

Disasters, economic growth and fiscal response in the countries of Latin America and the Caribbean, 1972-2010

Omar D. Bello¹

Abstract

The aim of this study is to estimate the impact of geological and climate-related disasters on the per capita growth rates of gross domestic product (GDP) and fiscal expenditure in Latin American and Caribbean countries. The results show that the effects vary by type of disaster and by subregion. In the Caribbean countries, the per capita GDP growth rate has typically responded negatively to climate disasters, whereas the response to a geological disaster has generally not been statistically significant. In Central American countries, the response of the per capita GDP growth rate was found to be negative in the first year and positive in the third year in the case of climate disasters, but positive in the second and third years for disasters of geological origin.

Keywords

Natural disasters, economic growth, gross domestic product, public expenditure, Latin America and the Caribbean

JEL classification

Q54, L6, L7, L8

Author

Omar D. Bello is coordinator of the Sustainable Development and Disaster Unit of the Economic Commission for Latin America and the Caribbean (ECLAC) subregional headquarters for the Caribbean, Port of Spain. omar.bello@cepal.org

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I. Introduction

Disasters are shocks that can affect a country's various environmental, economic and social variables.² They are commonly occurring phenomena, and their frequency has been increasing.³ According to the Emergency Events Database (EM-DAT) of the Office of Foreign Disaster Assistance and the Centre for Research on the Epidemiology of Disasters (OFDA/CRED) of the Catholic University of Louvain in Brussels, which has the most extensive record of disasters around the world, in 1970-2010, there were 10,271 disasters worldwide, of which 23.7% occurred in America (16.9% in Latin American and Caribbean countries), while Asia was the worst affected continent (39.3% of disasters occurred in that region). The database defines a disaster as an event that meets one of the following criteria: (i) 10 or more deaths are reported; (ii) at least 100 people are reported as being affected; (iii) a state of emergency is declared, or (iv) a request for assistance is issued.

The same source reports that 1,737 disasters occurred in Latin America and the Caribbean in that period, of which 1,392 were of climate-driven, 227 geological, and 118 of biological origin. In the subregions, the frequency of disasters grew fastest in Central America (by 410%) and in the Caribbean (372%);⁴ while in South America the number rose by 288%.⁵ This pattern was determined by the occurrence of climate-driven phenomena, which increased by 448% and 438% in Central America and in the Caribbean, respectively. The evidence presented in the second section of this article shows that the disasters in these subregions have also been more severe in terms of deaths, population affected, and material damage.

Disasters can be classified alongside the varied disturbances that affect the economies of the region, including the business cycles of high-income countries —the international trade repercussions of which trigger changes both in export volumes, particularly commodities, and in their prices⁶— and disturbances on international financial markets. In the last 40 years, there have been various episodes such as debt crises, the saving and loan crisis in the United States, the Mexican crisis, the Asian crisis, the Argentine crisis, and the crisis in the United States real estate market, all of which have affected the Latin American and Caribbean countries through different mechanisms (see, for example, Titelman, Pérez and Pineda (2009), De Gregorio and Valdés (2001) and Reinhart and Rogoff (2008)). It is well documented that reductions in GDP in developed countries, the prices of commodity exports and external interest rates are factors that help to explain, among other things, various episodes that have hindered the economic performance of the Latin American and Caribbean countries.⁷

² This article uses the term "disasters," because these situations are the outcome of a natural event (for example, an earthquake, volcanic eruption or hurricane) and of human error. Accordingly, for many years, the community that analyses the topic has replaced the term "natural disasters" by "disasters."

³ According to Stromberg (2007), the increase in the number of disasters is related to three factors: (i) the reporting of small-scale disasters is probably more complete in recent years; (ii) the world's population has grown, so a larger number of people are exposed to natural hazards, and (iii) climate events are more frequent.

⁴ Central America includes Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama; the Caribbean includes Antigua and Barbuda, the Bahamas, Barbados, Cuba, Dominica, the Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago.

⁵ South America includes Argentina, the Bolivarian Republic of Venezuela, Brazil, Chile, Ecuador, Guyana, Paraguay, Peru, the Plurinational State of Bolivia and Suriname.

⁶ Except for Mexico and Brazil, in 2000-2010 more than 45% of the annual average export basket of Latin American countries consisted of commodities.

⁷ Laeven and Valencia (2008) note that 13 of the 41 banking crises on which they report occurred in Latin America.

From the economic standpoint, disasters produce both effects and impacts. The former involve damage to assets and changes in flows, which are the additional losses and costs. The impacts are consequences of the effects on different social and economic variables, such as family incomes, unemployment, GDP growth and the fiscal deficit, among others.⁸ It is therefore to be expected that the destruction of assets by a disaster will temporarily interrupt production flows and affect the public finances, for example through the reduction in tax revenue and the additional costs that the emergency may generate.

This article estimates the impacts of different types of disaster on two variables: the per capita GDP growth rate and the rate of growth of per capita fiscal spending in Latin American and Caribbean countries, and in the two subregions most intensively affected by these events, the Caribbean and Central America.

The article is organized as follows: section II presents the stylized facts of the disasters that have occurred in Latin America and the Caribbean; section III contains a review of the literature on the impact of disasters on economic activity, public finances and social variables; section IV sets out the estimation methodology and the variables used; section V discusses the estimated impulse-response functions of the per capita growth rates of GDP and government spending, in response to shocks in the variables studied. The final section contains a number of evaluations of the results.

II. Stylized facts on the disasters that have occurred in Latin America and the Caribbean

This section analyses the trend of disasters and some of the measures of intensity generally used, such as deaths, population affected and damage. The emphasis is placed on disasters occurring in Latin America and the Caribbean.

1. Number of disasters

The frequency of disasters, of all types, has increased in all continents during the period analysed,⁹ although those of climate origin have increased the most (see figure 1).¹⁰ Climate-driven disasters can be classified as follows: (i) storms, and (ii) other climate disasters, including floods, droughts and wet mass movements. Table 1 reports the dynamic of these events by decade in Latin America and the Caribbean, showing that both storms and other climate-related disasters have grown steadily.¹¹ Between the 1970s and the 2000 decade, climate disasters increased by 326%, owing to the frequency of storms, which increased by 453%. In the Caribbean and Central American subregions, storm frequency rose by 540% and 533%, respectively, while the frequency of other climate disasters increased by 309% and 425%.

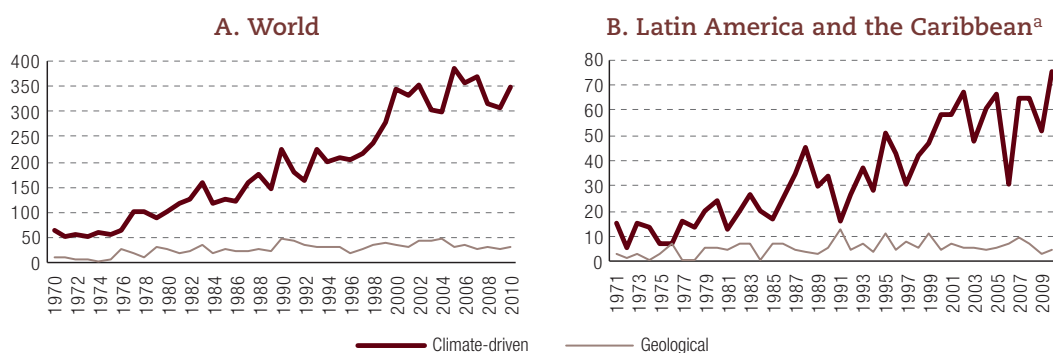
⁸ See ECLAC (2014).

⁹ See Stromberg (2007).

¹⁰ The classification used follows Skidmore and Toya (2002).

¹¹ To reduce the noise that might be caused by considering individual disasters, the information is presented by decade, specifically the four decades spanning 1970-1999.

Figure 1
World and Latin America and the Caribbean: disasters by climate
or geological origin, 1970-2010
(Number of disasters)



Source: Emergency Events Database (EM-DAT) of the Office of Foreign Disaster Assistance (OFDAT) and the Center for Research on the Epidemiology of Disasters (CRED) of the Catholic University of Louvain.

^a Latin America and the Caribbean includes: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, the Plurinational State of Bolivia, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Uruguay.

Table 1
Latin America and the Caribbean: disasters by type of event and decade
(Number of disasters)

Decade	Storms	Other climate disasters	Geological disasters	Total
Latin America and the Caribbean^a				
1970-1979	34	100	30	164
1980-1989	70	186	52	308
1990-1999	130	226	76	432
2000-2009	188	383	62	633
Total	422	895	220	1 537
Caribbean^b				
1970-1979	15	11	4	30
1980-1989	42	38	0	80
1990-1999	67	30	6	103
2000-2009	96	45	7	148
Total	220	124	17	361
Central America^c				
1970-1979	6	16	11	33
1980-1989	6	21	23	50
1990-1999	21	39	37	97
2000-2009	38	84	21	143
Total	71	160	92	323

Source: Emergency Events Database (EM-DAT) of the Office of Foreign Disaster Assistance (OFDAT) and the Center for Research on the Epidemiology of Disasters (CRED) of the Catholic University of Louvain.

^a Latin America and the Caribbean includes: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, the Plurinational State of Bolivia, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Uruguay

^b The Caribbean includes: Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago.

^c Central America includes: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.

2. Deaths

Of the various measures of disaster intensity, mortality is the most affected by specific events. In 1970-2010, a total of 3,450,255 people died worldwide as a result of disasters.¹² Of that total, 498,030 deaths occurred in Latin America and the Caribbean, and 73.1% of those deaths occurred as a result of five events:¹³ (i) the earthquake in Chimbote (Peru, 1970); (ii) the earthquake in Guatemala City (1976); (iii) the eruption of the Nevado del Ruiz Volcano (Colombia, 1985); (iv) the landslide in Vargas (Bolivarian Republic of Venezuela, 1999), and (v) the earthquake in Port-au-Prince (Haiti, 2010).¹⁴ Table 2 shows the trend of the deaths per 1,000 inhabitants by decade. During the course of these decades, the number of deaths in Latin America and the Caribbean fluctuated, but disaster mortality rates in the Caribbean and in Central America outpaced the entire region in every decade studied.

Table 2
Latin America and the Caribbean: disaster-related deaths, by decade
(Number of deaths per 1,000 inhabitants)

Decade	Latin America and the Caribbean ^a	Caribbean ^b	Central America ^c
1970-1979	0.063	0.011	0.452
1980-1989	0.014	0.007	0.015
1990-1999	0.017	0.008	0.065
2000-2009	0.004	0.021	0.012
2010-2011	0.403	8.914	0.014

Source: Emergency Events Database (EM-DAT) of the Office of Foreign Disaster Assistance (OFDAT) and the Center for Research on the Epidemiology of Disasters (CRED) of the Catholic University of Louvain.

^a Latin America and the Caribbean includes: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, the Plurinational State of Bolivia, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Uruguay.

^b The Caribbean includes: Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago.

^c Central America includes: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.

In the 1970s and 1980s, 81% of fatalities were caused by geological disasters. In contrast, in 1990-2009, 80.1% of the losses of human life were a result of climate-related disasters. This pattern is very likely to reverse in the current decade owing to the number of deaths caused by the 2010 earthquake in Haiti.

In Central America, climate events caused 49.2% of disaster-related deaths, whereas geological events caused 48.9%. In that region, there were fatalities in 65% of climate-related disasters, with an average of 216 deaths in each event. In the Caribbean, geological events caused 92.2% of the deaths, while climate events accounted for 5.4%. Fatalities occurred in 56.6% of climate events, with 63 people dying on average. The number of deaths per 1,000 inhabitants caused by geological disasters increased sharply in 2010-2011, as a result of the 2010 earthquake in Haiti, which was the single event that caused most deaths in the region.

¹² Throughout this article, mention of "disaster" refers to the occurrence of a disaster in one country. If an event, such as Hurricane Mitch, affects several countries, an observation is made for each of the countries affected.

¹³ Worldwide, 10 disasters caused 53.8% of all of these fatalities. The only disaster occurring in Latin America and the Caribbean included among them is the Port-au-Prince earthquake of 2010.

¹⁴ Cavallo and Noy (2010) claim that 96% of the deaths caused by disasters in 1970-2008 occurred in Africa, Latin America and the Caribbean, and Asia, which jointly account for 75% of the world's population. Stromberg (2007) argues that in 1980-2004, for every death caused by disasters in high-income countries, there were 12 deaths in low-income countries. These results stem from the four events that caused most of the fatalities: the 1984 droughts in Sudan and Ethiopia, the 1991 cyclone in Bangladesh and the 2004 tsunami in the Indian Ocean.

3. Population affected

Between 1970 and 2009, 6.308 billion people around the world were affected by disasters. The numbers affected increased in both types of climate disaster considered, whereas the population affected by geological disasters, rose and fell alternately during those decades.¹⁵ Of those affected, 89% lived in Asia and 3.3% lived in Latin America and the Caribbean. The vast majority of people affected suffered from climate-related disasters, in contrast to the figures reported above on fatalities. For the world as a whole, 97% of the population affected corresponded to climate events, and 2.7% corresponded to geological events. In Latin America and the Caribbean, the equivalent proportions were 83.9% and 14.9%, respectively.¹⁶

Another measure of disaster intensity is the number of persons affected per 1,000 inhabitants in the countries in which the disasters occurred. Evidence based on this measure shows that geological disasters and storms have been more severe in the Caribbean and in Central America than in South America (see table 3).

Table 3
Latin America and the Caribbean: persons affected by disasters, 1970-2009^a
(Number of persons affected per 1,000 inhabitants)

Decade	Storms	Other climate disasters	Other geological disasters	Total
Caribbean^b				
1970-1979	16.1	16.6	20.8	24.2
1980-1989	30.9	11.5	0.0	28.1
1990-1999	17.0	20.8	94.8	28.2
2000-2009	34.1	2.4	3.4	33.7
Total	24.5	12.8	29.8	28.5
Central America^c				
1970-1979	21.7	4.2	62.9	60.5
1980-1989	4.6	7.2	6.3	9.4
1990-1999	14.9	12.4	3.2	21.4
2000-2009	4.9	13.3	10.2	21.0
Total	11.5	9.3	20.6	28.1
South America^d				
1970-1979	0.8	14.8	24.7	20.1
1980-1989	0.5	23.7	2.5	20.8
1990-1999	0.6	7.0	2.8	7.5
2000-2009	0.3	6.2	2.2	6.9
Total	0.5	12.9	8.1	13.8

Source: Emergency Events Database (EM-DAT) of the Office of Foreign Disaster Assistance (OFDAT) and the Center for Research on the Epidemiology of Disasters (CRED) of the Catholic University of Louvain.

^a In the Caribbean, 3.7 million people were affected by geological events in 2010, compared to 107,200 affected by storms, and 59,200 people by other climate-related events. In Central America, the equivalent figures were 1,800, 436,800 and 170,900, respectively.

^b The Caribbean includes: Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago.

^c Central America includes: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.

^d South America includes: Argentina, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, the Plurinational State of Bolivia, Suriname and Uruguay.

¹⁵ Worldwide, the quotient between the number of persons affected and deaths caused by disasters was 1,826. The corresponding figures for geological and climate disasters were 3,178 and 128, respectively.

¹⁶ In 1980-2009, over 90% of persons affected corresponded to climate disasters.

4. Damage

In 1970-2011, the damage caused by climate-related disasters represented 72.9% of global disaster damage, whereas that caused by geological disasters accounted for 27%.¹⁷ Storms caused 53.4% of climate-related damage, while other climate-driven disasters caused 46.6%. Of total damage, 9.1% occurred in Latin America and the Caribbean.

Despite being the most comprehensive database of disasters in the world, EM-DAT underestimates disaster damage, because it only records damage in 32.1% of the events registered.¹⁸ If this figure is broken down by the type of threat causing them, damage is recorded in just 32.3% of geological disasters, 50.8% of storms and 29.3% of other climate-related disasters. Two factors seem to explain the preponderance of damage caused by climate disasters: the increase in this type of event worldwide compared to those of geological origin, and the larger proportion of events of this type with a record of damage. Nonetheless, the average damage per geological event exceeded the average per climate event. A similar result was obtained by Bello, Ortiz and Samaniego (2014) using a database containing estimates of natural disaster impacts in Latin America, which was maintained by ECLAC for internal use between 1972 and 2010.

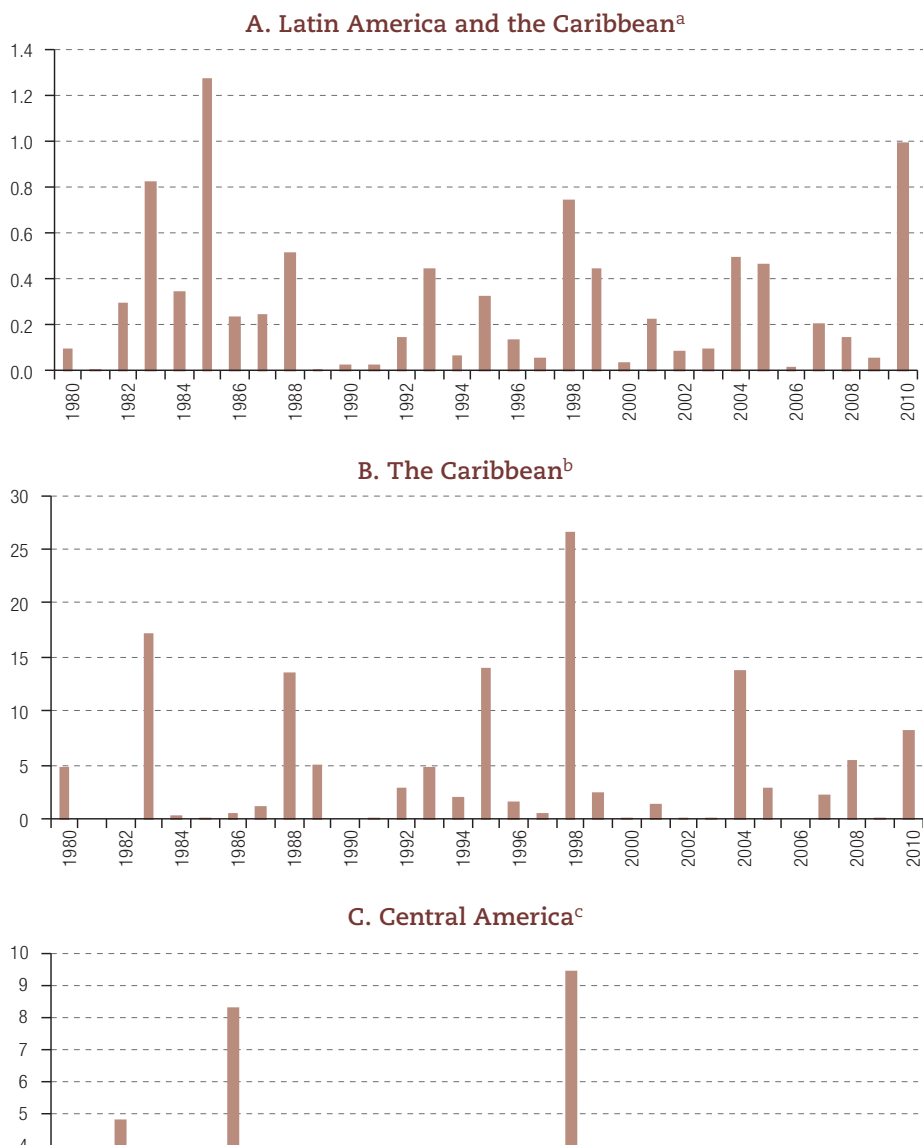
Instead of absolute values, damage is better expressed as percentages of GDP of the countries affected by disasters in each region and in each year. The Caribbean is the region in which disaster damage, on average, has represented the largest share of GDP, surpassing 8% seven times. It is followed by Central America, where disaster damage exceeded 8% of GDP twice. In Latin America and the Caribbean, this indicator reached at least 1% of GDP of the countries affected on just two occasions.

In short, the Caribbean and Central America are the two subregions most affected by disasters, in terms of both population and material effect. Compared to South America and Mexico, they are smaller territories and have few inhabitants. A characteristic of disasters is that in most cases they only affect one area, one region, or one specific department of a country. The exception is the Caribbean, where some of the small islands have been overwhelmed by hurricanes. As described in Albaladejo (1993), disasters are generally confined to a specific space, and indirectly affect the rest of the economy through the links between the local and national systems. The stronger these links are, the greater the potential for transmission. When the effect of the disaster is measured in terms of a national economic indicator, such as GDP, this does not express its true extent in the regional economy, which in practice is likely to suffer the greatest impact; but in large countries, the regional may be minimized, as shown in figure 2A.

¹⁷ The question that arises from this evolution is "how much of this is attributable to climate change?" An answer was provided in the Special Report of the Intergovernmental Panel on Climate Change (IPCC) of 2012. This panel states that until now the trends of disaster damage, adjusted for wealth and population, are not attributable to climate change.

¹⁸ This percentage has been similar in the four decades considered: 35.4%, 29.9%, 39.4% and 28.1%, respectively. In the case of Latin America and the Caribbean, the proportions were 38.7%, 31.1%, 34.0% and 25.8%, respectively.

Figure 2
Latin America and the Caribbean: damage caused by disasters, 1980-2010
(Percentages of GDP)



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