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Natural disasters, emergency declaration, and corruption

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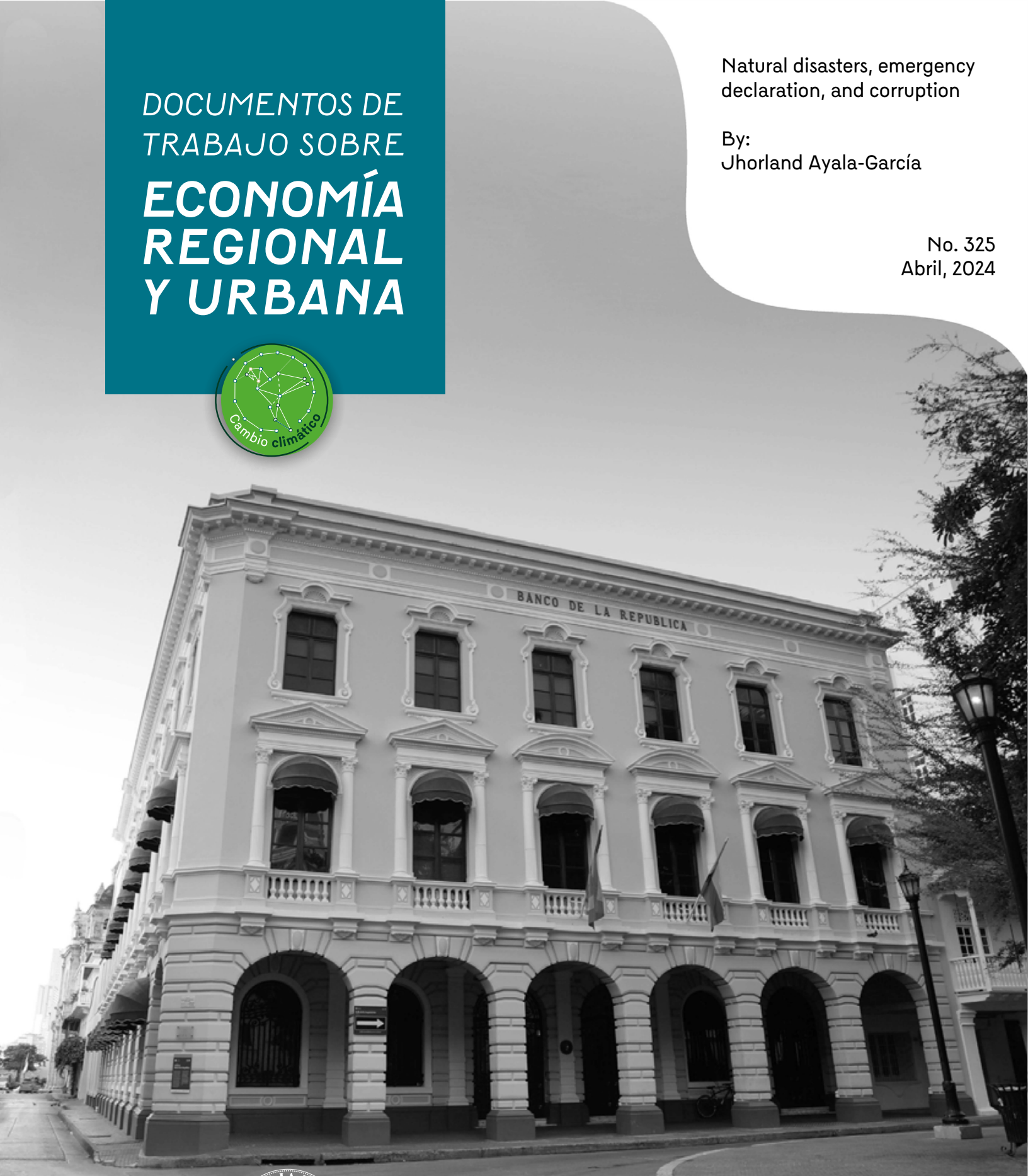

Centro de Estudios Económicos Regionales (CEER) - Cartagena

Natural disasters, emergency declaration, and corruption*

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Abstract

Corruption is generally understood as taking advantage of public power for private benefit. This paper evaluates the relationship between emergency declarations for natural disasters and corruption. We use information from Colombia between 2012 and 2022 and an instrumental variable approach. We take advantage of the exogeneity of the frequency of natural disasters to city level unobservable characteristics to construct our instrument. Since emergency declarations increase the discretion of local officials towards public spending, it is expected to see a rise in corruption. Our findings show a positive relationship between the frequency of natural disasters and the probability of emergency declaration, followed by an increase in observed corruption. The higher level of discretion of public officials not only increases the number of open cases of corruption and convictions, but also the amount of resources involved. We also find that the frequency of natural disasters is not associated with a higher level of expenditure in preemptive and relief spending, nor is it generating unexpected spending. This suggests that what is behind the higher corruption after an emergency declaration is a misappropriation of the budgeted resources in Colombian cities.

Keywords: corruption, governance, natural disasters, discretion.
JEL Classification: H41, H57, H83, H84.

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Desastres naturales, declaratoria de emergencia y corrupción*

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Resumen

Generalmente se entiende por corrupción el aprovechamiento del poder público para beneficio privado. Este artículo evalúa la relación entre las declaraciones de emergencia por desastres naturales y la corrupción. Utilizamos información de Colombia entre 2012 y 2022 y un enfoque de variables instrumentales. Aprovechamos la exogeneidad de la frecuencia de los desastres naturales con respecto a las características no observables por municipio para construir nuestro instrumento. Dado que las declaraciones de emergencia aumentan la discrecionalidad de los funcionarios públicos locales para ejecutar gasto público, se espera un aumento de la corrupción. Nuestros hallazgos muestran una relación positiva entre la frecuencia de los desastres naturales y la probabilidad de una declaración de emergencia, seguida de un aumento en la corrupción observada. La mayor discrecionalidad de los funcionarios públicos no sólo aumenta el número de casos abiertos de corrupción y las condenas, sino también la cantidad de recursos involucrados. También encontramos que la frecuencia de los desastres naturales no está asociada con un mayor gasto preventivos y de alivio, ni genera gastos no presupuestados. Esto sugiere que lo que está detrás de la mayor corrupción tras una declaración de emergencia es una malversación de los recursos presupuestados en las ciudades colombianas.

Palabras clave: corrupción, gobernanza, desastres naturales, discreción.
Clasificación JEL: H41, H57, H83, H84.

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1. Introduction

Corruption is generally understood as taking advantage of a public power for private benefit (Banerjee *et al.*, 2013). It has been raised as one of the main determinants of economic backwardness in developing countries (Del Monte and Papagni, 2001). The consequences include lower long-term growth (Del Monte and Papagni, 1997; Portilla and Gallón, 2001; Gründler and Potrafke, 2019), lower investment (Gründler and Potrafke, 2019; Mauro, 1995, 1998), higher inflation levels (Gründler and Potrafke, 2019), and a consequent reduction in the provision of public goods and services (Isaza, 2018). Among the main determinants of corruption identified in the literature are: i) monopoly power over public goods and services, ii) the discretion of state officials, iii) the level of accountability, and iv) the degree of transparency (Bandiera *et al*., 2021; Klitgaard, 2011; Pont-Newman and Ángel-Arango, 2017; Ferguson *et al*., 2023). This document tries to contribute to the literature that explains the determinants of corruption, evaluating how spending flexibility measures affect the incentives for more inefficient public spending.

With information from Colombia between 2012 and 2022, this paper uses an instrumental variable approach to evaluate the relationship between emergency declarations for natural disasters and corruption. We take advantage of the exogeneity of the frequency of natural disasters (Baker et al., 2023) to the unobservable characteristics of cities to construct our instrument. Since emergency declarations increase the discretion of local officials in public spending, it is expected to see a rise in corruption. This paper evaluates the probability that a capital city declares a public calamity in a first stage, to later evaluate how this declaration of public calamity affects the quality of spending or subnational corruption. The results are expected to show a positive and significant relationship between natural disasters and the declaration of emergency, as well as a positive and significant relationship between the declaration of emergency and corruption.

Colombia presents an opportunity to study the impact of an increase in discretion of state officials on natural disasters. Since 2012, mayors and governors can make use of the public calamity declaration tool to address the negative consequences of natural disasters, which temporarily increases the discretion of subnational public spending. The declaration of public calamity can be made whenever an unintentional natural or anthropic event occurs, which,

given pre-existing vulnerability conditions, generates human, economic, and environmental losses. In this sense, it is possible that the declaration of emergency will result in more acts of corruption in the country. The greater expenditure flexibility combined with incentives to provide relief to the affected population after a natural disaster opens a window of opportunity for corruption behavior.

Measuring corruption is challenging because of the hidden nature of the corruption behavior. To test this relationship, we use corruption data from the Government Accountability Office of Colombia (*Contraloría General de la República*), which records the Fiscal Liability Processes of public officials. According to Law 610/2000, a Fiscal Liability Process is an administrative decision taken by the government accountability offices to determine the responsibility of public or private servants whose actions cause patrimonial detriment to the state. A patrimonial detriment is a loss in the value or a wrong use of the public goods and resources, and it gives rise to a Fiscal Liability Process when a complaint or an audit report suggest a wrongdoing in the use of public resources. This is our measure of corruption, as it has been previously used in the literature for Colombia (Badel, 1999; Gamarra, 2008). After a case is open, there is an investigation that can result in a conviction where the party found responsible for the patrimonial detriment is obliged to pay back the money involved. We are aware that the verdicts from the Government Accountability Office are not a perfect measure of corruption, because it is possible that the final decision is affected by corrupt behavior itself, or because it may be not enough evidence to get a conviction. However, we can use both the open cases, which are not expected to suffer from significant bias as do the cases with enough evidence to get a conviction.

Our findings show a positive and strong relationship between the frequency of natural disasters and the probability of emergency declaration, followed by an increase in observed corruption. An emergency declaration in the Colombian capital cities increases the total open cases with a possibility of corruption by 3.7 per 100,000 people compared to cities that do not declare emergency, and the amount of money involved per person increases COP $5,218 per capita. In addition, an emergency declaration increases the number of cases of corruption with conviction by 1.24 per 100,000 people, and the amount involved increases COP $1,390 per capita. Note that when considering cases with conviction, both the number of open cases

and the money involved show a lower response to an emergency declaration than when considering all cases. We also find that larger cities do not show higher levels of corruption, but the richer the city, the higher the observed corruption.

2. Natural disasters and emergency declaration in Colombia

Colombia is recognized as a pioneer developing country in establishing a comprehensive vision of disaster risk management (World Bank, 2012). Starting in 1984 with the creation of the National Calamity Fund (decree 1547 of 1984), to assist affected population after a natural disaster. It was subject to constant modifications through future decrees and/or laws. Few years later, the Law 46 of 1988 outlined the route of the Colombian System for Disaster Risk Management. It defined a disaster as a grave incident altering the normal functioning of life in a certain population group, in such a way that it demands timely governmental attention. According to the Law 46 of 1988, only the president, with prior authorization from the aforementioned committee, was allowed to make a disaster situation declaration which would then be classified according to its incidence as national, departmental, district or municipal[1]. The adverse situation was finally addressed with resources of the National Calamity Fund.

A year later, Decree-Law 919 of 1989 included for the first time of the term "public calamity", defined as that situation that does not reach the level and severity of a disaster. Once the situation of public calamity has been declared, a specific action plan had to be prepared to address the adverse situation by the National Disaster Response Office if it is national and by the regional, district or municipal committees, depending on the scope of the situation. Then, the Law 80 of 1993, which refers to the general statute of public administration, in its article 42 defines manifest urgency as that situation in which goods and/or services are demanded immediately in exceptional situations, calamity or disaster. Becoming another figure that allowed direct hiring and budget transfers, which may create opportunity for corruption (Gallego *et al*., 2021).

[1] There are three levels of government in Colombia: the central or national, the departmental, and the municipal.

The legal structure did not change significantly until 2010. After a declaration of economic, social, and ecological emergency derived from the La Niña Phenomenon and carried out on December 7, 2010, some shortcomings of decree-law 919 of 1989 were evident regarding legal functions of power. As a result, the decree 4702 of 2010 modifies the decree-law 919 of 1989. In this, changes are made to the structure of the Board of Directors of the Calamity Fund (formerly the Consulting Board) where the director of civil defense is eliminated and the director of the National Planning Department and four members from the private sector elected by the presidency are added. Additionally, the Management of the National Calamity Fund is created, with intermediation functions between the national government, territorial entities, and private individuals; guide damage mitigation actors; and convene the board of directors; among other. The manager will be appointed by the president of the republic. In summary, this decree intended to make the process of transaction of resources from the National Calamity Fund to national, territorial, and private public entities more efficient, bypassing budgetary operations on their part, to respond to emergencies more quickly.

In 2011, the decree-law 4147 created the National Unit for Disaster Risk Management (UNGRD, in Spanish) whose objective is to implement disaster risk management and coordinate the National System for Disaster Prevention and Attention (SNPAD, in Spanish), its structure can be reviewed in article 10 of the decree-law. Then, on April 24, 2012, Law 1523 appears, which broadly establishes the SNPAD as national policy. According to this law, public calamity is defined as the consequence derived from unintentional natural or anthropic events, which in the face of pre-existing conditions of vulnerability (all people are potentially vulnerable) generates human, economic and environmental losses, having a negative and widespread impact on the lives of the respective population. It is in this context that the people in charge of directing any territorial entity, both at the departmental and municipal levels, are urged to execute actions that mitigate and repair the damage.

However, governors and mayors must consider some criteria for the declaration of public calamity contained in article 59 of this law. This is how the political authority must consider: i) The legal assets of people in danger or who have suffered damage; ii) The legal assets of the community and institutions in danger or that have suffered damage; iii) The dynamism of the emergency to destabilize the existing balance and to generate new risks and disasters;

iv) The tendency of the emergency to be modified, aggravated, reproduced in other territories and populations or perpetuated; v) The capacity or inability of the authorities of each order to face emergency conditions; vi) The temporal element that adds urgency and urgency to the need for a response, and vii) the imminence of disasters or public calamity with due factual support.

Whenever the previous criteria are considered, governors and mayors will be able to make a declaration of a public calamity situation, if the Departmental, District or Municipal Risk Management Council approves it. It is important to note that the public calamity may be in force for a maximum period of six months with the option of extension for up to the same period. Once the situation of public calamity has been declared, the territorial authorities undertake to build a "Specific Recovery Plan" in such a way that the response to the adverse situation is as efficient and effective as possible. To do this, they have the mobility of resources between secretariats which, without the figure of the declaration of public calamity, would be a complex bureaucratic process. With the above, governors and mayors can make purchases of goods or services to address the most urgent needs of the affected population. This entire process is carried out through direct hiring; that is, ignoring bidding processes that, in principle, can be considered coherent due to the magnitude of a public calamity.

However, the law is not clear on the limit of treasury redistribution. Although it empowers the Comptroller General of the Republic to subsequently review the management of its own resources, a figure such as the one mentioned above can be taken advantage of by individual economic interests. In such a way that, being a measure established to urgently attend to a specific population, it can end in a corruption process from which only a few people would benefit. On the other hand, there is no marked difference between the declaration of a public calamity and a declaration of emergency. The law conceptually defines these two in very similar ways, so it can be inferred that within a public calamity there will always be an emergency. On the contrary, a clear difference can be established between a declaration of public calamity and a declaration of disasters. Conceptually they are identical, the divergence lies in the fact that the former is issued by territorial entities at departmental and municipal levels, while the latter is under the consideration of the national government. Finally, disasters can have a total validity of twelve months, extendable by the same period.

3. Methodology and data

The declaration of public calamity requires that mayors make an evaluation of the damages and losses after a natural disaster. The capacity to correctly measure those consequences depends on the cities' institutional capacity. Not all natural disasters end up in emergency declarations since local governments may have the institutional capacity to respond to the emergency without needing to move resources between secretaries. As a result, there are incentives for more corrupt officials to make public calamity declarations, which raises endogeneity concerns when evaluating the impact of such responses. This paper uses an instrumental variable approach to evaluate the relationship between emergency declaration and corruption. We take advantage of natural disasters as exogenous shocks that increase the probability of declaring an emergency. Since emergency declaration increases the discretion of local officials, it is expected to see a rise in corruption. The instrument in this case is the predicted probability that a public calamity is declared in a capital city because of a natural disaster, following the proposals of Windmeijer and Santos-Silva (1997) and Xu (2021). This sort of instruments works better when the endogenous variable, in this case the declaration of public calamity, is dichotomous and the instrument is continuous. More precisely, the instrument Z for the city i at time t is given by:

$$Z_{it} = E(DC|N_{it}, \mathbf{P})$$

Where $E(DC \mid N_{it}, P)$ is the predicted probability of an emergency declaration resulting from a logit estimate in which the declaration of emergency is a function of natural disasters, N_{it}, P is a matrix of control variables that includes population, GDP per capita, state size, and time fixed effects. DC is a dichotomic variable that takes the value of 1 if an emergency declaration was made and zero otherwise. Natural disasters have been used as exogenous instruments in some contexts (Baker et al., 2023), and this paper uses the frequency of extreme natural events per year for every capital city as a measure of natural disasters. By using the frequency of natural disasters instead of a direct measure of the losses, we avoid the potential endogeneity concerns regarding the vulnerability of the population possibly driven by the lack of governmental action. The predicted probability, Z, is expected to be a powerful predictor of emergency declaration decisions. Then, the first stage is estimated in a linear probability model as follows:

$$DC_{it} = \alpha_0 + \alpha_1 Z_{it} + \mathbf{X}\boldsymbol{\lambda} + u_{it}$$

Where **X** is a matrix of control variables that includes population, GDP per capita, state size, and city fixed effects. Finally, we estimate the second stage as:

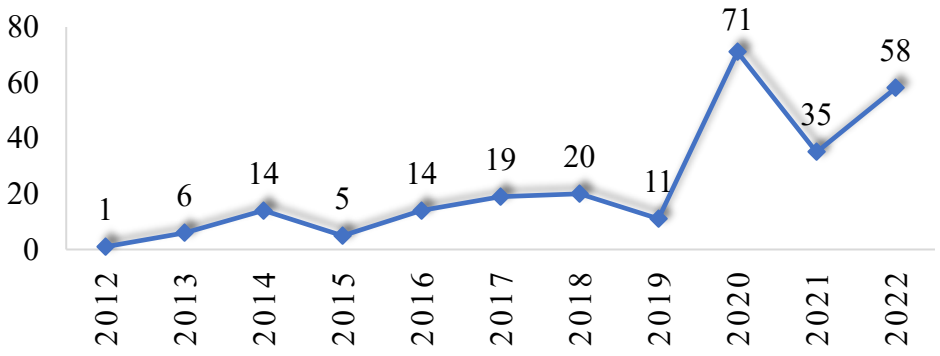
$$C_{it} = \beta_0 + \beta_1 \widehat{DC_{it}} + \mathbf{X}\boldsymbol{\gamma} + e_{it}$$

Where C_{it} is the measure of corruption in the capital city i in year t. As we mentioned earlier, emergency declaration increases the level of discretion of public officials for public procurement. They can relocate resources from one sector to another and face fewer restrictions to purchase goods and services. We expect to see a positive relationship between emergency declaration and corruption in Colombian cities.

3.1 Data

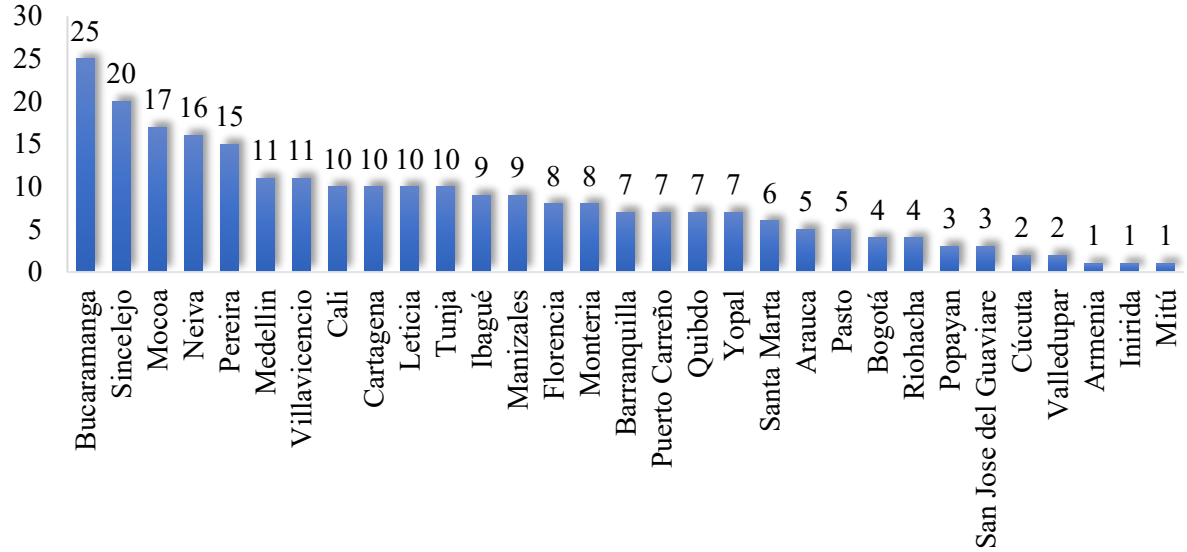
We construct a database of emergency declaration for all Colombian departmental capital cities from 2012 through 2022. We rely on publicly available decrees published in the official mayor's websites, which contains information about the motives, the location of the event, and the duration of the calamity declaration. Figure 1 shows that the number of public calamity declarations in capital cities increased from 1 in 2012 to 58 in 2022. There was a significant increase in the number of decrees in 2020 because of the Covid-19, with 71 decrees in 27 capital cities, 53 of which correspond to emergencies related to the pandemic. By cities (Figure 2), the ones with the larger amount of public calamity decrees are Bucaramanga (25), Sincelejo (20), Mocoa (17), Neiva (16), and Pereira (15), while the lowest values are in Mitú (1), Inírida (1), Armenia (1), Valledupar (2), and Cúcuta (2).

Figure 1. Total decrees of public calamity declaration in capital cities



Source: elaborated by the author.

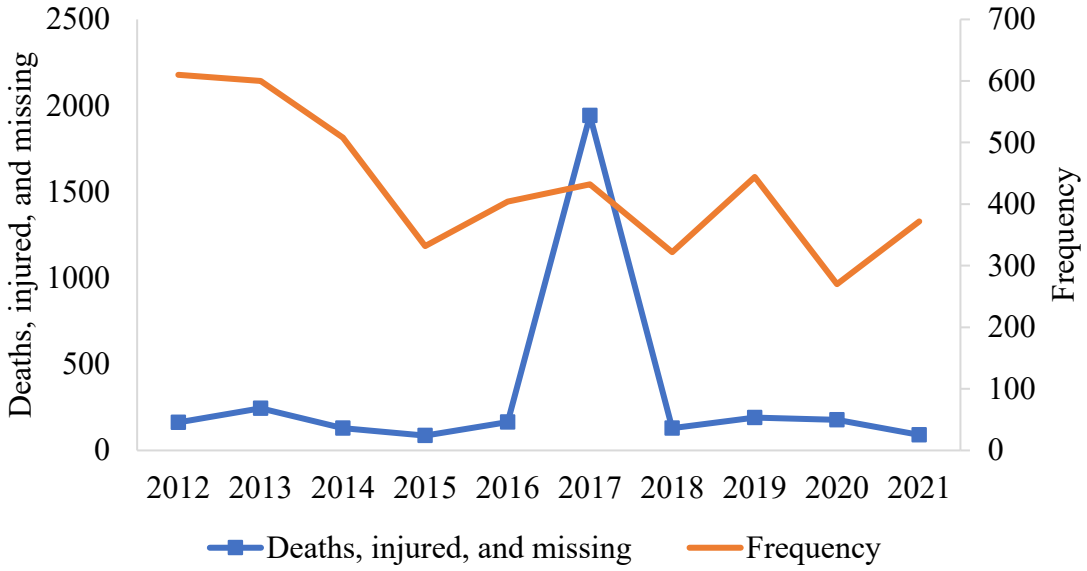
Figure 2. Total decrees of calamity declaration in capital cities, 2012-2022.



Source: elaborated by the author.

The natural disasters information comes from the Emergency Reports of the *UNGRD*. This database has information about all the emergencies that occurred in every city since 2012. The *UNGRG* classifies twelve types of emergencies that can be considered natural disasters: avalanches, landslides, erosion, hailstorms, frosts, floods, storm surges, droughts, earthquakes, electrical storms, gales, and volcanic eruptions. The two most common events in Colombia are floods and landslides, accounting for 84% of human losses and affectations between 1998 and 2021 (Ayala and Ospino, 2023). We use the frequency of natural disasters to avoid potential endogeneity concerns, considering that it is not expected to be correlated with any unobservable characteristic of any given city. Figure 3 shows the evolution of the frequency of natural events and the number of deaths, injured and missing population (highly affected population) in capital cities from 2012 through 2022. The frequency of natural disasters in these cities decreased from 610 in 2012 to 372 in 2021, while the highly population affected remained relatively stable. The spike in 2017 is explained by the tragedy of Mocoa, which killed 332 people, 398 were injured and 77 were missing (National Planning Department, 2017). It is important to point out that capital cities exhibit a different pattern than the one observed in the country, where both the frequency and the highly affected population have increased in the last decade (Ayala and Ospino, 2023).

Figure 3. Frequency and direct affectations of natural disasters in capital cities, 2012-2021.



Finally, measuring corruption is a challenging task, especially in developing countries. However, the information available in Colombia offers an opportunity to study the intended relationship. The corruption data comes from the Government Accountability Office of Colombia, which records the Fiscal Liability Processes of public officials. As we mentioned earlier, a Fiscal Liability Process is an administrative decision taken by the government accountability offices to determine the responsibility of public or private servants whose actions cause of patrimonial detriment to the state, and it has been commonly used as a measure of observed corruption (Gamarra, 2008; Ayala *et al*., 2022). We have the total number of open processes, the processes with conviction, and the amount of money involved in every case. We consider both the open cases and the cases with conviction because of the possibility that convictions are affected by corrupt officials. While it is likely to observe dishonest behavior in the judiciary process, the accusations and complaints are less expected to be affected by corrupt officials. Table 1 shows the average number of opened cases and the amount of money involved, as well as those cases where a patrimonial detriment was found. According to the open fiscal liability processes, the cities with the highest levels of corruption are Yopal, Bogotá, and Arauca, while the least corruption is found in Popayán, Cúcuta, and Pasto. Figure 4 shows the geographical distribution of the amount of money involved in fiscal liability processes.

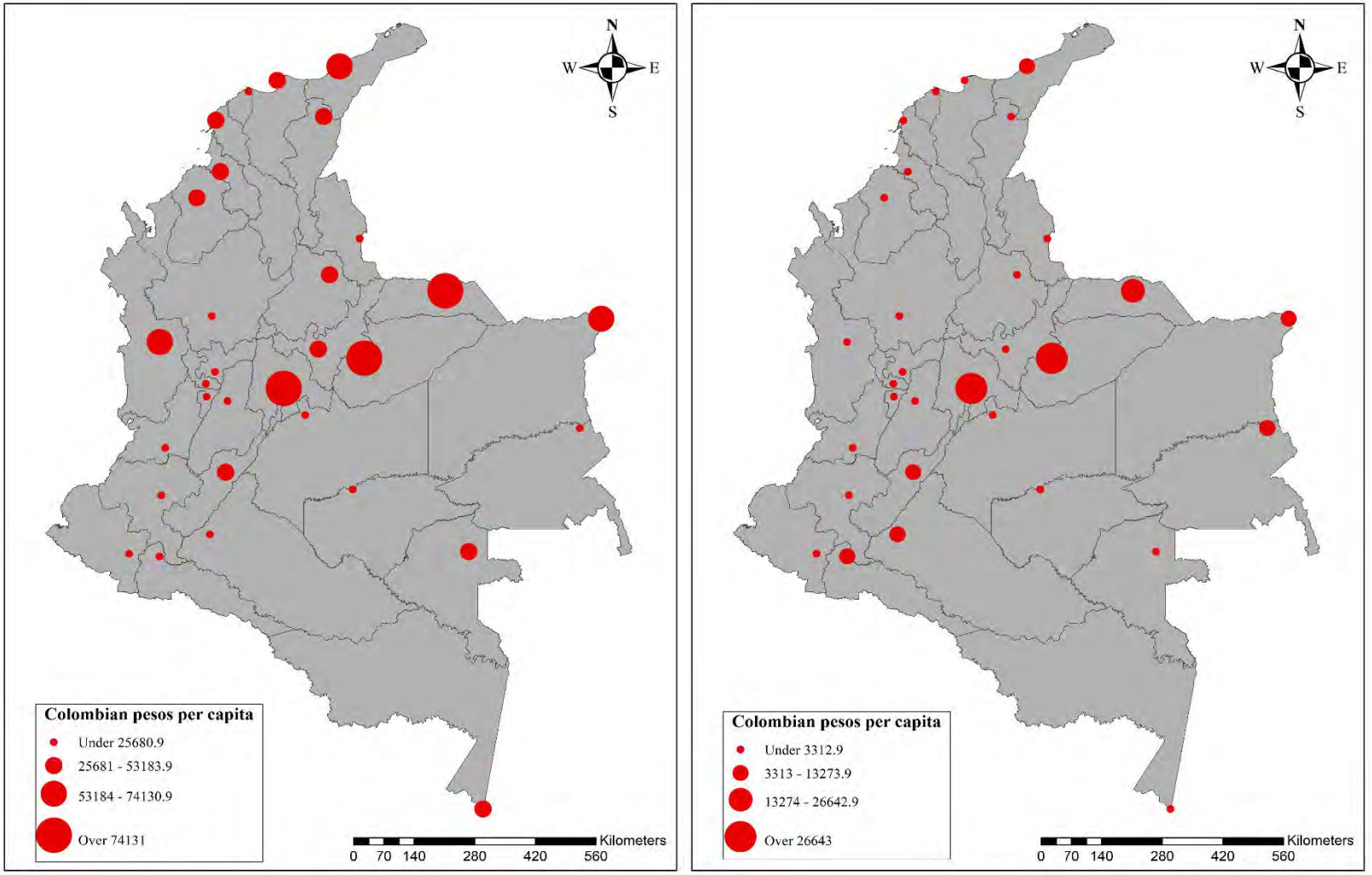
Table 1. Fiscal liability processes by capital cities, 2012-2022.

City	Open cases	Money involved in open cases (per capita)	Cases with conviction	Money involved in cases with conviction (per capita)
Yopal	115	183,558	30	66,080
Bogotá, D.C.	678	139,802	56	50,670
Arauca	103	128,990	17	26,643
Riohacha	214	74,131	9	11,967
Quibdó	205	72,406	24	3,313
Puerto Carreño	40	66,559	11	13,273
Santa Marta	135	53,183	16	1,075
Valledupar	333	49,643	30	3,088
Montería	163	44,342	12	2,475
Neiva	169	43,138	24	7,180
Mitú	32	42,939	11	1,934
Cartagena de Indias	272	41,580	10	159
Bucaramanga	345	36,371	43	1,592
Tunja	161	34,812	14	1,206
Sincelejo	220	33,848	20	2,455
Leticia	126	31,198	21	1,313
Inírida	39	25,679	10	11,892
Mocoa	39	22,589	12	8,526
Villavicencio	128	22,014	10	798
San Andrés	43	21,105	24	4,945
Florencia	120	18,539	20	5,838
Pereira	230	16,970	19	225
Barranquilla	80	14,832	2	5
Cali	147	12,816	15	873
Armenia	107	11,144	16	1,265
San José del Guaviare	22	11,030	2	252
Manizales	221	8,871	17	972
Ibagué	448	8,263	77	2,400
Medellín	144	7,642	13	309
Pasto	168	7,412	26	2,184
Cúcuta	63	5,667	6	400
Popayán	92	3,925	25	793

Source: elaborated by the author with data from the Government Accountability Office of Colombia.

Figure 4. Money involved in fiscal liability processes, per capita, 2012-2022.

a) Open cases **b) Cases with conviction**



Source: The author with data from the Government Accountability Office of Colombia.

4. Results

As we mentioned earlier, we use an instrumental variable approach to estimate the impact of emergency declaration on corruption. We take advantage of the exogeneity of the frequency of natural disasters to city level unobservable characteristics to construct our instrument. Following Xu (2021), Table 2 shows the results of the logit estimation where the frequency of natural disasters is used to predict the probability of public calamity declaration in each city. The coefficients indicate a positive and statistically significant relationship between the frequency of natural disasters and the probability of emergency declaration. We include some additional controls to isolate the correlation between our source of exogenous variation and the predicted probability of emergency declaration such as population size, lagged per capita GDP, and lagged government size.

Table 2. Logit estimation: probability of emergency declaration.

Dependent Variable:	Emergency declaration
Frequency of natural disasters	0.033***
	(0.011)
Population per 100.000	-0.034***
	(0.011)
Per capita GDP (*t-1*)	0.067**
	(0.032)
Government size (*t-1*)	0.104
	(0.452)
Constant	-2.831***
	(0.673)
Observations	248

Robust standard errors in parentheses.
Year fixed effects included. *** p<0.01, ** p<0.05, * p<0.1.

After constructing our instrument, we move to the first stage results that show a positive and significant relationship between the predicted probability of an emergency declaration and the decision of declaring emergency in a capital city with a linear coefficient of statistically equal to one (Table 3). The F statistic shows a very strong prediction power of our instrument after considering all the control variables in our specification. We include additional weak identification tests (Cragg-Donald Wald F statistic, Kleibergen-Paap Wald F statistic, and the Stock-Yogo weak ID test), all of which gives us similar results.

Table 3. First stage: Probability of emergency declaration and emergency declatarion.

Dependent Variable:	Emergency declaration
Predicted probability of emergency declaration	1.000***
	(0.131)
Population per-100.000	-0.006
	(0.053)
Per capita GDP (*t-1*)	-0.002
	(0.011)
Government size (*t-1*)	0.169
	(0.125)
Time	-0.015
	(0.022)
Constant	-0.193
	-0.217
Observations	248
F-test	58.08
Cragg-Donald Wald F statistic	63.12
Kleibergen-Paap Wald F statistic	58.08
Stock-Yogo weak ID test (10%)	16.38

Standard errors clustered at the city level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.
City fixed effects included.

Our main specification considers four different dependent variables as measures of corruption: i) Total open cases, which represents cases where corruption is suspected and reported to the authority, ii) Money involved in all cases, which measures the level of corruption observed in all open cases, ii) Open cases with conviction, meaning the cases where a patrimonial detriment was found by the authority, and iv) Money involved in cases with conviction, which measures the level of observed corruption in cases with sufficient evidence of corruption. We consider both the open cases and the cases with conviction given the potential measurement error problems that arise when only observed corruption is used: the nature of the corruptive behavior consists of not leaving evidence behind. This is the main challenge when one tries to measure corruption. We expect that with all cases, including those where a report is made independently of the final decision, the concerns about the measurement error problem disappear.

The results of the second stage are presented in Table 4. Our main variable of interest is the Declaration of PC (Public Calamity), which shows a positive and statistically significant

relationship with all four measures of corruption. The findings show that a declaration of public calamity in the Colombian capital cities increases the total open cases with a possibility of corruption in 3.7 per every 100,000 people, and the amount of money involved per person increases in COP $5,218 per capita. Of course, not all these cases end up in conviction. Table 4 shows that an emergency declaration increases the number of cases of corruption with conviction in 1.24 per every 100,000 people, and the amount involved increases in COP $1,390 per capita. Note that when considering cases with conviction, both the number of open cases and the money involved show a lower response to an emergency declaration than when considering all cases. We also find that larger cities do not show higher levels of corruption, but the richer the city, the higher the observed corruption.

Table 4. Second stage: Emergency declaration and corruption.

	(1)	(2)	(3)	(4)
Dependent variables	Open cases – All cases	Money involved – All cases	Open cases – with conviction	Money involved – Cases with conviction
Declaration of PC.	3.708**	5,218***	1.243**	1,390**
	(1.816)	(1,708)	(0.512)	(650.4)
Population x 100,000	1.297	-1,928	0.0433	-932.9
	(1.150)	(1,365)	(0.261)	(635.1)
GDP per capita (t-1)	0.883**	995.2***	0.257***	417.6***
	(0.374)	(105.8)	(0.0466)	(77.48)
Government size (t-1)	3.208	-2,791	2.799**	556.5
	(3.809)	(2,486)	(1.293)	(679.9)
Time trend	-3.567***	-1,886***	-0.978***	-524.1***
	(0.648)	(354.4)	(0.224)	(124.7)
Observations	248	248	248	248

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. City fixed effects included in all regressions.

There are two possible explanations for the increase in corruption cases and level given the higher flexibility after an emergency declaration. First, it is possible to observe that the amount of money diverted towards a higher preemptive and relieve expending increases

because of the natural disasters. Second, we may see that the spending level remains the same, while the inefficiency increases. We test whether mayors increase the preemptive and relieve spending in years with a higher frequency of natural disasters. The results show that the rise in corruption after an emergency declaration does not come from a higher fiscal expenditure. Table 5 shows that the frequency of natural disasters is not associated with a higher level of expenditure in preemptive and relieve spending, nor is it generating unexpected spending, defined as the difference between the observed total expenditure and what was budgeted for preemptive and relieve spending. This suggests that what is behind the higher corruption after emergency declaration is a misappropriation of the budgeted resources in Colombian cities.

Table 5. Natural disasters and preemptive and relieve spending.

Dependent variables	(1) Preemptive and relieve spending	(2) Unexpected expenses
Frequency of natural disasters	62.43	77.97
	(76.37)	(69.07)
Population x 100,000	1.11	-0.89
	(1.39)	(3.21)
GDP per capita (t-1)	-1.00**	-1.00*
	(0.45)	(0.53)
Tax expense per capita (t-1)	13.00***	10.00**
	(3.81)	(3.79)
Year	-26.78	191.08
	(581.04)	(546.60)
Constant	54,701.53	-376,480.01
	(1,170,566.21)	(1,095,154.08)
R-squared	0.08	0.05
Observations	248	248

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

5. Conclusions

Corruption have been found to have significant negative socio-economic consequences such as lower long-term growth, lower investment, higher inflation levels, and a reduction in the provision of public goods and services. However, there is scarce evidence about its determinants, especially in the case of developing countries where the information available is limited. The precise hidden nature of corruption makes it impossible to find a unique and undisputable way to measure it. This paper contributes to the literature on the identification of potential determinants of corruption in Colombian cities. This case study of a developing country represents an opportunity to understand how a natural disaster, and the corresponding public calamity declaration given by mayors and governors, can lead to even worse consequences such as loss of resources related to acts of corruption.

We study how increasing discretion of public officials can enhance the prevalence of corruption. Following an instrumental variable approach, this paper provides causal evidence on the impact of emergency declarations. We combine information from the Accountability Office of Colombia, which records all the Fiscal Liability Processes of public officials, with the natural disasters' information from the UNGRD. In addition, we build a yearly database of public calamity declarations for the Colombian capital cities. First, we construct our instrument by estimating the predicted probability of a public calamity declaration as a function of the frequency of natural disasters for every city and year. We use the frequency of natural disasters to avoid potential endogeneity concerns, considering that it is not expected to be correlated with any unobservable characteristic of any given city. Second, we use the predicted probability of calamity declaration as an instrument to the decision of mayors to declare emergency and increase the level of discretion over fiscal expenditures after a natural disaster. Finally, we estimate the impact of the higher level of discretion over four different measures of corruption, all from the Fiscal Liability Processes: open cases, money involved in open cases, open cases with conviction, and money involved in open cases with conviction.

Our findings show a positive relationship between the frequency of natural disasters and the probability of emergency declaration, followed by an increase in observed corruption. An emergency declaration in the Colombian capital cities increases the total open cases with a

possibility of corruption in 3.7 per every 100,000 people, and the amount of money involved per person increases in COP $5,218 per capita. In addition, an emergency declaration increases the number of cases of corruption with conviction in 1.24 per every 100,000 people, and the amount involved increases in COP $1,390 per capita. Note that when considering cases with conviction, both the number of open cases and the money involved show a lower response to an emergency declaration than when considering all cases. We also find that larger cities do not show higher levels of corruption, but the richer the city, the higher the observed corruption.

The higher level of discretion of public officials not only increases the number of open cases of corruption and the convictions, but also the resources involved. There are two possible explanations for the increase in corruption cases and level given the higher flexibility after an emergency declaration. First, it is possible to observe that the amount of money diverted towards a higher preemptive and relieve expending increases because of the natural disasters. Second, we may see that the spending level remains the same, while the inefficiency increases. We test whether mayors increase the preemptive and relieve spending in years with a higher frequency of natural disasters. We find that the frequency of natural disasters is not associated with a higher level of expenditure in preemptive and relieve spending, nor is it generating unexpected spending, defined as the difference between the observed total expenditure and what was budgeted for preemptive and relieve spending. This suggests that what is behind the higher corruption after emergency declaration is a misappropriation of the budgeted resources in Colombian cities.

References

Ayala-García, J., Bonet-Morón, J., Pérez-Valbuena, G.J., Heilbron-Fernández, E.J., Suret-Leguizamón, J.D., (2022), La corrupción en Colombia, un análisis integral. *Documentos de Trabajo sobre Economía Regional y Urbana*, No. 307. Banco de la República.

Ayala-García, J., y Dall'erba, S. (2020). The impact of preemptive investment on natural disasters. *Papers in Regional Science*, 101(5), 1087-1103.

Ayala-García, J., Ospino-Ramos, K., (2023), Desastres naturales en Colombia: un análisis regional. *Documentos de Trabajo sobre Economía Regional y Urbana*, No. 317. Banco de la República.

Badel, Martha E. (1999): Costos de la Corrupción en Colombia. *Documentos de Macroeconomía*, No. 111. DNP Unidad de Análisis Macroeconómico, Bogotá.

Baker, S. R., Bloom, N., Terry, S.J., (2023). Using Disasters to Estimate the Impact of Uncertainty, *The Review of Economic Studies,* rdad036.

Bandiera, O. Erica Bosio and Gian Carlo Spagnolo (Eds.) (2021). *Procurement in Focus: Rules, Discretion, and Emergencies*. Centre for Economic Policy Research (CEPR).

Banerjee, A., Hanna, R., & Mullainathan, S. (2012). Corruption. In R. Gibbons & J. Roberts (Eds.), *The Handbook of Organizational Economics* (pp. 1109–1147). Princeton University.

Del Monte, A. and Papagni, E. (2001) Public expenditure, corruption and economic growth: The case of Italy, *European Journal of Political Economy*, 17, pp. 1-16.

Fergusson, L., Harker, A., Molina, C., and Jamín, J.C., (2023). "Political incentives and corruption evidence from ghost students," *Documentos CEDE* 20732, Universidad de los Andes, Facultad de Economía, CEDE.

Gallego, J., Prem, M., and Vargas, J.F., (2021). "Pandemic corruption: Insights from Latin America" In Bandiera, O. Erica Bosio and Gian Carlo Spagnolo (Eds.) (2021). *Procurement in Focus: Rules, Discretion, and Emergencies*. Centre for Economic Policy Research (CEPR), pp. 101-110.

Gamarra, J. R. (2008). Desfalcos y regiones : un análisis de los procesos de responsabilidad fiscal en Colombia. *Geografía Económica y Análisis Espacial En Colombia. Capítulo 3. Desfalcos y Regiones : Un Análisis de Los Procesos de Responsabilidad Fiscal En Colombia. Pág.:107-142*, *66*.

Gründler, K., y Potrafke, N. (2019). Corruption and economic growth: New empirical evidence. *European Journal of Political Economy*, 60, 101810.

Isaza, C. (2018). Estudio Introductorio: Hallazgos y conclusiones de los estudios de las ciencias sociales sobre la corrupción y aportes de este libro a esa conversación en Colombia. En: Luis Carlos Calixto Rodríguez; Juan Carlos Henao y Carolina Isaza Espinosa (editores) - Bogotá: Universidad Externado de Colombia.

Klitgaard, R. (2011). Fighting corruption. CEsIFO DICE Report, 46(37), 5.

Mauro, P. (1995). Corruption and Growth. *Quaterly Journal of Economics*, 110(3), pp. 681-712.

Mauro, P. (1998). Corruption and the Composition of Government Expenditure. *Journal of Public Economics*, 5(69), pp. 263–279.

National Planning Department, 2017. "Plan para la reconstrucción del municipio de Mocoa, 2017-2022, concepto favorable a la nación para contratar un empréstito externo hasta por la suma de USD 30 millones, o su equivalente en otras monedas, para financiar la

implementación del Plan Maestro de Alcantarillado del municipio de Mocoa (Fase I), y declaración de importancia estratégica del Plan Maestro de Alcantarillado del municipio de Mocoa (Fase I). *Documento CONPES*, No. 3904. Bogotá, D.C.: National Planning Department.

Pont-Newman, V., y Ángel-Arango, M. P. (2017). Estado del arte sobre la corrupción en Colombia. 121. https://www.repository.fedesarrollo.org.co/bitstream/handle/11445/3411/Repor_Junio_2017_Newman-Pont_y_Angel.pdf?sequence=1&isAllowed=y

Portilla, K., y Gallón Gomez, S. (2001). El impacto de la corrupción sobre el crecimiento económico colombiano, 1990-1999, *Lecturas de Economía*, 57, pp. 51-85.

Windmeijera, F. A. G. y Santos Silva, J. M. C. (1997) Endogeneity in count data models: An application to demand for health care. *Journal of Applied Econometrics*, 12, pp. 281-294.

World Bank. (2012). Análisis de la gestión del riesgo de desastres en Colombia: un aporte para la construcción de políticas públicas. Bogotá, D.C.

Xu, R. (2021) On the instrument functional form with a binary endogenous explanatory variable, *Economic Letters*, 206, 109993.