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# Discipline and disasters: The political economy of Mexico's Sovereign Disaster Risk Financing Program

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## Abstract

Evidence suggests that voters punish politicians for the occurrence of natural disasters but reward them for the allocation of post-disaster aid. These behaviors create incentives for politicians to overspend on post-disaster aid, in particular in election years. Advocates of Sovereign Disaster Risk Financing and Insurance (SDRFI) Programs claim that these programs help to eliminate these incentives through transparent rules that govern politicians' behavior (Dana and Von Dahlen, 2014). This note examines voters' behavior and these claims in the context of Mexico, where the Federal Government has adopted a SDRFI strategy. It finds that voters punish incumbent political parties for the occurrence of natural disasters. It also finds that the Mexican governors are more likely to request, and the Federal Government is more likely to declare, natural disasters during election years. Finally, it finds that while using parametric thresholds to determine natural disaster declarations may help to discipline politicians in election years, the fact that some types of events do not use thresholds may erode parametric thresholds' disciplining value.

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## Introduction

Discipline and accountability are important pathways to impact for Sovereign Disaster Risk Financing and Insurance (SDRFI) Programs (Dana and Von Dahlen, 2014). In particular, SDRFI Programs that feature objective mechanisms, such as parametric event thresholds to determine access to funding, limit politicians' discretion following natural disasters, when they may face incentives to overspend on disaster relief (Healy and Malhotra, 2009). Rules and transparency also compel the government to commit to behave in a certain way or to face punishment by voters (Ferraz and Finan, 2011). But SDRFI Programs must be politically viable, and evidence suggests that voters demand overly responsive governments before elections (Cole et al., 2012). This policy note provides an early analysis of the effectiveness of one SDRFI Program, Mexico's Natural Disaster Fund (FONDEN), at disciplining politicians in light of potentially suboptimal incentives provided by voters.

## Research questions

This research note analyzes two streams of questions related to the political economy of SDRFI:

i. *Voter behavior*: Do Mexican voters punish politicians for the occurrence of natural disasters?[1]
ii. *FONDEN effectiveness*: Do Governors of Mexican States request more natural disaster declarations during election years? Does the Federal Government grant more natural disaster declarations during election years? Does the FONDEN help to discipline politicians in light of potentially suboptimal incentives provided by voters?

1. A related, important question is whether voters reward politicians for the delivery of post-disaster aid; due to data limitations, this question is not addressed in this note but will be added to the analysis in the next stage of research.

## Related literature

Previous research shows that voters punish politicians for the occurrence of natural disasters in the run-up to elections (Achen and Bartels, 2004; Cole et al., 2012). But politicians can partially offset these effects, and sometimes even gain voteshare, by providing reconstruction funding (Cole et al., 2012; Healy and Malhotra, 2009). These results highlight the adverse incentives generated for politicians around elections. Consistent with these incentives, Gasper and Reeves (2012) and Reeves (2011) find that in the United States, governors up for reelection request more disaster declarations in election years, and correspondingly, presidents grant more disaster declarations in election years.

These findings suggest a potentially important role for SDRFI Programs to tie politicians' hands and to increase transparency. To the author's knowledge, however, there are no empirical studies of SDRFI Programs' effectiveness at disciplining politicians. This research note provides preliminary evidence of one aspect of FONDEN's effectiveness at disciplining politicians in election years. The next stage of this research will deepen this analysis, which is the primary contribution of this research to the existing literature.

## Context

### Politics in Mexico

Mexico is a federal presidential representative democratic republic consisting of 31 states and one federal district. Although a multi-party system, Mexico's political scene was long dominated by a single party, which won every Presidential election from 1929 until 2000. The 2000 Presidential election was a landmark change of power, and since then the Presidency has been highly contended by several parties. Presidential elections are held every six years and feature single-term limits.

State governors are elected once every six years and also face single-term limits. The timing of governors' elections varies across states. Since 2000, there has been significant variation in gubernatorial leadership at the state level. In the majority of states, party control of the governorship has changed at least once since 2000. Coalitions and local political parties are very prevalent in state politics; many elections are won through multi-party coalitions, and it is often difficult to identify an incumbent party. The data on state elections collected for this research include over 100 different political parties and coalitions across 112 elections.

### El Fondo de Desastres Naturales (FONDEN)

In 1996, the Federal Government of Mexico (FGM) established FONDEN to ensure that adequate financial resources were available to finance post-disaster reconstruction of public infrastructure and low-income housing without compromising existing budgetary plans and public programs. Although the FGM did not list the discipline of politicians among its goals in establishing FONDEN, the government considers accountability and transparency as important features of the FONDEN system (World Bank and Government of Mexico, 2012).

FONDEN utilizes a two-stage process to determine a municipality's eligibility for reconstruction funds. First, a governor requests for one of three technical agencies, which are responsible for different types of events, to evaluate the presence of a hazard in one or more municipalities that experienced an event. For certain types of hazards, FONDEN uses pre-determined thresholds based on physical event parameters (e.g., millimeters of rainfall) to determine municipalities' eligibility (Table 1). The FONDEN's use of thresholds based on physical event parameters is particularly interesting and an important feature of this study. The technical agency assesses which municipalities qualify and sends this information to the FGM, which declares a natural disaster in these municipalities. Municipalities that are declared enter the second stage of the FONDEN process, a damage assessment, where the amount of reconstruction funding is determined.

**Table 1:** Threshold and non-threshold events covered by FONDEN

| Threshold event | Non-threshold event |
|---|---|
| Extreme rainfall | Flooding* |
| Drought | Hurricane/tropical storm* |
| Frost | Earthquake/tsunami |
| Hail | Landslide |
| Snow | Tornado |
| Forest fire | Avalanche |

* *De facto*, for flooding classified as "flooding due to rainfall" and for most storm events, the rainfall threshold is used. For storms, this is because the government does not have the technical capability to determine wind speed at the municipal level.
Source: *Las Reglas de Operación del Fondo de Desastres Naturales* (versions 3/31/1999, 2/29/2000, and 10/22/2004.)

## Data

### Natural disaster and weather data

This research avails of an original dataset, developed by the author, of natural disaster declarations published in Mexico's *Diario Oficial de la Federación* from 1999-2013. The declarations contain information including the list of municipalities requested by the governor, the list of municipalities declared by the FGM, the event type, and the event dates. In total, there were 547 unique natural disaster declarations from 1999 through 2013, of these, 320 occurred after the October 22, 2004 update to the FONDEN operating guidelines (see Table 2 for summary statistics).[2] Most of the declarations – 61.3% of all municipalities declared since the 2004 rule change – are for threshold events.

2. One limitation of the data is that it necessarily only includes published declarations, and so misses any governors' requests that are completely denied. According to the former head of FONDEN, however, it is very rare for requests to be completely denied.

### Political data

This analysis uses presidential election results from the Federal Election Institute (IFE) of Mexico at the municipality level for 2006 and 2012. It also uses state-level gubernatorial election results between 2000 and 2011. Panel B of Table 2 reports summary statistics for federal and gubernatorial elections.

**Table 2:** Summary Statistics

| Statistic | N | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|---|
| **Panel A** | | | | | |
| State: Year (2005-2013) | | | | | |
| Annual # Munis Req | 288 | 29.1 | 77.5 | 0 | 642 |
| Annual # Munis Dec | 288 | 16 | 40.85 | 0 | 323 |
| Annual # Threshold Munis Dec | 288 | 9.8 | 26.3 | 0 | 212 |
| Municipality: Full period (2001-2013) | | | | | |
| # Requests | 2275 | 4.587 | 3.7369 | 0 | 19 |
| # Decs | 2275 | 2.644 | 2.3858 | 0 | 23 |
| **Panel B** | | | | | |
| Federal Election Results | | | | | |
| Incumbent voteshare (state) | 64 | 0.30 | 0.12 | 0.04 | 0.59 |
| Incumbent voteshare (municipality) | 4885 | 0.26 | 0.14 | 0 | 0.72 |
| State Election Results | | | | | |
| Incumbent voteshare (state) | 57 | 0.449 | 0.114 | 0.025 | 0.620 |

## Empirical strategy and results

### Voter behavior

Evidence from India and the United States shows that voters punish politicians for the occurrence of natural disasters but reward them for delivering post disaster aid (Cole et al., 2012; Healy and Malhotra, 2009). This analysis first analyzes whether Mexican voters who experience abnormally high numbers of natural disasters in an election year punishes the incumbent party. Due to current data limitations, the question of whether they also reward post-disaster aid is left to the next stage of this analysis. I estimate:

$$IncumVote_{it} = \alpha + \beta DisDec_{it-1} + \gamma_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Where $IncumVote_{it}$ is voteshare in entity $i$ of the incumbent political party in election year $t$. $DisDec_{it-1}$ is the standard score of disaster declarations entity $i$ in the year leading up to the election; $\gamma_i$ and $\lambda_i$ are entity and election fixed effects, respectively, and $\varepsilon_{it}$ is the residual. Standard errors are clustered at the entity level in all regressions.

Table 3 Column (1) shows that a one standard deviation increase in the number of natural disasters experienced by a municipality in the year prior to the election decreases the incumbent presidential party's voteshare in that municipality by 2.4%; this result is consistent with Cole et al. (2012), who estimate that a one standard deviation decline in rainfall decreases the incumbent party's voteshare by 2.6% at a comparable administrative division in India. The effect is still detectable at the state level, where a one standard deviation increase in disaster declarations decreases the incumbent presidential party's voteshare by 1.3%. This decrease is politically important – in 25% of observations, the gap between winning and losing parties is 2.7% or less. Finally, Column (2) shows that while the sign and magnitude of the point estimate for gubernatorial elections is consistent with that of presidential elections, large standard errors render it insignificant – this result is not surprising considering the important role of coalitions, which makes it difficult to identify one incumbent party in the data.

**Table 3:** Voter response to natural disasters

| | Presidential party incumbent voteshare (1) | Gubernatorial party incumbent voteshare (2) |
|---|---|---|
| State-level analysis | | |
| $DisDec_{it-1}$ | -0.013* (0.007) | -0.012 (0.031) |
| N | 62 | 61 |
| Municipal-level analysis | | |
| $DisDec_{it-1}$ | -0.024* (0.013) | |
| N | 4885 | |

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
* Significant at the 10 percent level.

### FONDEN effectiveness

Evidently, Mexican voters punish incumbent political parties when they experience natural disasters. If they also reward incumbent parties who allocate post-disaster reconstruction funding, consistent with voter behavior in other contexts, then we would expect to see Mexican political parties overly responding with reconstruction funding in election years. FONDEN's use of thresholds for certain events, however, should tie the state and federal governments' hands in election years, making it more difficult to channel funds to municipalities that experience less extreme events.

First, I determine whether state governors are more likely to request natural disaster declarations in election years.[3] Then, I analyze whether the FGM is more likely to declare more municipalities in election years; importantly, I examine these effects separately for threshold and non-threshold events. Due to space constraints, I omit results for gubernatorial election years, which consistent with the results above, are not significant. Also, to ensure comparability of results, I confine the analysis to the period following the 2004 rule change. I estimate two specifications:

$$Re\,q_{st} = \alpha + \beta\, ElectYr_t + \gamma_s + \varepsilon_{it} \quad (2)$$

$$NumDec_{sdt} = \alpha + \beta_1\, NonThresh_{sdt} + \beta_2\, ElectYr_{st} + \beta_3\, ElectYr_{st} * NonThresh_{sdt} + \delta\, NumReq_{std} + \gamma_s + \lambda_t + \varepsilon_{sdt} \quad (3)$$

In equation (2), I first estimate linear probability, probit, and conditional logit models of the likelihood of a governor requesting a natural disaster declaration during an election year. $Req_{st}$ is an indicator equal to 1 if a governor of state $s$ requests a natural disaster declaration during year $t$, $\gamma_s$ is a state fixed effect, and $\varepsilon_{st}$ is the residual. Standard errors are clustered at the state level in all regressions in this section. I also check the frequency of declaration requests in election versus nonelection years using a negative binomial and a linear model with a count variable for $Req_{st}$.[4]

In equation (3), $NumDec_{sdt}$ is the number of municipalities declared by the FGM in state s in declaration $d$ at time $t$. $NonThresh_{sdt}$ is an indicator if a declaration is for one of the non-threshold events listed in Table 1, $ElectYr_t$ is an indicator for whether a declaration is made in a presidential election year, and $NumReq_{sdt}$ controls for the number of municipalities requested by the governor. $\gamma_s$ and $\lambda_t$ are entity and election fixed effects, respectively, and $\varepsilon_{sdt}$ is the residual.

Table 4 shows the results of estimating (2); it includes the estimate for from each specification mentioned above. The estimates show that governors are significantly more likely to request at least one disaster declaration in presidential election years than in nonelection years (estimates suggest 10-15% more likely). In addition, they are significantly more likely to request more disaster declarations in presidential elec-

3. The next stage of this analysis will analyze whether governors request more municipalities for non-threshold verus threshold events in election years.

4. I use a negative binomial model due to overdispersion of the data. Negative binomial result is reported as the Incidence Rate Ratio (IRR).

tion years. The IRR from the negative binomial model and the estimate from the linear regression model suggest request counts increase 25% in presidential election years (all results significant at the 5% level).

**Table 4:** Governors' Disaster Declaration Requests During Federal Election Years

| | Federal Election Year |
|---|---|
| *Request declaration in year ({0,1})* | |
| Linear Probability Model | 0.1094** (0.047) |
| Probit M.E. | 0.153** (0.062) |
| Conditional Logit M. E. | 0.143** (0.056) |
| *Number of requests in year (count variable)* | |
| Linear model | 0.2552** (0.123) |
| Negative binomial model (Incidence Rate Ratio reported) | 1.254** (0.118) |
| State FE | Y |
| N | 256 |

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
* Significant at the 10 percent level.

Turning to the FGM's disaster declarations, Table 5 Column 2 shows the results of estimating (3). Starting with $\beta_1$, the estimate shows that, controlling for the number of municipalities requested, the FGM declares an average of 3 more municipalities for non-threshold events than for threshold events in nonelection years (significant at the 10% level). $\beta_2$ shows that the FGM declares more municipalities for threshold events in presidential election years than in nonelection years. But the most interesting coefficient is $\beta_3$, which shows that the effect of a presidential election on the number of municipalities declared for non-threshold events (sum of $\beta_2$ and $\beta_3$) is much greater than for threshold events ($\beta_2$ and $\beta_3$ both significant at the 5% level).

**Table 5:** Federal Government Declarations during Federal Election Years

| | Number declared (1) | Number declared (2) |
|---|---|---|
| $Non\text{-}threshold_{sdt}$ | | 2.933* (1.669) |
| $Fed\ Elect_t$ | 14.061* (7.167) | 10.315** (4.694) |
| $Fed\ Elect_t$* $Non\text{-}threshold_{sdt}$ | | 11.395** (4.511) |
| $NumReq_{sdt}$ | 0.460*** (0.033) | 0.457*** (0.034) |
| State FE<br>Year FE | Y<br>Y | Y<br>Y |
| N | 320 | 320 |

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
* Significant at the 10 percent level.

## Discussion and concluding remarks

This policy note has analyzed political behavior related to natural disasters in Mexico. It has shown that voters punish incumbent political parties for the occurrence of natural disasters in the run-up to elections, with potentially important consequences due to close presidential elections in recent years. Perhaps to try to offset the negative effects of natural disasters on their parties' voteshare, state governors are more likely to request disaster declarations that result in federal funding for reconstruction in election years. What's more, the FGM grants more disaster declarations in presidential election years. Importantly, the FONDEN's use of physical event thresholds to determine natural disaster declarations reduces the number of municipalities granted for threshold events, compared to non-threshold events, in election years. The significant increase in the number of municipalities declared for non-threshold events in election years, however, suggests that some of the disciplining benefits of the thresholds may be eroded because the FGM can shift to declaring municipalities for non-threshold events.

This analysis is necessarily limited and interpretation of the result on greater numbers of non-threshold event declarations in election years is difficult to interpret without additional information on the welfare consequences. These considerations will constitute an important next step in this analysis. In addition, analysis of the rainfall thresholds will provide more insight into the electoral consequences of disaster declarations and into FONDEN's effectiveness at disciplining politicians in election years.

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