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Storm politics: how governmental response to natural disasters is influenced by capacity

Política de tempestade: como a resposta governamental a desastres naturais é influenciada pela capacidade

Política de tormentas: cómo la capacidad influye en la respuesta del gobierno a los desastres naturales

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Abstract
Despite the remarkable gains in performance research, public administration field still lacks more empirical analysis of the organizational capacity-government performance relationship and objective measures of organizational capacity. We shed light on the role how capacity enhances performance. By using secondary longitudinal data, we focus on the actions taken by 5,570 Brazilian municipalities to prevent or reduce damage caused by natural disasters. Droughts represent a significant impact on the environment of the region, affect local economy and bring misery to the population. Our hypotheses investigate whether mayors' competence and/or municipal capabilities influence the governmental response to prevent or reduce damage caused by natural disasters. Results provide support for all three hypotheses meaning that when considering both internal dimensions of capacity, it is possible to predict the probability of a municipality adopts actions pro-environment to prevent or reduce damage caused by droughts. Although government faces various constraints, we contribute to investigate subnational organizational capacity as an input to performance of municipalities giving research a more fulsome assessment of government quality.
Keywords: Capacity; Performance; Panel data; Disaster.

Resumo
Apesar dos notáveis ganhos na pesquisa em desempenho, o campo da administração pública ainda carece de análises mais empíricas da relação capacidade organizacional-desempenho do governo e medidas objetivas de capacidade organizacional. Lançamos luz sobre o papel de como a capacidade melhora o desempenho. Por meio de dados longitudinais secundários, focamos nas ações realizadas por 5.570 municípios brasileiros para prevenir ou reduzir os danos causados por desastres naturais. As secas representam um impacto significativo no meio ambiente da região, afetam a economia local e trazem miséria à população. Nossas hipóteses investigam se a competência dos prefeitos e/ou capacidades municipais influenciam a resposta governamental para prevenir ou reduzir os danos causados por desastres naturais. Os resultados fornecem suporte para as três hipóteses, significando que, ao considerar ambas as dimensões internas de capacidade, é possível prever a probabilidade de um município adotar ações pró-ambiente para prevenir ou reduzir os danos causados pelas secas. Embora o governo enfrente várias restrições, contribuímos para investigar a capacidade organizacional subnacional como um insumo para o desempenho dos municípios, dando à pesquisa uma avaliação mais completa da qualidade do governo.
Palavras-chave: Capacidade; Desempenho; Dados em painel; Desastre.

Resumen
A pesar de los notables avances en la investigación del desempeño, el campo de la administración pública aún carece de más análisis empíricos de la relación capacidad organizacional-desempeño del gobierno y medidas objetivas de la capacidad organizacional. Arrojamos luz sobre el papel de cómo la capacidad mejora el rendimiento. Mediante el uso de datos longitudinales secundarios, nos enfocamos en las acciones realizadas por 5.570 municipios brasileños para prevenir o reducir los daños causados por desastres naturales. Las sequías representan un impacto significativo en el medio ambiente de la región, afectan la economía local y traen miseria a la población. Nuestras hipótesis investigan si la competencia de los alcaldes y/o las capacidades municipales influyen en la respuesta gubernamental para prevenir o reducir los daños causados por los desastres naturales. Los resultados respaldan las tres hipótesis, lo que significa que al considerar ambas dimensiones internas de la capacidad, es posible predecir la probabilidad de que un municipio adopte acciones proambientales para prevenir o reducir los daños causados por sequías. Aunque el gobierno enfrenta

varias limitaciones, contribuimos a investigar la capacidad organizativa subnacional como un insumo para el desempeño de los municipios, brindando a la investigación una evaluación más completa de la calidad del gobierno.
Palavras clave: Capacidad; Desempeño; Panel de datos; Desastre.

1. Introduction

Despite the remarkable gains in public administration research thanks to the high level of interest in modeling performance (Wechsler & Clary, 2000; Kroll & Moynihan, 2018), there is still a literature gap regarding the complementary concept of capacity (Christensen & Gazley, 2008; Im & Hartley, 2017). Organizational capacity has been defined as 'government's ability to marshal, develop, direct and control its financial, human, physical and information resources' (Ingraham et al.,2003).

However, public management field lack of more empirical analysis of the organizational capacity-government performance relationship and objective measures of organizational capacity (Piña and Avellaneda, 2017). In this paper, I intend to advance the comprehension of this concept shedding light on the role of how capacity enhances performance. By comparing two dimensions of organizational capacity, I will focus on the actions taken by 5,570 Brazilian municipalities to prevent or reduce damage caused by natural disasters.

2. Literature

The Brazilian Constitution of 1988 provides for a federal government and guarantees the independence of state and local levels of government. As of December 2017, Brazil had 5,570 municipalities across 26 states and one federal district. Despite Brazilian municipalities are economically diverse, Avellaneda and Gomes (2015) point out that Brazil, like most Latin American countries, has its own unique form of local government: a strong, elected prefeito (mayor) toward a perception that governors and capital city mayors hold more political power than federal legislators - even with a lower budget. Under pressure to do more with less, Brown and Potoski (2003) defend that governments can respond to poor conditions by investing in the organizational capacity to identify suitable situations for contracting, negotiate strong contracts, and monitor vendor performance.

However, the study of organizational capacity has been ongoing since the publication of Gargan (1981) who stated that the concept has faced competing definitions and metrics for measurement for quite some time. Indeed, there is a puzzle when comparing the use of `capacity' in conceptual and empirical work: the meaning of capacity is near its synonyms such as ability, capability, and capacity building (Gargan, 1981; Honadle, 1981; Chaskin, 2001; Cairns et al., 2005). Exploring this black box, scholars have proposed the most diverse multi-dimensional frameworks, incorporating the internal and external dimensions of capacity Boyne (2003); Eisinger (2002); Forbes and Lynn Jr (2006); Christensen & Gazley (2008). In this paper, I consider the internal dimensions of Christensen and Gazley (2008)'s framework that suits my purposes given the data and ease of interpretation. Here capacity is characterized as a function of (1) leadership and (2) organizational infrastructure.

Leadership: Mayors' competence

The importance of chief executives' managerial capacity has been discussed among scholars as the determination whether institutions will serve people well or whether they will squander talents and resources (Mintzberg, 1975), not an end in itself but rather a `platform' for performance due to the complex capacity-building in public organizations (Ingraham et al., 2003). Measuring chief executives' managerial capacity has a great variance (Moore, 1995; O'Toole Jr and Meier, 1999; Meier and O'Toole Jr, 2002; Fernandez, 2004; Avellaneda, 2008, 2009; Korac et al., 2017). For example, Hambrick and Mason

(1984) have discussed characteristics of top managers such as age, education and sectorial background as proxies for their cognitive frames, in the sense that organizational outcomes are partially predicted by managerial background features.

However, regarding specifically to the support to environmental agenda, it is not enough to have managerial capacity per se, but also the will to represent people who are sensitive to these issues. In this subject, scholars have shown evidence that left-wing parties adopt more pro-environment policy positions than right-wing parties (Neumayer, 2003; Carter, 2013). By that, mayors' political orientation may also represent a good proxy in this analysis.

Organizational infrastructure: Capabilities

The organizational infrastructure is also required to analyze the capabilities needed by local governments for managing natural disasters. As stated by Kusumasari et al. (2010) "the role of local government and the capability requirement for this institution have been major concerns in disaster discourse, since local government plays the most active role during disasters". Therefore, local governments must protect the community from vulnerability looking for the reduction of disaster impacts.

In Brazil, Law 12,608 / 2012 established the regulatory framework for the policy of monitoring, prevention and response to natural disasters, with municipalities having five obligations to benefit from the program: to develop risk mapping; to develop a contingency plan; prepare a plan for the implementation of works and services to reduce the risks of disasters; create control and inspection mechanisms to avoid buildings in areas susceptible to natural disasters; and prepare a geo technical chart of suitability for urbanization. When there is some infrastructure in the local government, Brazilian municipalities can count on three different institutions to respond to natural disasters, preventing or reducing damage caused by natural disasters: Fire Department Units, Community Civil Defense Corps (Núcleo Comunitário de Defesa Civil - NUDEC), and Municipal Coordination of Protection and Civil Defense (Coordenadoria Municipal de Proteçãao e Defesa Civil - COMDEC).

3. Methodology

In this study, the unit of analysis is the municipality. The data come from the Brazilian Institute of Geography and Statistics (IBGE) covering all 5,570 Brazilian municipalities. The Municipal Basic Information Survey (Munic) carries out, periodically, a detailed survey of information on the structure, dynamics and functioning of municipal public institutions, especially the city hall, also comprising different policies and sectors that involve municipal government and the municipality.

The analysis was based on the year of 2017, the first year of the 2017-2020 mayoral administration. As a result of the ongoing effort to update the research, including its broad scope of issues, since its first edition in 1999, Munic data constitute a relevant set of evaluation indicators, monitoring the institutional and administrative framework of Brazilian municipalities. These indicators express, in a clear and objective way, not only the supply and quality of local public services but also the capacity of municipal managers to serve the population.

All variables used in the analyses are summarized in Table 1. The variable RESP is an indicator for governmental response to prevent or reduce drought damage, the variable RESP equals 1 if the municipality endeavored at least one of these actions: a) concentration of pollutants in water requiring expansion in water abstraction and treatment; b) construction of cisterns; c) construction of dams; d) construction of wells; e) revegetation; f) public incentive to agriculture adapted to the climate and soil of the region, with irrigation; g) regular distribution of water through water trucks in times of drought (emergency situations); h) actions for the sustainable use of natural resources (wind or solar energy sources, basin plans, awareness and awareness programs, etc.); and, i) the municipality

provides Contingency Plan and / or Preservation for drought.

Age, Educational Level and Party are proxies to Mayor's competence. Age is related to politicians' experience in most of cases while educational level may reflect a characteristic that electors believe it is important in their representants: the higher the educational level, the more budget the mayor can allocate to environmental issues. Brazil has 35 political parties and ideological identity was divided by using Ribeiro et al. (2016)'s methodology. I expect that mayors from left-wing parties have a pro-environment policy agenda, so that may have efforts to prevent or reduce damage caused by natural disasters. The existence of Fire Department Units, Community Civil Defense Corps (Núcleo Comunit_ario de Defesa Civil - NUDEC), and Municipal Coordination of Protection and Civil Defense (Coordenadoria Municipal de Proteção e Defesa Civil - COMDEC) represent the municipalities capabilities. Differences refer to political representativeness and organizational structure. COMDEC is a Municipal Government

body composed of members appointed by the Mayor, while NUDEC is a community association and its members are chosen by the community. It should be noted that, besides the binary response "YES / NO", Munic survey also presents the option "DO NOT KNOW". In such cases (1.3% of the total), I considered as a "NO" answer.

Table 1. Description of Variables.

Variable	Description
Dependent Variable	
RESP	=1 if municipality endeavoured some action to prevent or reduce drought damage. Mean=1.52
Independent Variables	
Age	Mayor's age. Mean=49.34
Level dummy variables L1, L2, L3, L4	=1 if Educational Level is Elementary, High School, Graduate, Postgraduate. Means=0.07, 0.33, 0.41, 0.12
Party dummy variable	=1 if Mayor's party is leftist. Mean=0.26
FireUnit	=1 if municipality has a fire department unit. Mean=0.17
NUDECs	=1 if municipality has a community civil defense corps. Mean=0.68
COMDECs	=1 if municipality has a municipal civil defense coordination. Mean=0.74

Source: Author.

The governmental response may prevent or reduce drought damages, especially when talking about the 2,706 municipalities that were affected by droughts in the last four years. Table 2 displays descriptive statistics of different drought damages.

Table 2. Drought Damages.

Damage	Mean	Std. Dev.
Financial losses	.8130	.3899
Human losses	.0802	.2716
Animal losses	.6762	.4679
Environmental losses	.6412	.4797
Loss or reduction of agricultural production	.8928	.3094
Emergence or increase of desertification area	.2358	.4245

All possible drought damages caused in 2,706 municipalities. Source: 2017 IBGE Munic.

Source: Author.

Droughts represent a significant impact on the environment of the region, affect local economy and bring misery to the population. Since the objective of assessing governmental capacity is to specify the probability of municipal response to these issues, I propose the following hypotheses:

H1: *The higher the mayor's competence, the greater the probability of endeavoring actions to prevent or reduce damage caused by droughts.*
H2: *The higher the capability of municipality, the greater the probability of endeavoring actions to prevent or reduce damage caused by droughts.*
H3: *The combination of competence and capability enhances the probability of endeavoring actions to prevent or reduce damage caused by droughts.*

In the next section, I provide the results regarding the governmental capacity when preventing or reducing damage caused by droughts.

4. Results

My main objective is to find out whether mayors' competence or municipal capabilities influence the governmental response to prevent or reduce damage caused by natural disasters. The sample has 5,570 municipalities, in which 4,628 (83% of the total) endeavored some action to prevent or reduce drought damage. This fact may indicate that, in some municipalities, concrete governmental actions are developed isolated from the fact of occurring of droughts. Since RESP is a categorical variable, I directly estimate probit regression models with RESP as dependent variable, and the competence (model 1), the capabilities (model 2), and the overall capacity (model 3) respectively as independent variables.

Regression results are presented in Table 3. In model 1 and 3, the coefficients for age negative and statistically significant at 0.01 level, this means that older mayors are less likely to favor actions pro-environment to avoid natural disasters. As expected, party coefficients in model 1 and 3 were statistically significant indicating the strong relation between left-wing parties and pro-environment agenda. The educational level did not present any coefficient statistically significant. Regarding capabilities, the existence of Fire Units, COMDECs and NUDECs were significant in Model 2, but in Model 3, only COMDECs is not significant. However, the coefficient of Fire Units is negative, meaning that the existence of Fire Units in

municipality is less likely to help in actions previous to the drought, which it makes sense because of the mission of this organization - that generally acts after a disaster to help to save lives and collect corpses.

Table 3. Regression Results.

Variable	Model 1 (competence)		Model 2 (capabilities)		Model 3 (overall capacity)	
RESP	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.
Age	-.0056***	.0015	-	-	-.0053***	.0016
L1	.1154	.1012	-	-	.1570	.1018
L2	.1980	.0852	-	-	.2390**	.0858
L3	.1636	.0844	-	-	.2175	.0852
L4	.1111	.0937	-	-	.1660	.0950
Party	.2233***	.0380	-	-	.2163***	.0383
FireUnit	-	-	-.3893***	.0477	-.3749***	.0486
NUDECs	-	-	.4324***	.0374	.4389***	.0376
COMDECs	-	-	.1730*	.0669	.1622	.0670
Intercept	.0492	.1189	-.2540***	.0307	-.2592	.1220

The sample used in all three probit regressions is the same and consists of 5,570 observations from 2017. The dependente variable, RESP, takes the value one if governmental response occurs and zero otherwise. ***,**,* Significantly diferente from zero at the .01, 0.05, and .1-level.

Source: Author.

To check the robustness of the tests, I investigate the differences between logit and probit regressions in order to check a) the coefficients have the same signals, indicating positive or negative relationships, and b) similar results of t tests, as the Table 4 below proves:

Table 4. Robustness Test.

Variable	Mlogit	MProbit
Age	-0.009	-0.005
	-3.39	-3.38
LevelElem	0.253	0.157
	1.54	1.54
LevelHigh	0.384	0.239
	2.77	2.78
LevelUnder	0.350	0.218
	2.54	2.55
LevelGrad	0.267	0.166
	1.74	1.75
Party	0.348	0.216
	5.65	5.65
Fire Unit	-0.605	-0.375
	-7.67	-7.70
NUDECs	0.706	0.439
	11.60	11.67
COMDECs	0.262	0.162
	2.42	2.42
Constant	-0.415	-0.259
	-2.10	-2.12

Source: Author.

These results are hold in the literature, as shown in section 3, excepting the educational level, which is not significant to predict the probability of preventing or reducing damage caused by natural disasters. The evaluation criteria regarding Pseudo R^2 and estat classiffication are presented in Table 5 showing that model 3 is superior to models 1 and 2 with respect to all criteria. The pseudo R^2 is significantly bigger (0.0304). Moreover, the type I error rate of model 3 (0.4219) is lower than the

one of model 1 (0.4434) and model 2 (0.4232). The same results are hold in type II error rate: while model 3 presents 0.4009, model 1 (0.4552) and model 2 (0.4021) have bigger values.

Table 5. Evaluation Criteria.

Criterion	Model 1	Model 2	Model 3
Pseudo R^2	.0076	.0230	.0304
Type I error rate	.4434	.4232	.4219
Type II error rate	.4552	.4021	.4009

Source: Author.

Summarizing, when considering both internal dimensions of capacity, it is possible to predict the probability of a municipality adopts actions pro-environment to prevent or reduce damage caused by droughts. The results above provide support for the three hypotheses.

5. Concluding Remarks

The Brazilian case is interesting because of the local community's perception about the theme. When taking up comparative country approaches, I examined the Online Analysis feature of World Values Survey (WVS) that has demonstrated how distinct are people's beliefs in this theme. The tension between 'Protecting environment' and 'Economic growth' was looked in depth in our selected sample: Brazil, China, India, Russia, South Africa, and United States. Table 6 shows the results when respondents were asked “Here are two statements people sometimes make when discussing the environment and economic growth. Which of them comes closer to your own point of view?":

Among BRIC countries, most of Brazilian people (65.6%) had very similar results that China (65%) and India (69.8%) presented such as protecting the environment as a priority in the sense they are above the mean (54.4%). Next, Russia had a more divided opinion (55.7%). Unlike, economic growth and creating jobs should be a priority in the vision of respondents from South Africa (60.6%) and United States (61.8%).

Table 6. Protecting environment vs. Economic growth.

Country	*Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs.*	*Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent.*	Other answer
Brazil (n=1,367)	65.6%	32.7%	1.8%
China (n=2,001)	65.0%	32.2%	2.8%
India (n=3,411)	69.8%	30.2%	-
Russia (n=2,254)	55.7%	40.0%	4.3%
South Africa (n=3,531)	38.3%	60.6%	1.1%
United States (n=2,173)	38.2%	61.8%	-
TOTAL (n=14,737)	54.4%	44.1%	1.5%

Source: WVS Wave 6. V81.- Protecting environment vs. Economic growth.Selected samples: Brasil 2014, China 2013, India 2012, Russia 2011, South-Africa 2013, United States 2011. Other answer represents “DE,SE: Inapplicable; RU: Inappropriate response; HT: Dropped out survey; No answer;or Dont know”. Adapted by the authors.

To confirm this mindset, I selected another question from the WVS: “Now I will briefly describe some people. Using this card, would you please indicate for each description whether that person is very much like you, like you, somewhat like you, not like you, or not at all like you? Looking after the environment is important to this person; to care for nature and save life resources". Table 7 illustrates the results:

Table 7. Environmental concerns.

Statement	**TOTAL (n=14,737)**	Brazil (n=1,477)	China (n=2,182)	India (n=3,560)	Russia (n=2,306)	South Africa (n=3,469)	United States (n=2,190)
Very much like me	23.1%	25.8%	10.2%	45.4%	15.2%	17.9%	14.6%
Like me	25.8%	52.0%	31.6%	-	34.2%	32.7%	24.4%
Somewhat like me	29.0%	13.0%	32.6%	35.7%	30.7%	26.5%	27.1%
A little like me	12.9%	5.1%	17.1%	-	19.9%	15.9%	22.6%
Not like me	6.4%	3.3%	6.4%	11.8%	-	5.2%	8.1%
Not at all like me	2.9%	0.9%	2.1%	7.1%	-	1.7%	3.2%
Mean	2.62	2.11	2.84	2.54	2.55	2.63	2.95
Standard Deviation	1.30	1.01	1.15	1.65	0.98	1.20	1.29

Source: WVS Wave 6. V78.- Schwartz: Looking after the environment is important to this person, to care for nature and save life resources. Selected samples: Brasil 2014, China 2013, India 2012, Russia 2011, South-Africa 2013, United States 2011. Adapted by the authors.

Again, we can observe that most of Brazilian respondents (77.8%) see themselves as people who find very much like them (25.8%) or like them (52%) to look after environment. As shown in the column “TOTAL", Brazilian perception is much above the mean of the countries of the sample. This finding can reflect an evidence what the electorate believe it is important for political agenda, leading to a unique assessment of government quality.

There is a sensitivity to the environmental area and, consequently, preventing natural disasters should be an issue in the political agenda. According to Srinivas and Nakagawa (2008) "Environmental conditions may exacerbate the impact of a disaster, and vice versa, disasters tend to have an impact on the environment". This sensitivity may be translated in concrete governmental actions to prevent or reduce damage caused by natural disasters. Table 8 presents the municipalities affected by droughts, floods or landslides in the last four years:

Table 8. Brazilian municipalities affected by natural disasters

Natural Disaster	Affected Municipalities	Percentage of the total (n = 5,570)
Drought	2,706	48.6 %
Flood	1,895	34%
Landslide	833	15%

Source: 2017 IBGE Munic.

Based on my contextual sensitivity, I chose to approach only droughts. This phenomenon is less prone to be affected by the influence of external variables, e.g., federal and state amendments or Armed Forced missions such as operational management of natural disasters with emphasis in humanitarian logistics. Finally, given the recurrence of droughts in Brazilian territory (48.6%, concentrated in the northeastern backlands), it is not plausible to argue that the phenomenon is a particular external shock so that it cannot be treated as an instrumental variable simulating a quasi-experiment (as-if-random assignment).

This study endeavors a first attempt to compare the use of capacity in conceptual and empirical work. I also think that external dimensions of capacity, as proposed by Christensen and Gazley (2008), such as financial resources and management, may enrich the model. Unfortunately, this comparison was not possible due to the lack of data. Finbra dataset, which provides financial information of the municipalities, only have data until 2014.

Future research may also provide insights for the formulation of public policies as problems of organizational and managerial capacity of municipalities are identified. Although government faces various constraints, I believe that investigating subnational organizational capacity as an input to performance of municipalities will give us a more fulsome assessment of government quality.

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