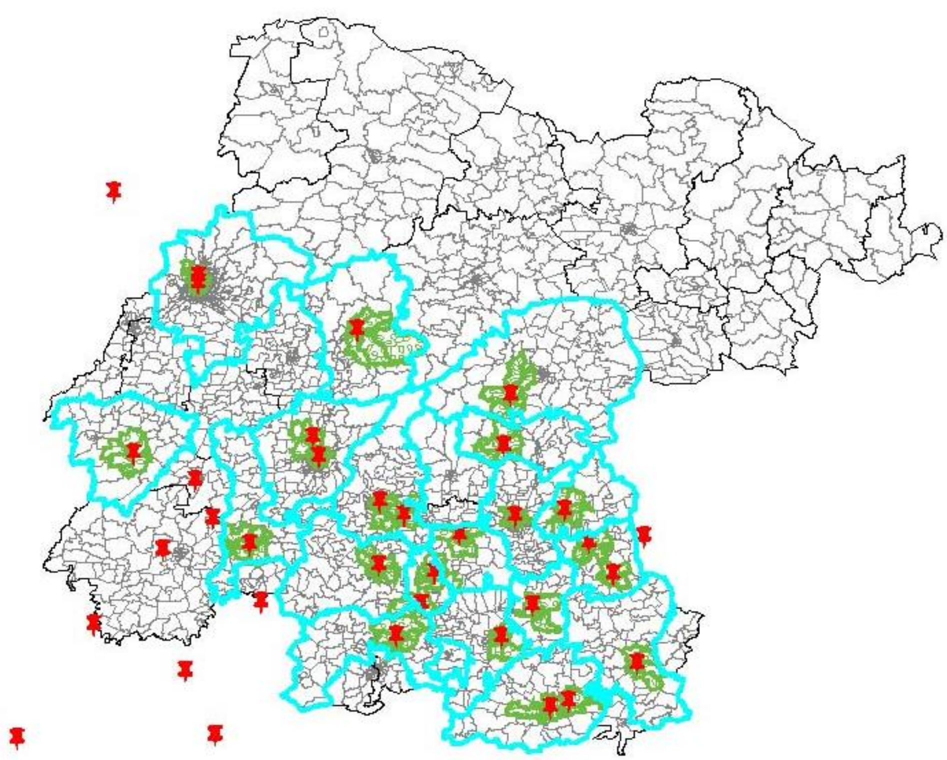

**Figure 3. Electoral sections in municipalities with insurance coverage in 2005 and Drought Relief Compensation for corresponding weather stations.**

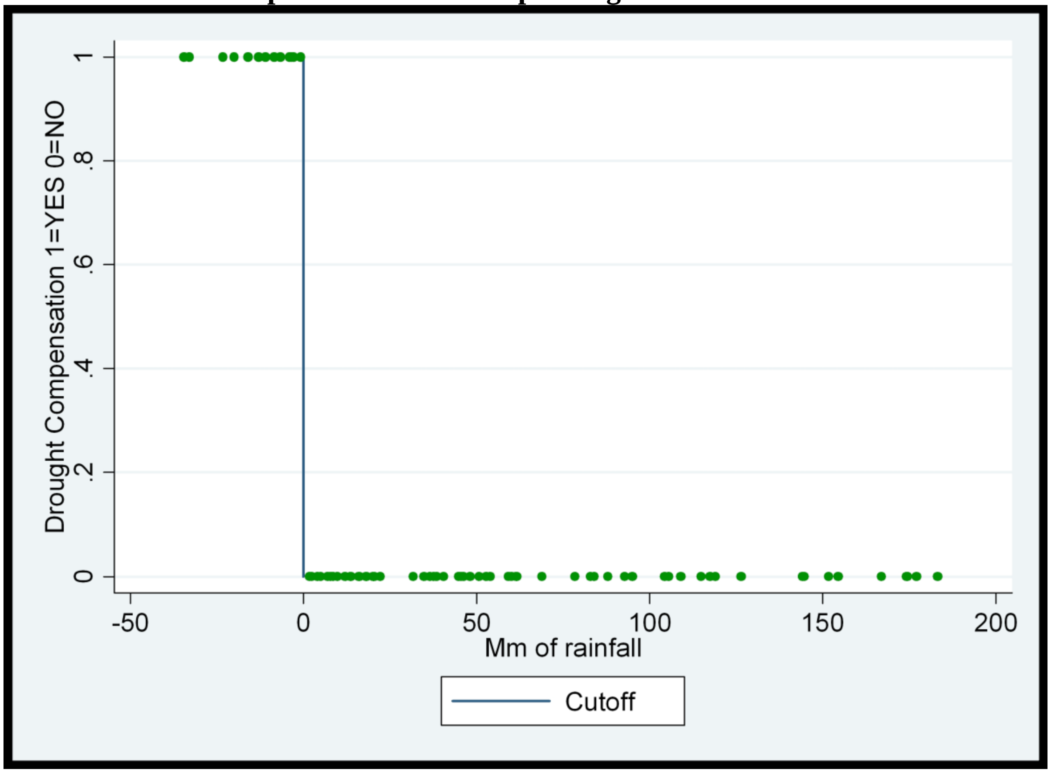


**Figure 4. Non-parametric graphic analysis, share of votes for the incumbent in electoral sections with insurance coverage in 2005**

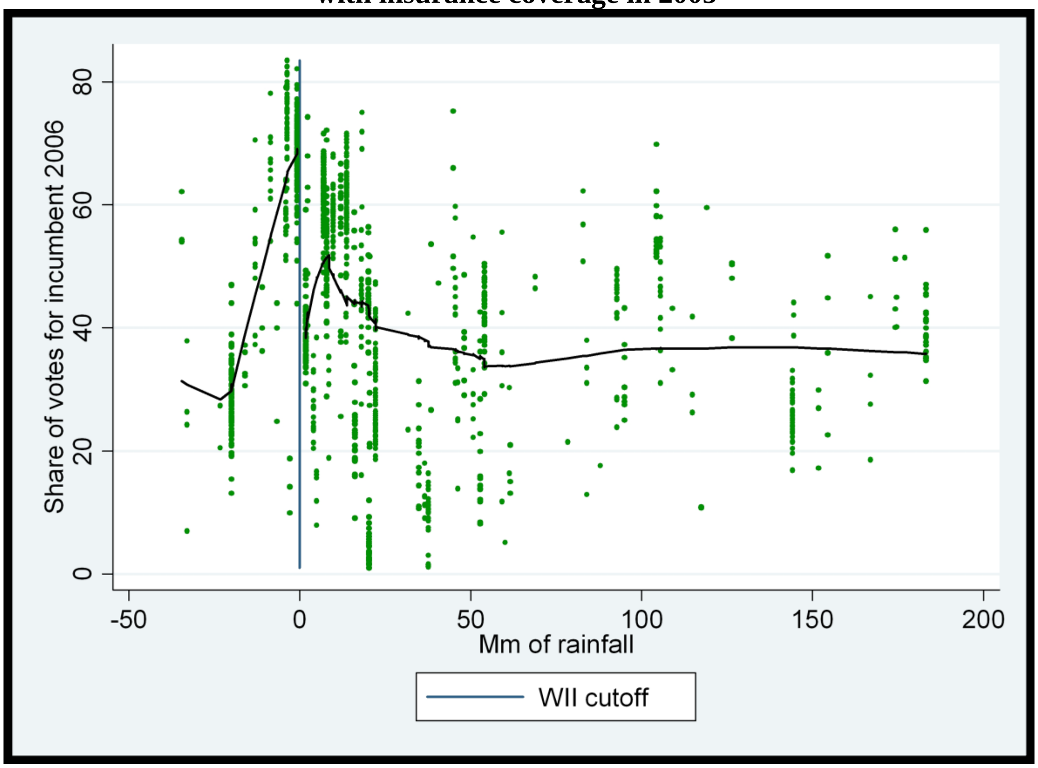

**Figure 5. Non-parametric graphic analysis, total number of votes casted in electoral sections with insurance coverage in 2005**

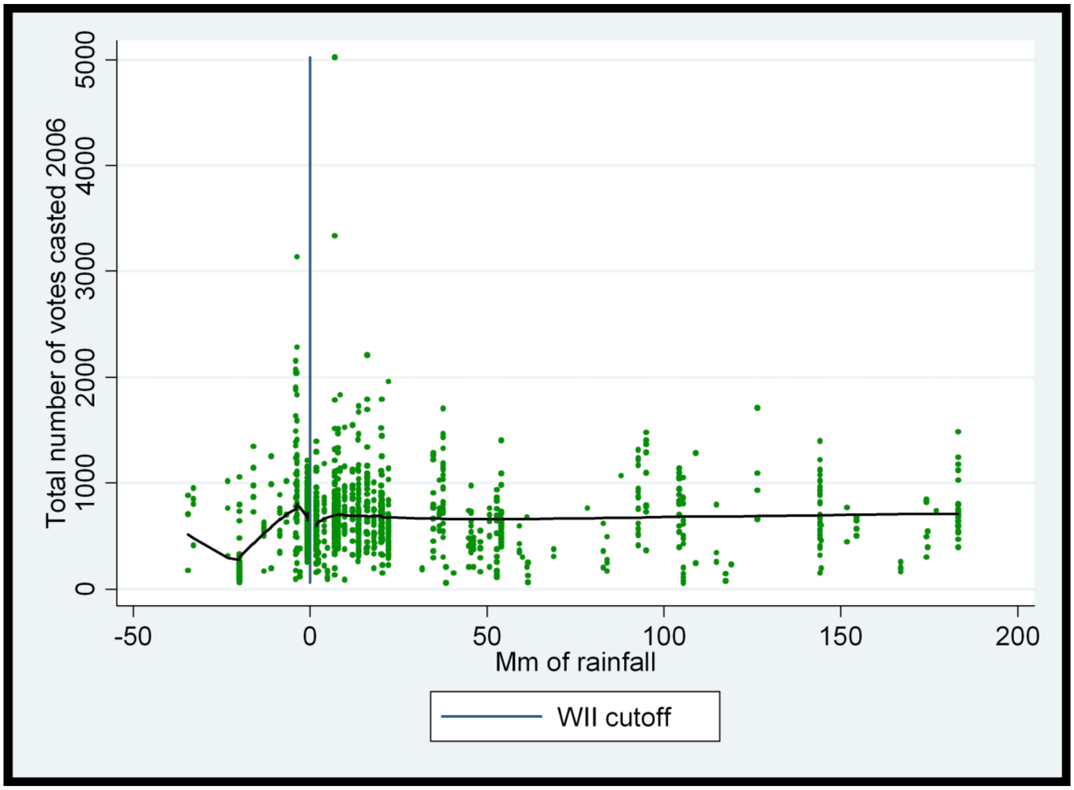

**Table 1. Descriptive Statistics, electoral sections with insurance coverage in 2005**

| | Units WITH compensation | Units WITHOUT compensation |
|---|---|---|
| Altitude (meters) | 1442.75 | 1554.19 |
| | (43.48) | (23.39) |
| Distance from weather station (meters) | 1088.12 | 1042.5 |
| | (30.66) | (23.11) |
| Distance to cabecera (meters) | 1792.98 | 1771.4 |
| | (96.73) | (123.10) |
| Distance to nearest river (meters) | 526.2 | 582.88 |
| | (35.68) | (27.05) |
| Municipal infant Mortality | 21.97 | 25.33 |
| | (0.12) | (0.13) |
| Municipal income per capita (pesos) | 1821.82 | 1233.51 |
| | (26.97)*** | (12.7)*** |
| Number of votes, 2006 | 617.84 | 677.99 |
| | (23.06) | (11.75) |
| Share of votes for incumbent 2000 | 32.35 | 32.22 |
| | (1.08) | (0.48) |
| Number of votes, 2000 | 619.05 | 651.2 |
| | (19.69) | (9.08) |
| Observations | 305 | 733 |

Standard errors for the t-test in parenthesis. Null hypothesis is average characteristic is equal for the two groups. *** Indicates the null is rejected at 1% confidence level.

## Table 2. Effect of Drought Relief Compensation on Share of Votes for the Incumbent, Main Results

| | Dependent variable: Share of votes for incumbent in 2006 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Below Cutoff | 10.395 | 8.211 | 8.332 | 7.69 |
| | (1.421)*** | (1.040)*** | (1.219)*** | (1.000)*** |
| Rain Deviation | -0.078 | 0.057 | 0.045 | 0.03 |
| | (0.012)*** | (0.015)*** | (0.018)** | (0.018)* |
| Constant | 45.188 | 14.38 | -13.398 | 7.255 |
| | (0.845)*** | (3.574)*** | (10.258) | (9.071) |
| Observations | 1038 | 1038 | 1038 | 1038 |
| R-squared | 0.12 | 0.78 | 0.79 | 0.82 |
| State controls | No | Yes | Yes | Yes |
| Controls at electoral section level | No | No | Yes | Yes |
| Controls at municipal level | No | No | No | Yes |
| Mean of dependent variable | 45.37 | 45.37 | 45.37 | 45.37 |

Robust standard errors in parentheses

State controls are dummy variables for each state. Controls at the electoral sections include altitude, distance from the weather station, distance to the nearest river and distance to the "cabecera". Controls at the municipal level include municipal income per capita for the year 2000.

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 3. Validity check using the pre-treatment elections of 2000

| | Dependent variable: Share of votes for incumbent in 2000 |
|---|---|
| | (1) |
| Below Cutoff | -1.525 |
| | (1.236) |
| Rain Deviation | -0.036 |
| | (0.015)** |
| Constant | 49.032 |
| | (9.619)*** |
| Observations | 1038 |
| R-squared | 0.75 |
| State controls | Yes |
| Controls at electoral section level | Yes |
| Controls at municipal level | Yes |
| Mean of dependent variable | 32.25 |

Robust standard errors in parentheses

State controls are dummy variables for each state. Controls at the electoral sections include altitude, distance from the weather station, distance to the nearest river and distance to the "cabecera". Controls at the municipal level include municipal income per capita for the year 2000.

* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 4. Estimates using a polynomial function of rainfall**

| | Dependent variable: Share of votes for incumbent in 2006 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Below Cutoff | 7.69 | 7.434 | 7.674 | 10.136 |
| | (1.000)*** | (1.087)*** | (1.443)*** | (1.650)*** |
| Rain Deviation | 0.03 | 0.015 | 0.028 | 0.143 |
| | (0.018)* | (0.041) | (0.068) | (0.077)* |
| (Rain Deviation)^2 | | 0.000 | 0.000 | -0.007 |
| | | (0.000) | (0.001) | (0.003)*** |
| (Rain Deviation)^3 | | | 0.000 | 0.000 |
| | | | (0.000) | (0.000)*** |
| (Rain Deviation)^4 | | | | 0.000 |
| | | | | (0.000)*** |
| Constant | 7.255 | 6.754 | 7.216 | 13.666 |
| | (9.071) | (9.252) | (9.515) | (9.647) |
| Observations | 1038 | 1038 | 1038 | 1038 |
| R-squared | 0.82 | 0.82 | 0.82 | 0.82 |
| State controls | Yes | Yes | Yes | Yes |
| Controls at electoral section level | Yes | Yes | Yes | Yes |
| Controls at municipal level | Yes | Yes | Yes | Yes |
| Mean of dependent variable | 45.37 | 45.37 | 45.37 | 45.37 |

Robust standard errors in parentheses

State controls are dummy variables for each state. Controls at the electoral sections include altitude, distance from the weather station, distance to the nearest river and distance to the "cabecera". Controls at the municipal level include municipal income per capita for the year 2000.

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 5. Robustness check, varying the window around the discontinuity

| | Dependent variable: Share of votes for incumbent in 2006 | |
|---|---|---|
| | Window of 30mm | Window of 20mm |
| | (1) | (2) |
| Below Cutoff | 6.516 | 6.874 |
| | (2.57)* | (2.72)** |
| Rain Deviation | 0.116 | 0.142 |
| | (0.75) | (0.93) |
| Constant | 52.325 | 48.997 |
| | (4.69)** | (4.46)** |
| Observations | 810 | 766 |
| R-squared | 0.88 | 0.84 |
| State controls | Yes | Yes |
| Controls at electoral section level | Yes | Yes |
| Controls at municipal level | Yes | Yes |
| Mean of dependent variable | 49.21 | 53.28 |

Robust standard errors in parentheses

State controls are dummy variables for each state. Controls at the electoral sections include altitude, distance from the weather station, distance to the nearest river and distance to the "cabecera". Controls at the municipal level include municipal income per capita for the year 2000.

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 6. The Effect of Drought Relief Compensation on Turnout 2006

| | Dependent variable: Total number of votes casted, 2006 |
|---|---|
| | (1) |
| Below Cutoff | -55.228 |
| | (37.058) |
| Rain Deviation | 0.028 |
| | (0.426) |
| Constant | 399.184 |
| | (328.255) |
| Observations | 1038 |
| R-squared | 0.2251 |
| State controls | Yes |
| Controls at electoral section level | Yes |
| Controls at municipal level | Yes |
| Mean of dependent variable | 664.51 |

Robust standard errors in parentheses

State controls are dummy variables for each state. Controls at the electoral sections include altitude, distance from the weather station, distance to the nearest river and distance to the "cabecera". Controls at the municipal level include municipal income per capita for the year 2000.

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 7. The Effect of Drought Relief Compensation on the Share of Votes for other Parties

| | Dependent variable: | | |
|---|---|---|---|
| | Share of votes for PRI, 2006 | Share of votes for PRD, 2006 | Share of votes for Other Parties, 2006 |
| | (1) | (2) | (3) |
| Below Cutoff | -2.884 | -3.876 | -2.041 |
| | (1.196)** | (0.965)*** | (0.610)*** |
| Rain Deviation | -0.08 | 0.047 | -0.013 |
| | (0.012)*** | (0.018)*** | (0.007)** |
| Constant | 20.962 | 65.546 | 21.014 |
| | (9.658)** | (7.626)*** | (4.040)*** |
| Observations | 1038 | 1038 | 1038 |
| R-squared | 0.6561 | 0.6719 | 0.3918 |
| State controls | Yes | Yes | Yes |
| Controls at electoral section level | Yes | Yes | Yes |
| Controls at municipal level | Yes | Yes | Yes |
| Mean of dependent variable | 27.934 | 20.933 | 6.03 |

Robust standard errors in parentheses

State controls are dummy variables for each state.. Controls at the electoral sections include altitude, distance from the weather station, distance to the nearest river and distance to the "cabecera". Controls at the municipal level include municipal income per capita for the year 2000.

* significant at 10%; ** significant at 5%; *** significant at 1%