Workshop / *Atelier*

Disaster Risk Financing and Insurance (DRFI)
Financement et Assurance des Risques de Désastres Naturels

Thursday-Friday, June 4-5, 2015
Jeudi-Vendredi 4-5 Juin 2015

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

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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?

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.

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[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.

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. Indeed, 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 that one of three technical agencies, which are responsible for different types of events, 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 (Appendix 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.

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 Appendix 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.

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.

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:

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

Where *IncumVote*$_{ipt}$ is voteshare in entity *i* of the incumbent political party *p* in election at time *t*. *DisDec*$_{it-1}$ is the standard score of disaster declarations entity *i* in the year leading up to the election; γ_i and λ_t are entity and election fixed effects, respectively, and ε_{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%;

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[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.

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.

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 analysis of 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:

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

$$NumDec_{sdt} = \alpha + \beta_1 NonThresh_{sdt} + \beta_2 ElectYr_{dt} + \beta_3 ElectYr_{dt} * NonThresh_{sdt}$$
$$+ \delta Num\mathrm{Re}q_{sdt} + \gamma_s + \lambda_t + \varepsilon_{sdt} \qquad (3)$$

In equation (2), I first estimate a linear probability model and a probit model 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, γ_s is a state fixed effect, and ε_{st} is the residual.[4] Standard errors are clustered at the state level in all regressions in this section. I also check the

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

[4] The "incidental parameters problem" that generates biased coefficients when using fixed effects in nonlinear models is well-known; several recent studies demonstrate, however, that in particular marginal effects are not greatly biased by the inclusion of fixed effects.

frequency of declaration requests in election versus nonelection years using a negative binomial and a linear model with a count variable for Req_{st}.[5]

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 Appendix 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. γ_s and λ_t are entity and election fixed effects, respectively, and ε_{sdt} is the residual.

Table 4 in the Appendix shows the results of estimating (2); it includes the estimate for β 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 election 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).

Turning to the FGM's disaster declarations, Table 5 Column 2 shows the results of estimating (3). Starting with β_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). β_2 shows that the FGM more municipalities for threshold events in presidential election years than in nonelection years. But the most interesting coefficient is β_3, which shows that the effect of a presidential election on the number of municipalities declared for non-threshold events (sum of β_2 and β_3) is much greater than for threshold events (β_2 and β_3 both significant at the 5% 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, though, 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.

This analysis is necessarily limited and interpretation of the result that FONDEN to some extent limits the number of additional threshold declarations in election years is difficult

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

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.

Appendix

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.)

Table 2: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Max
Panel A					
State: Year (2005-2013)					
Annual Num Munis Req	288	29.1	77.5	0	642
Annual Num Munis Dec	288	16	40.85	0	323
Annual Num Threshold Munis Dec	288	9.8	26.3	0	212
Municipality: Full period (2001-2013)					
Num Requests	2275	4.587	3.7369	0	19
Num 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	57	0.449	0.114	0.025	0.620

voteshare
(state)

Table 3: Voter response to natural disasters

	Presidential party incumbent voteshare	Gubernatorial party incumbent voteshare
	(1)	(2)
State-level analysis		
$DisDec_{it-1}$	-0.013*	-0.012
	(0.007)	(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.

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)
Number of requests in year (count variable)	
Linear model	0.2552**
	(0.123)
Negative binomial model	1.254**
(Incidence Rate Ratio reported)	(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.

Table 5: Federal Government Declarations during Federal Election Years

	Number declared (1)	Number declared (2)
Non-threshold$_{sdt}$		2.933*
		(1.669)
Fed Elect$_t$	14.061*	10.315**
	(7.167)	(4.694)
*Fed Elect$_t$*Non-threshold$_{sdt}$*		11.395**
		(4.511)
NumReq$_{sdt}$	0.460***	0.457***
	(0.033)	(0.034)
State FE	Y	Y
Year FE	Y	Y
N	320	320
Notes:		***Significant at the 1 percent level.
		**Significant at the 5 percent level.
		* Significant at the 10 percent level.

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