

Calamities, Debt and Growth

Rachel Yuting Fan, Daniel Lederman, Ha Nguyen, Claudio Rojas¹

This draft: December 25, 2021

Abstract

This paper examines how debt and economic growth evolve around the onset of three important types of calamities, namely natural disasters, conflicts, and external debt distress in developing countries. The paper finds that debt and growth evolve quite differently depending on the type of calamities. Our paper argues that the Covid-19 pandemic shares many traits with natural disasters. The evidence indicates that public debt and output growth tend to rise faster after natural disasters than in economies without disasters, thus illustrating how debt-financed fiscal expansions can help economic reconstruction.

Keywords: calamity, natural disasters, public debt, pandemic

JEL classifications: Q54; E6; H6.

¹Daniel Lederman is the Deputy Chief Economist, Ha Nguyen is a Senior Economist, Rachel Yuting Fan is an Economist at the World Bank's chief economist office for the Middle East and North Africa. Claudio Rojas is an Operation Officer for the World Bank's Infrastructure Practice Group. We thank three anonymous reviewers, Jongrim Ha and participants at the 1st Annual Central Bank Conference on Development Economics in the Middle East and North Africa for comments and feedback.

The findings, interpretations, and conclusions expressed in this paper are of the authors and do not necessarily reflect the views of the World Bank, the Executive Directors of the World Bank or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work. All errors are of the authors.

1. Introduction

The Covid-19 pandemic is still ravaging the world. As a result, countries are building up debt to make up for the collapse in revenue and respond to the pandemic. As a result, global average general government debt rose from 84 percent of GDP in 2019 to 99 percent in 2020. In emerging market economies, average general government debt rose from 52 of GDP in 2019 to 64 percent in 2020 (IMF, 2021).

While raising debt is currently less of an issue for advanced countries, developing countries face more severe tensions between the short-run gains and the potential long-run costs of debt-financed public spending. Therefore, this pandemic calamity raises the importance of understanding how public debt and growth evolve around calamities in developing countries. Yet, despite the issue's importance, the literature is scant and incomplete at best.

This paper is an effort to fill the gap. It examines how debt and economic growth evolve before, during, and after the onset of three important types of calamities, namely natural disasters, conflicts, and external debt distress, in developing countries.

This paper finds that in developing countries, public debt tends to rise to finance economic recovery during and after large natural disasters. During the three years following a large natural disaster, growth in public debt is significantly higher than in countries that did not experience a disaster. Real GDP growth collapses in the year of a natural disaster but after that picks up faster than growth in no-disaster countries. This finding provides an important empirical regularity that public debt does accumulate after disasters and is likely to do so after this pandemic, possibly to support economic recovery.

In contrast, the evolution of debt and growth is different around armed conflicts. Public debt increases during armed conflicts, but economic growth does not pick up after them, which suggests that government spending during conflicts might not be used to support economic growth.

Finally, the paper finds that highly indebted developing countries experience lower growth during debt distress episodes. Debt distress episodes are defined in this paper as those accompanied by debt restructurings². Debt restructuring is a process wherein a country experiencing financial distress and liquidity problems refinances its existing debt obligations to gain more flexibility in the short term and make its debt load more manageable overall. There are two types of debt restructurings—preemptive and post-default. In preemptive restructurings, a country decides to restructure its external debt before it misses any payments. In a post-default restructuring, a country is forced to enter into debt negotiations because it has missed payments (that is, defaulted). Our analyses show that both types of restructurings are costly in output growth, but preemptive restructurings are less costly than defaults. Before they restructure, debtor countries experience slower growth than countries that do not restructure. This empirical finding applies to both preemptive and post-default restructurings. However, after the first year of restructuring, growth starts to recover for preemptive restructurings but remains depressed for post-default restructurings. In addition, debt growth is significantly lower in both preemptive and post-default restructurings compared to the countries that did not restructure.

² This paper uses debt distress and debt restructurings interchangeably.

Our paper is relevant to the Covid-19 pandemic because the paper examines and differentiates the evolution of debt and growth around many types of calamities. The Covid-19 pandemic shares many traits with large natural disasters, such as earthquakes, in fundamental ways relevant to understanding analytically how public debt and economic growth interact. Both pandemic and natural disasters are rare and unexpected occurrences, and neither are directly caused by economic policies. Both result in economic contractions because people cannot work (due to physical destruction or safety concerns) (see Krugman, 2021). Therefore, examining debt and output growth around natural disasters helps policymakers and economists understand how debt-financed fiscal expenditures can help the recovery from the pandemic. The evidence indicates that public debt and output growth tend to rise faster after natural disasters than in economies without disasters, thus illustrating how debt-financed fiscal expansions can help economic reconstruction.

Certainly, different aspects of the pandemic differ from a natural disaster. A natural disaster is generally local, whereas the pandemic is global. A natural disaster is more short-lived, while the pandemic's duration is more uncertain. New variants make the pandemic longer than anticipated, even in countries with high vaccination rates. Nevertheless, we argue that the differences do not weaken the similarities of the pandemic and a natural disaster.

Our paper also helps shed light on how debt and growth change around debt distress episodes, which many countries will inevitably enter after the pandemic given large debt accumulation. For example, in the Middle East and North Africa region, Lebanon has already entered debt distress.

The literature offers incomplete evidence about the evolution of debt and growth around calamities. Gatti et al. (2021) provide a brief discussion about the evolution in the context of a broad policy discussion on public debt in the MENA region. Fomby et al. (2013) analyze the growth aftermath of natural disasters, but they did not discuss the role of public debt.

The literature on the detrimental effects of conflicts on output is rich and consistent. Collier (1999) distinguishes four common routes by which armed conflicts can hurt the economy. Conflicts destroy physical and human capital, disrupt internal social dynamics, cause countries to divert public funds from activities that enhance output, contribute to dissaving, which leads to economic deterioration. The magnitude of the impact of conflict on output is also estimated by economic literature. Collier finds that the annual growth rate during civil wars is 2.2 percentage points lower if the war never happened. Growth during the five years that follow a one-year conflict is about 2.1 percentage points lower than what would have occurred had the war never happened. Armed conflict can also generate significant collateral damage to the output of neighboring economies. These negative spillover effects tend to amplify as the intensity of conflict increases (Murdoch and Sandler 2002 and 2004).

Nevertheless, the literature on the relationship between conflicts and public debt is scantier. Lederman and Rojas (2018) study the evolution of fiscal expenditure, public debt, and inflation around the onset of armed conflicts, but the authors did not examine output growth. The authors find that public debt in conflict-afflicted economies tends to be higher than in non-conflict economies before the onset of conflicts, begins to rise further before the conflict begins, and stays high afterward.

The literature about growth around debt distress episodes is rich, especially the literature on sovereign defaults. For example, Borensztein and Panizza (2009) find that the output costs of sovereign defaults are high. Moreover, defaulting on debt can cause long-run damages as it severely damages the financial systems (Reinhart et al., 2003). More recently, Asonuma and Trebesch (2016) distinguish between pre-emptive versus post-default restructurings and show that pre-emptive restructurings see lower output losses than post-defaults. Nevertheless, they only provide descriptive statistics to support the findings.

Our paper is the first that put together rigorous econometric evidence regarding the evolution of public debt and growth around these calamities, aiming to understand how debt and growth interact. It employs a difference-in-difference econometric framework with country and year fixed effects. The details of the framework will be explained in the next section. The difference-in-difference framework allows comparing the growth and debt evolution between the countries experiencing calamities and those that do not.

2. Data and Empirical Specifications

2.1 Data

Four main sets of data are used for this paper.

a. Data on natural disasters

Data for natural disasters are from the International Disaster Database (EM-DAT). The pool of natural disasters included in EM-DAT fulfills at least one of the following outcomes in the country affected: 10 or more people dead, or 100 or more people affected, a declaration of a state of emergency, or a call for international assistance. Between 1900 and 2020, the world has had 15,563 natural disasters, of which 1,492 were epidemics, making them the fourth most common natural disaster after floods, storms, and earthquakes (see Figure 1).³

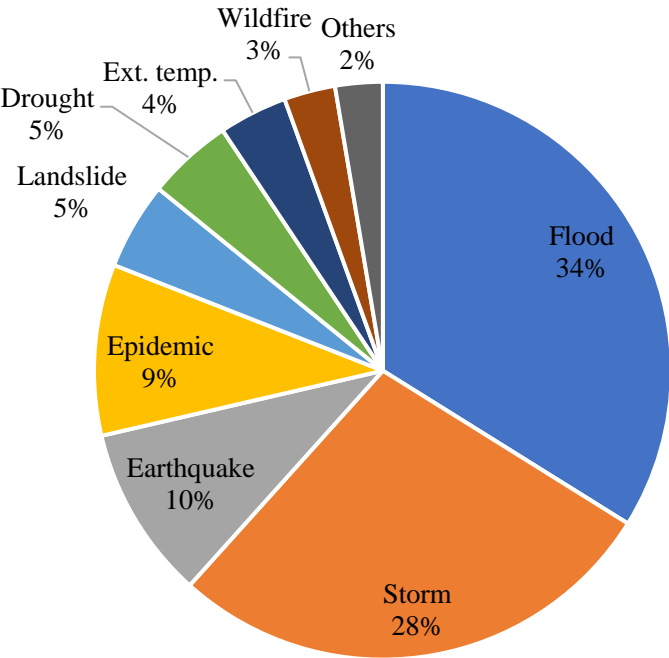


Figure 1: Natural Disasters 1900-2020.

Note: Authors' calculations based on EM-DAT database

³ According to the EM-DAT database, from the 691 catastrophes registered for Middle East and North Africa Region between 1900 and 2020, the most common natural disasters are floods (323 episodes, 46.7 percent of the total), earthquakes (167 episodes, 24.2 percent), storms (72 episodes, 10.4 percent), and epidemics (39 episodes, 5.6 percent).

Since the interest is in analyzing macroeconomic trends in developing countries, all developed countries (identified by the World Bank's Historical Income Classification in 1987) are excluded from the analysis. If a country was created after 1987, its classification is based on the income classification on the year of its creation.

Not all disasters generate damages large enough to change the macroeconomic dynamics of a country. Therefore, to filter events with large macroeconomic effects, our econometric analysis focuses on natural disasters that generated damages equivalent to at least 1 percent of the country's GDP that year (based on the total estimated damages reported by EM-DAT⁴). The final sample covers 282 severe natural disasters between 1960 and 2019 in 86 developing countries. They include floods, earthquakes, droughts, storms, landslides, volcanic activity, extreme temperature, and wildfire.

b. Data on armed conflicts

This paper uses the UCDP/PRIO Armed Conflict dataset (version 20.1) that covers conflicts between 1963 to 2019. Given that the main goal is to study the relationship between growth and debt around the start of conflicts in general, all extra-systemic, interstate, internal, and internationalized internal armed conflicts affecting developing countries reported by the database are included in the estimation samples. Conflicts between two or more states are assigned to the developing countries involved in such conflicts. A conflict is defined as "*a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in a calendar year.*" The sample covers 107 armed conflicts between 1963 and 2019 in 61 developing countries.

c. Data on debt restructurings

Data on debt restructurings are based on Asonuma and Trebesch (2016), which provide information on the occurrence and duration of 204 restructurings globally starting in 1978, 197 of which have been completed. The cases are further differentiated into two categories: preemptive restructurings and post-default restructurings. In preemptive restructurings, governments renegotiate with lenders while they are still current on their loan payments. In post-default restructurings, governments unilaterally default and then renegotiate their debt. Among the 197 finished restructurings, 81 were preemptive, and 116 were post-default. Many countries have multiple restructurings. All countries in the dataset are developing countries (defined by the World Bank's Historical Income Classification in 1987). Among 74 countries that had completed restructurings, five are from the MENA region.

d. Growth and Debt Data

Data for output growth are annual growth in real GDP from the World Bank's *World Development Indicators*. Data for public debt are Central Government Debt from the IMF's *Global Debt Database* (GDD), which is the most comprehensive database of public debt. Data for external debt are from the IMF's *World Economic Outlook* (October 2020).

2.2 Empirical Specifications

This paper uses the same difference-in-difference framework with country and year fixed effects to investigate the evolution of debt and growth around a calamity. This method estimates the association of a treatment (the onset of a calamity, such as a natural disaster, an armed conflict, or a debt restructuring episode) to an outcome (GDP growth and public debt accumulation). The framework compares the

⁴ According to EM-DAT, this is a value of all damages and economic losses directly or indirectly related to the disaster.

average change of these variables for the treatment group (economies affected by a calamity) with the average change for the control group (non-affected economies).

The econometric strategy that aims to identify these potential effects is the following difference-in-difference estimator:

$$y_{c,t} = c_0 + \mu_c + \mu_t + \beta_n D_n + \theta Calamities_{c,t} + \epsilon_{c,t} \quad (1)$$

The subscripts c and t denote countries and years, respectively. $y_{c,t}$ represents the macroeconomic variable of interest (GDP growth, annual percent; Debt growth, annual percent). The inclusion of country fixed effects (μ_c) along with time fixed effects (μ_t) implies that we will be comparing within-country macroeconomic trends of affected and non-affected economies during each year in the sample.

D_n is a dummy variable that identifies the n^{th} year from the onset (year 0) of a calamity. The subscript n denotes the duration of each episode covering seven years around the onset of a calamity. Therefore, n ranges from -3 to +3. For example, $n = -3$ implies 3 years before the onset of the calamity (be it a natural disaster, conflict or debt distress). c_0 represents the constant term, and $\epsilon_{c,t}$ is the error term. β_n is the coefficients of interest to be estimated, which we allow to vary over the course of the episodes of a calamity. Again, n ranges from -3 to +3. This setup implies that we are tracing pre-calamity trends and post-onset trends, which allows for inferences about whether the differential trends if any, predate the onset of a calamity. Additional controls in the regression include $Calamities_{c,t}$ which is a control for the number of calamities during the previous six years, in case calamities are overlapping. Robust standard errors are clustered at the country level.

Again, it is useful to note that the estimated coefficients D_n do not represent the causal effects of calamities on public debt and output growth. Some calamities, such as debt restructurings or conflicts, might not be exogenous. They can arise from the poor performance of the economy and other institutions characteristics. The estimated coefficients D_n only capture the *differential* dynamics of public debt and output growth around the onset of calamities between the treatment group (economies affected by calamities) with the control group (non-affected economies). Hence, it might be prudent to interpret them as associations.

3. Main findings

This section examines the dynamics of growth and public debt around natural disasters, armed conflicts, and debt restructurings in that order.

Output and Public Debt Growth Around Natural Disasters

First, we present the dynamics of public debt and economic growth around large natural disasters (generated damages of at least 1 percent of their GDP) relative to the contemporaneous control group of non-affected countries for public debt and GDP growth. Table 1 shows the effects between three years before and three years after the year of natural disasters.

GDP growth is higher post-disaster in developing countries affected by large natural disasters than countries that did not experience them (column [1] of Table 1). In the year of the disaster (D_0), GDP growth in affected economies is significantly lower than the control group (1.3 percentage points lower). But GDP growth is 0.9 and 0.8 percentage points higher in the first and second years after the onset of a large natural disaster in affected counties relative to non-affected countries. In sum, although large natural disasters cause a strong economic contraction in the year they occur, GDP tends to bounce back the three years following the event, reaching a rate of output growth almost one percentage point higher than in non-affected economies.

Debt growth significantly increases more in developing countries affected by large natural disasters than in countries that did not experience such natural disasters (column [2] of Table 2). For example, from the first year to the third year after the onset of a natural disaster, public debt growth in affected economies is 2.3 to 3.6 percentage points higher than in unaffected economies. This finding provides an important empirical regularity that public debt does accumulate after disasters and is likely to do so after this pandemic, possibly to support economic recovery.

Table 1: Output and Public Debt Growth around Large Natural Disasters

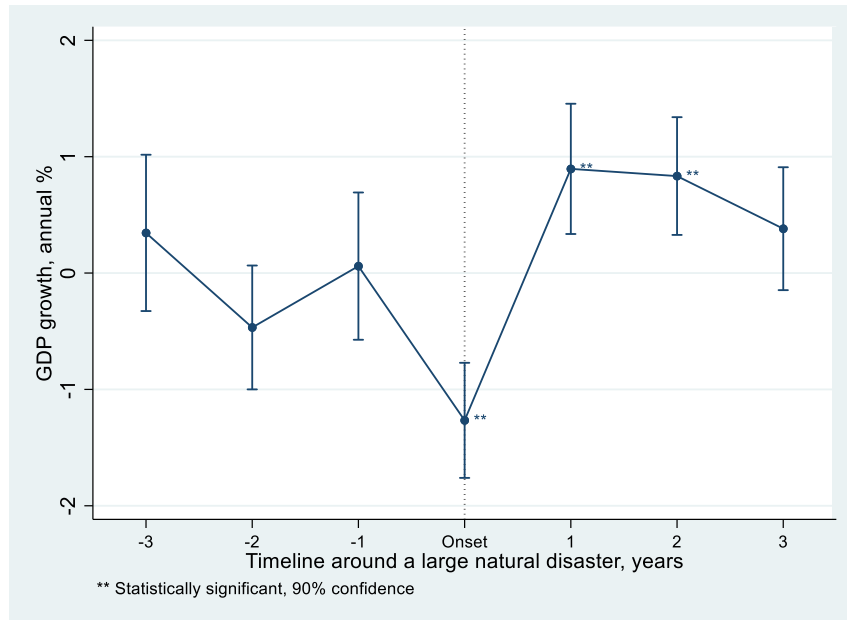
VARIABLES	growth in real GDP (%)	growth in public debt (%)
	[1]	[2]
D_{-3}	0.345 [0.406]	1.236 [1.495]
D_{-2}	-0.467 [0.321]	1.121 [1.515]
D_{-1}	0.060 [0.382]	0.017 [1.262]
D_0 (Onset year)	-1.266*** [0.299]	1.697 [1.403]
D_{+1}	0.895*** [0.338]	3.624*** [1.336]
D_{+2}	0.834*** [0.306]	2.334* [1.281]
D_{+3}	0.381 [0.319]	3.141** [1.406]
Natural disasters intensity control	-0.289** [0.143]	-0.277 [0.580]
Constant	5.887*** [0.735]	6.725*** [2.310]
Year fixed effects	yes	yes
Country fixed effects	yes	yes
Observations	5,166	5,221
R-squared	0.057	0.067
Number of developing countries	142	142

Note: The table displays central government GDP growth and public debt growth before, during, and after severe natural disasters relative to the baseline of no severe disasters. Severe natural disasters are those that generate damages equivalent to at least 1 percent of the country's GDP. The final sample covers 282 severe natural disasters between 1960 and 2019 in 86 developing countries. The disasters include floods, earthquakes, droughts, storms, landslides, volcanic activities, extreme temperatures, and wildfires. The econometric framework follows a difference-in-difference approach, with country and year fixed effects. D_n captures the differential effects n year from the disaster. Natural disasters intensity control refers to the number of large natural disasters in the previous six years. Robust standard errors in brackets are clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

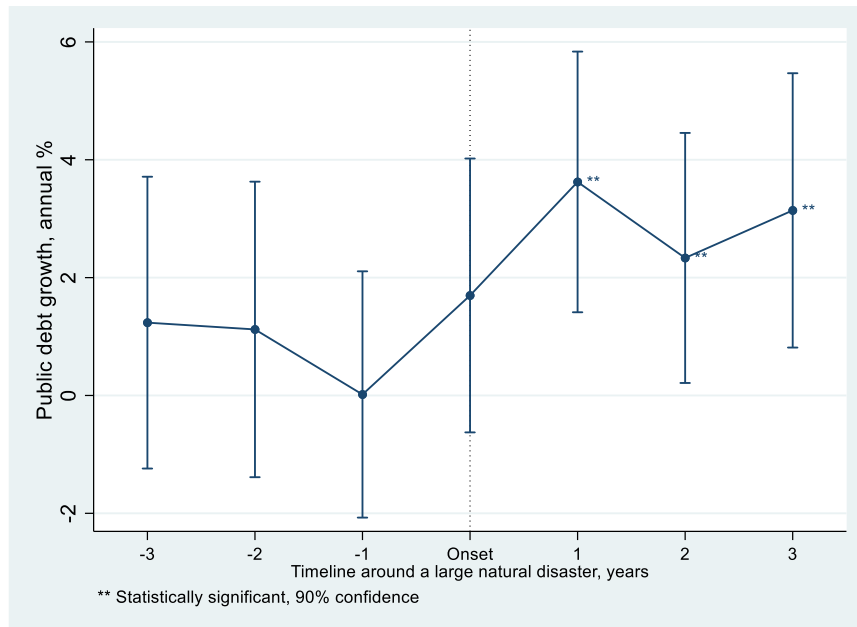
Figure 2 provides a visual illustration for Table 1. It shows the coefficients for the estimated mean differences in public debt growth and output growth between countries affected by a natural disaster, corresponding to Table 1. The bars show a 90 percent confidence interval. The double asterisks highlight the coefficient estimates that are statistically significant at the 10 percent level.

Figure 2: Output and Public Debt Growth around Large Natural Disasters

Panel A: Real GDP Growth around Large Natural Disasters



Panel B: Public Debt Growth around Large Natural Disasters



Note: The figure displays central government GDP growth and public debt growth before, during, and after severe natural disasters relative to the baseline of no severe disasters, corresponding to Table 1. Severe natural disasters generate damages equivalent to at least 1 percent of the country's GDP. The disasters include floods, earthquakes, droughts, storms, landslides, volcanic activities, extreme temperatures, and wildfires. The econometric framework follows a difference-in-difference approach, with country and year fixed effects. Bars show 90% confidence interval. ** indicates statistical significance at 90% confidence interval.

Output and Public Debt Growth Around Armed Conflicts

Econometric results suggest that growth did not significantly increase after a conflict's onset. Column [1] of Table 2 shows that at the onset of conflict (year 0), economic growth is significantly lower in conflict economies compared to non-conflict economies (2 percentage points lower). Nevertheless, three years after the start of conflicts, growth did not significantly pick up compared to non-conflict economies. If anything, economies with conflicts continued to see relative contraction for at least three years after conflicts, ranging from 0.3 to 1.1 percentage points lower than non-conflict economies. The contraction is statistically significant at D_{+2} .

On the other hand, growth in public debt is significantly higher for conflict economies than non-conflict economies three years after the onset of conflict (column [2] of Table 2). The difference is 8.6 to 13 percentage points and rises over time. These findings suggest that developing economies experiencing conflicts probably finance the increasing government expenditures by relying on public debt, particularly after the conflict starts. However, the finance did not help growth, perhaps because the finance is devoted to activities related to conflicts.

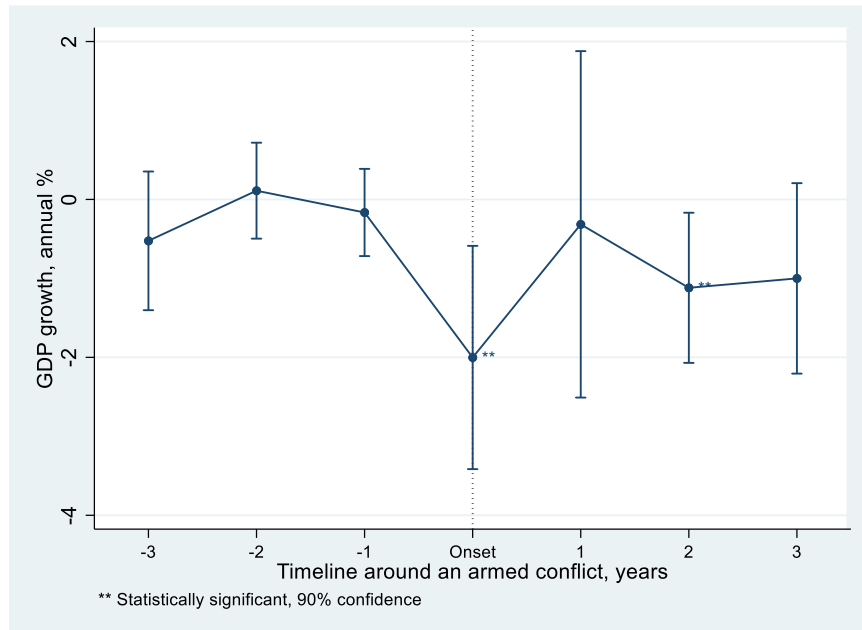
Table 2: Output and Public Debt Growth around the Onset of Armed Conflicts

VARIABLES	growth in real GDP (%)	growth in public debt (%)
	[1]	[2]
D_{-3}	-0.524 [0.530]	1.396 [2.202]
D_{-2}	0.111 [0.367]	0.559 [2.655]
D_{-1}	-0.165 [0.333]	1.495 [2.855]
D_0 (Onset year)	-2.002** [0.854]	2.876 [2.924]
D_{+1}	-0.315 [1.325]	8.656* [4.403]
D_{+2}	-1.119* [0.574]	11.119** [4.305]
D_{+3}	-1.000 [0.728]	12.965** [5.011]
Constant	5.346*** [0.847]	22.550*** [4.641]
Year fixed effects	yes	yes
Country fixed effects	yes	yes
Observations	4,927	4,927
R-squared	0.056	0.181
Number of developing countries	141	141

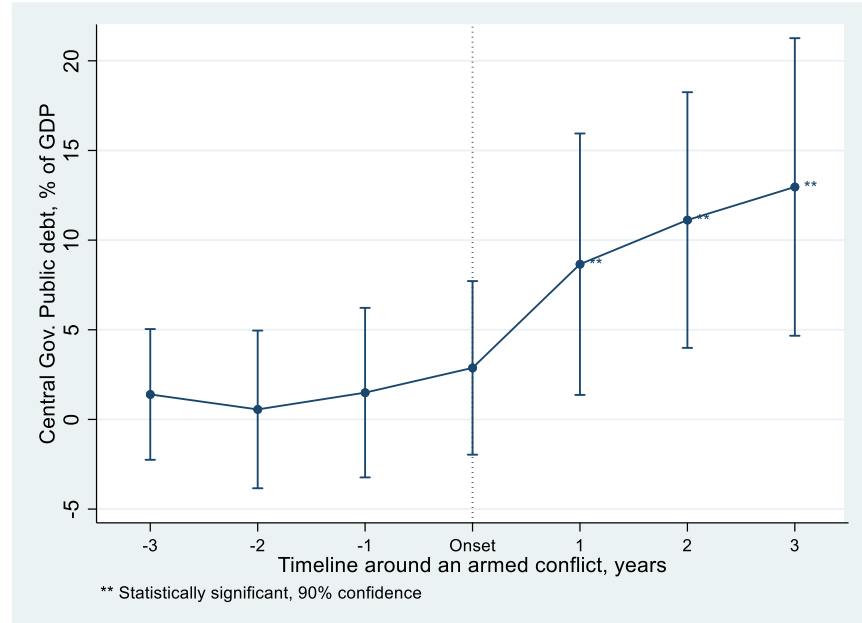
Note: This table presents the evolution of public debt and growth in conflict countries relative to non-conflict economies before, during, and after armed conflicts. The sample covers 107 armed conflicts between 1963 and 2019 in 61 developing countries. D_n captures the differential effects n year from the onset of armed conflicts. The econometric framework follows a difference-in-difference approach, with country and year fixed effects. Robust standard errors in brackets are clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 3: Output and Public Debt Growth around the Onset of Armed Conflicts

Panel A: Real GDP Growth around the Onset of Armed Conflicts



Panel B: Public Debt Growth around the Onset of Armed Conflicts



Note: The figure displays the evolution of public debt of conflict countries relative to non-conflict economies before, during, and after armed conflicts, corresponding to Table 2. $t=0$ indicates the onset of armed conflicts. The econometric framework follows a difference-in-difference approach, with country and year fixed effects. Bars show 90% confidence interval. ** indicates statistical significance at 90% confidence interval.

Figure 3 provides a visual illustration for Table 2. It shows the coefficients for the estimated mean differences in public debt growth and output growth between countries affected by armed conflicts, corresponding to Table 2. The bars show a 90 percent confidence interval. The double asterisks highlight the coefficient estimates that are statistically significant at the 10 percent level.

Output and External Debt Growth Around Debt Restructurings

Next, we analyze the growth dynamics in output and external debt around debt distress episodes. Table 3 shows the relative dynamics of external debt and output growth in developing countries with debt restructurings compared to countries without them. Economic growth for developing countries with debt distress is already lower than developing countries with no debt distress before restructuring episodes. One year before the start of the restructurings (D_{-1}), output growth is 2.3 percentage points lower, and the difference is statistically significant (see column [1]). After the start of a debt restructuring, growth for these countries continues to be significantly lower than countries without debt restructurings until three years after the onset of the restructuring. For example, one year after the start of restructurings (D_{+1}), output growth of developing countries with debt restructurings is 2.6 percentage points lower than developing countries with no debt restructurings. The findings suggest a large output cost of debt distress.

Results in column [2] suggest that external debt growth is slower as the restructuring starts (compared to countries with no debt restructuring). At D_{+1} and D_{+2} , external debt growth developing economies with debt restructurings is 14 to 26 percentage points lower than that in developing countries with no debt restructurings. The differences are statistically significant. This finding could reflect the exclusion of restructuring countries from international debt markets and/or the reduction in debt granted by creditors during the restructuring negotiations.

Figure 4 visually illustrates output growth (Panel A) and external debt growth (Panel B) around the onset of a debt restructuring episode (corresponding to Table 3). After the start of a debt restructuring, growth for these countries continues to be significantly lower than countries without debt restructurings. In addition, external debt growth is slower as the restructuring starts (compared to countries with no debt restructuring).

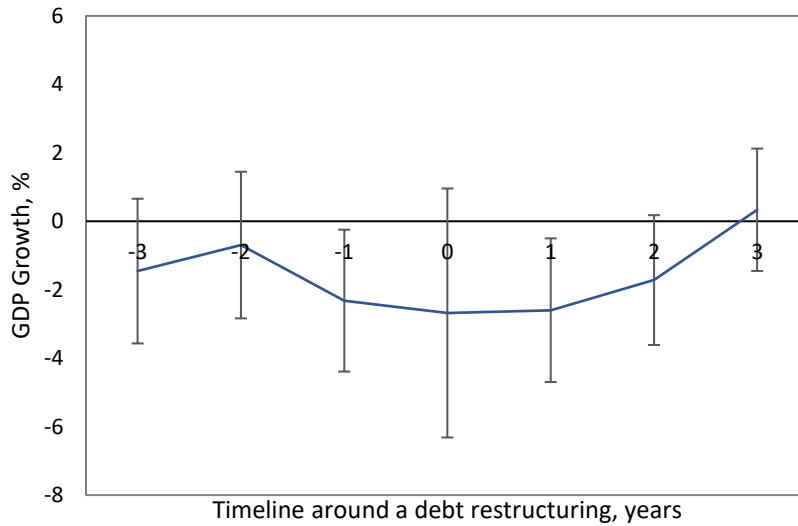
Table 3. Output and External Debt Growth around the Onset of Debt Restructurings

	Growth in real GDP	Growth in external debt
	[1]	[2]
D_{-3}	-1.456 [1.285]	4.761 [13.243]
D_{-2}	-0.695 [1.302]	15.756 [18.857]
D_{-1}	-2.319* [1.260]	-14.864 [13.077]
D_0 (Onset year)	-2.68 [2.211]	14.152 [27.785]
D_{+1}	-2.598** [1.276]	-14.065 [9.348]
D_{+2}	-1.719 [1.153]	-25.947** [11.844]
D_{+3}	0.335 [1.086]	-0.174 [12.488]
Constant	2.770** [1.198]	53.374* [28.462]
Restructuring-events intensity control	yes	yes
Year fixed effects	yes	yes
Country fixed effects	yes	yes
Observations	5,483	5,066
R-squared	0.143	0.148
Number of countries	157	150

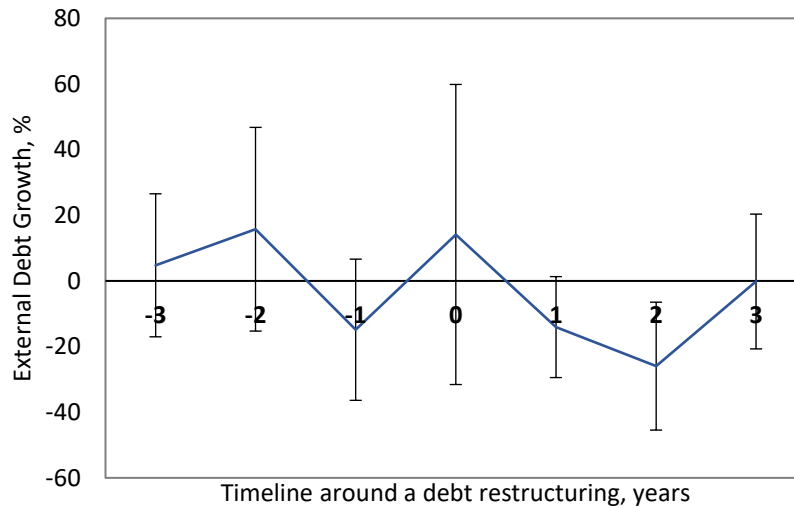
Note: The table displays central government GDP growth and public debt growth before, during, and after debt restructurings relative to the baseline of no debt restructurings. The econometric framework follows a difference-in-difference approach, with country and year fixed effects. R_n captures the differential effects n year from the restructuring. To control for overlapping events, we have added frequency indicators in all regressions. For each of the seven years on the timeline, there are three different counts: (1) how many windows of three years before a restructuring overlap with that specific year; (2) how many events start on the same year; and (3) how many windows of three years after a restructuring overlap with that specific year.. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 4: Output and External Debt Growth around the Onset of Debt Restructurings

Panel A: Real GDP Growth around the Onset of a Debt Restructuring



Panel B: External Debt Growth around the Onset of a Debt Restructuring



Note: difference-in-difference approach; $t=0$: onset of a restructuring. $t=-3,-2,-1$ indicate the years before restructurings; $t=1,2,3$ indicate the years after a restructuring starts. Data consists of 197 restructurings to private external creditors between 1981 and 2019 and are collected and updated by Asonuma & Trebesch (2016). Bars show 90% confidence interval.

While both forms of restructurings are costly, preemptive restructurings are less so (see Table 4 and Figure 5). Recall that there are two types of debt restructurings—preemptive and post-default. In preemptive restructurings, a country decides to restructure its external debt before it misses any payments. In a post-default restructuring, a country is forced to enter into debt negotiations because it has missed payments (that is, defaulted).

Panel A of Figure 5 shows that before debtor countries restructure, regardless of the type of restructurings, they experience slower growth than countries that do not restructure. However, after the first year of restructuring, growth starts to recover for countries with preemptive restructurings but remains depressed for countries with post-default restructurings. Column [1] of Table 4 shows that one and two years after restructurings, output growth of developing countries with pre-emptive restructurings is 1.5 and 0.6 percentage points lower than output growth of developing countries without restructurings. Nevertheless, the differences are not statistically significant. At the same time, one and two years after restructurings, output growth of developing countries with post-default restructurings is 2.9 and 2.1 percentage points lower than output growth of developing countries without restructurings. The differences are statistically significant. The finding obtained from a difference-in-difference framework is consistent with Asonuma and Trebesch (2016)'s more descriptive findings.

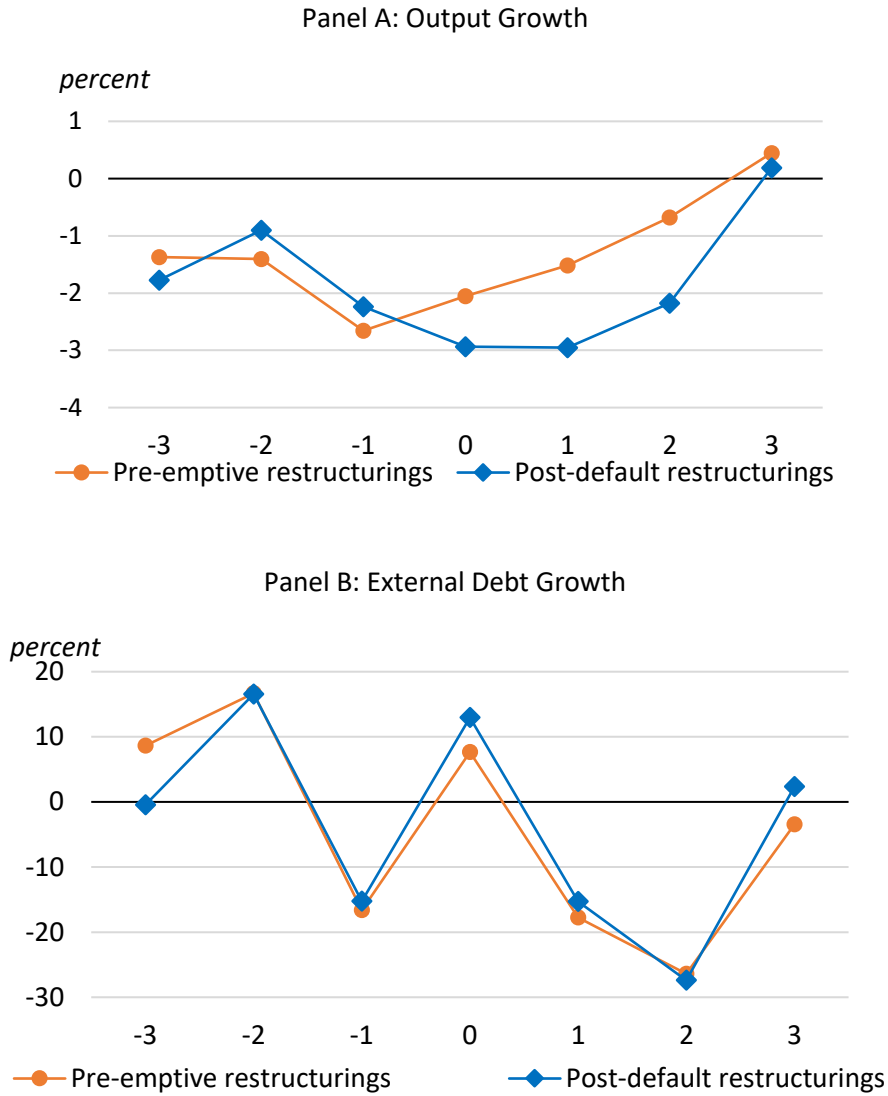
Panel B of Figure 5 shows little difference in external debt growth between the two types of restructurings. This finding, combined with differential growth effects between pre-emptive and post-defaults restructurings, suggests that if countries have to enter debt negotiation, it might be better to do so preemptively. This is because it brings smaller output costs and has similar effects on debt growth compared to countries that restructure after they default.

Table 4. Comparing Pre-emptive with Post-default Restructurings

VARIABLES	growth in real GDP	growth in external debt
	[1]	[2]
Pre-emptive ₋₃	-1.37 [1.264]	8.624 [15.940]
Pre-emptive ₋₂	-1.406 [1.238]	16.673 [18.588]
Pre-emptive ₋₁	-2.657* [1.369]	-16.646 [14.998]
Pre-emptive ₀ (Onset year)	-2.053 [2.143]	7.658 [22.053]
Pre-emptive ₊₁	-1.518 [1.314]	-17.756 [10.841]
Pre-emptive ₊₂	-0.675 [1.142]	-26.402* [15.654]
Pre-emptive ₊₃	0.447 [1.152]	-3.45 [13.493]
Post-default ₋₃	-1.773 [1.425]	-0.438 [12.408]
Post-default ₋₂	-0.901 [1.447]	16.554 [19.741]
Post-default ₋₁	-2.237* [1.309]	-15.249 [12.514]
Post-default ₀ (Onset year)	-2.936 [2.257]	12.979 [29.416]
Post-default ₊₁	-2.953** [1.328]	-15.292 [10.617]
Post-default ₊₂	-2.179* [1.238]	-27.400** [12.408]
Post-default ₊₃	0.188 [1.148]	2.361 [13.085]
Constant	2.828** [1.189]	54.994** [27.878]
Restructuring-events intensity control	yes	yes
Year fixed effects	yes	yes
Country fixed effects	yes	yes
Observations	5,483	5,015
R-squared	0.144	0.148
Number of countries	157	150

Note: The table displays GDP growth and external debt growth before, during, and after preemptive or post-default debt restructurings, relative to the baseline of no debt restructurings. The econometric framework follows a difference-in-difference approach, with country and year fixed effects. *Pre-emptive_n* captures the differential effects n year from the preemptive restructurings, and *Post-default_n* captures the differential effects n year from the post-default restructurings. We have added frequency indicators in all regressions to control for overlapping events. *** p<0.01, ** p<0.05, * p<0.1

Figure 5: Comparing Pre-emptive with Post-default Restructurings



Note: difference-in-difference approach; $t=0$: onset of a restructuring. $t=-3,-2,-1$ indicate the years before restructurings; $t=1,2,3$ indicate the years after a restructuring starts. Data consists of 197 restructurings to private external creditors between 1981 and 2019 and are collected and updated by Asonuma & Trebesch (2016).

4. Conclusions

This paper is the first effort to systematically understand how growth and debt evolve around the onset of three important types of calamities: natural disasters, armed conflicts, and debt distress. Moreover, the paper is relevant in the context of the Covid-19 pandemic, as countries accumulate debt to cope with the pandemic.

The paper finds that debt and growth evolve quite differently depending on the type of calamities. This finding carries important implications for economic management during the covid-19 pandemic because one needs to identify which types of calamities the pandemic is most similar to and which of the similarities are policy-relevant.

Our paper argues that the Covid-19 pandemic shares many traits with large natural disasters. Both pandemic and natural disasters are rare and unexpected occurrences, and neither are directly caused by economic policies. Both result in economic contractions because people cannot work (due to physical destruction or safety concerns). Therefore, examining debt and output growth around natural disasters can help understand how debt-financed fiscal expenditures can help the recovery from the pandemic. The evidence indicates that public debt and output growth tend to rise faster after natural disasters than in economies without disasters, thus illustrating how debt-financed fiscal expansions can help economic reconstruction.

References

- Asonuma, Tamon, and Christoph Trebesch. 2016. "Sovereign Debt Restructurings: Preemptive or Post-default." *Journal of the European Economic Association* 14.1: 175-214.
- Borensztein, Eduardo, and Ugo Panizza. 2009. "The Costs of Sovereign Default." *IMF Staff Papers*, vol. 56, no. 4, pp. 683–741,
- Collier, Paul. 1999. "On the economic consequences of civil war." *Oxford Economic Papers*, 51(1), 168-183.
- Gatti, Roberta; Lederman, Daniel; Nguyen, Ha M.; Alturki, Sultan Abdulaziz.; Fan, Rachel Yuting; Islam, Asif M.; Rojas, Claudio J. 2021. "Living with Debt: How Institutions Can Chart a Path to Recovery for the Middle East and North Africa" *Middle East and North Africa Economic Update* (April), Washington, DC: World Bank.
- Fomby, Thomas, Yuki Ikeda, and Norman V. Loayza. 2013. "The Growth Aftermath of Natural Disasters". *Journal of Applied Econometrics* 28 (3): 412-434.
- International Monetary Fund (IMF) (2021). Fiscal Monitor: Strengthening the Credibility of Public Finances. Washington, October.
- Krugman, Paul. 2021. "Fighting Covid Is Like Fighting a War", *New York Times* op-ed
- Lederman, Daniel and Claudio Rojas. 2018. "Three Macroeconomic Trends Around the Onset of Armed Conflict in Developing Economies." *Policy Research Working Paper No. WPS 8647*, The World Bank.
- Murdoch, James, and Todd Sandler. 2002. "Economic Growth, Civil Wars, and Spatial Spillovers." *Journal of Conflict Resolution*, 46(1), 91-110.
- Murdoch, James, and Todd Sandler. 2004. "Civil Wars and Economic Growth: Spatial Dispersion." *American Journal of Political Science* 48 (1): 138-151.
- Reinhart, Carmen, Kenneth S. Rogoff, and Miguel A. Savastano. 2003. "Debt Intolerance." *Brookings Papers on Economic Activity* 1:1-62.
- Reinhart, Carmen. 2015. "The Hidden Debt Burden of Emerging Markets." *Project Syndicate*, October 9, 2015.