Article

COVID-19 Crisis and the Association Between Inequality and Economic Growth

Journal of Interdisciplinary Economics
36(2) 246–261, 2024

DOI: 10.1177/02601079221142703
journals.sagepub.com/home/jie
Sage

Salim Chahine[1] and Adam Chahine[2]

> 'No society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable.'
>
> *The Wealth of Nations*, Adam Smith (1776)

Abstract

In this paper, we investigate the macroeconomic response to exogenous shocks, namely the COVID-19. We conjecture that the sensitivity of an economic system to an exogenous shock is endogenous on its characteristics and ability to counter a shock. We use the COVID-19 crisis as an exogenous shock, and we argue that a higher income inequality is likely to lead to a greater negative impact of an exogenous shock on economic growth. We validate our expectations using different inequality indexes. In further robustness tests, we confirm our conclusions using different proxies for economic conditions.

JEL Codes: A10, I14, I15

Keywords

Inequality, economic growth, exogenous shock

Introduction

Income inequality has recently become a global phenomenon (Piketty, 2014). Income inequality refers to the difference in the standard of living across a

[1] Central Bank of Lebanon, Beirut-Lebanon
[2] Economics Department, IE University, Madrid, Spain

Corresponding author:
Salim Chahine, Vice Governor, Central Bank of Lebanon, Beirut-Lebanon.
E-mail: salimchahine@gmail.com

population (Gallo, 2002), and the unfair distribution of resources among individuals (Priester & Mendelson, 2015). The concept of inequality goes beyond income and covers health, wealth and gender, and it is at the heart of sustainable economic development. Prior research focuses on the association between income inequality and economic growth and shows mixed results (De Dominicis et al., 2008; United Nations, 2013). Yet, there is little information on the association between both variables around exogenous shocks.

The economic evolution of nations is subject to economic or business cycles (Juglar, 1862; Ricardo, 1810; Smith, 1776). This refers to shifts between rapid, stagnant and declining economic growth around a long-term growth trend (Sullivan & Sheffrin, 2006). Two economic theories explain the fluctuations in economic activities, usually measured by the growth rate of real gross domestic product. On the one hand, the real business cycle (RBC) theory builds on perfect markets and rational expectations hypotheses, and conjectures that economic cycles result from exogenous shocks affecting real factors such as consumer preference, oil prices, productivity, … and destabilise the system (e.g., Frisch, 1933; Kydland & Prescott, 1982; Slutsky, 1927). On the other hand, the endogenous business cycle (EBC) theory assumes that fluctuations are the outcome of inherent processes and practices that endogenously disrupt economic growth (e.g., Chiarella et al., 2005; Goodwin, 1967; Harrod, 1939; Samuelson, 1939).

Prior research demonstrates that both EBC and RBC are likely to capture the impact of exogenous shocks on the economic cycle. Benson and Clay (2004) investigate the economic response to the 1999 Marmara earthquake in Turkey. They find that the cost of a natural disaster depends on the existing economic conditions. Specifically, they show that the cost of the destructions reached up to 3% of GDP, but the drop in production was limited by the reconstruction efforts, and the strong recession that the country went through during the year preceding the earthquake (World Bank, 1999). Hallegatte and Ghil (2007) use both EBC and RBC models to examine the impact of natural disasters on macroeconomic conditions. They argue that exogenous shocks differentially affect economic output for one economy according to its business cycle. They find that a stochastic productivity shock has a higher impact on output during expansions than during recessions and conclude that this at odds with the classical real-cycle theory.[1] Yet, the authors add that in two different countries at different stages of economic development, the poorer country with lower funding ability will be more vulnerable to a natural disaster. Building on prior economic literature, we argue that the impact of an exogenous shock on economic outputs is endogenous to economic conditions, namely pre-existing inequality. We use COVID-19 as an example of a recent exogenous shock, and we empirically verify whether economic growth is lower for countries with higher income inequality, which is the outcome of country-level political choices.

Despite its growing presence globally, previous studies show mixed conclusions on the impact of income inequality on economic growth. Empirical results are sensitive to the choice of the econometric method, the database, or the significant simultaneity problems between inequality and growth (Kuznets, 1955). Most of the cross-sectional research shows a negative association between income inequality and growth, but this is no longer significant in models using panel data

techniques (De Dominicis et al., 2008). Theoretical deductions also suggest divergent inferences (Aghion et al., 1999; Benabou, 1996). On the one hand, inequality reflects a redistribution of income in the higher class that saves and invests. The increase in savings results into a higher capital accumulation, productive capacity and growth (Forbes, 2000; Gallo, 2002; Kaldor, 1957; Li & Zou, 1998; Pasinetti, 1962). On the other hand, inequality is negatively associated with economic growth. The political economy argument predicts that tax rates that ensure an equitable redistribution of capital increase growth rates (Alesina & Rodrik, 1994). Moreover, a higher inequality leads to higher political instability, which decreases confidence and ultimately reduces economic growth (Alesina & Perotti, 1996; Banerjee & Duflo, 2003; Bruno, 1993; Rodrik, 1998). The economic theory argues that the negative association between inequality and growth is due to imperfect credit market, where poorer people have limited access to more expensive lending (Galor & Zeira, 1993). Inequality also leads to a less effective utilisation of productive assets, greater barriers on investment (Tabassum & Majeed, 2008), unequal opportunities and lower productivity (Scheuermeyer & Grundler, 2015), thus lowering growth.

Beyond its effect on growth, inequality increases unemployment, as well as the adverse socio-economic implications of business cycle fluctuations. Furman and Stiglitz (1998) argue that inequality amplifies the negative implications of the length of the job search period and employers' aversion to hire people who have been unemployed for a long period. This is likely to adversely affect unemployment and create discrepancies across races as well as educational and occupational levels. Income inequality is also likely to affect government revenues through the choice of taxes levied. For example, in the United States, personal income tax represents more than 44% and social security tax represents 37% of federal revenues in 1995 (Shariff, 1996). Guner et al. (2016) find that shifting the income tax schedule towards high earners allows for small revenue gains.

Our empirical investigations confirm our predictions using expected figures on economic growth, unemployment and government revenues over the period 2020 to 2024 and following the COVID-19 crisis. Using cross-country analysis surrounding the global exogenous shock due to the COVID-19 crisis, we find that the negative effect on expected economic growth is stronger in countries with higher income inequality. Although the use expected figures from World Bank database may be considered a limitation, our empirical methodology controls for the endogenous determination of inequality.[2]

Our contributions to prior research are twofold. First, while we recognise that the underlying economic hypotheses may affect the results, our empirical investigations provide a unified test of real and EBC theories using an exogenous health shock. As such, we complement prior research on the economic impact of exogenous shocks such as natural disasters (e.g., hurricanes and earthquakes) or other exogenous policies (climatic) (Loeuille & Ghil, 2004). Using COVID-19 as an example of an exogenous health shock, we show that the expected change in economic output arises from the interplay of endogenous dynamics and their responses to exogenous shocks. We, thus, confirm that the effect of an exogenous shock on macroeconomic fluctuations arises endogenously from intrinsic instabilities such as inequality. This is consistent with previous results in Hahn and Solow (1995) using the EBC theory.

Second, our research contributes to the debate on the association between inequality and economic growth. In further investigations, we use *Human Development Index* and *Social Progress Index* (SPI) as alternative measures of inequality, and we confirm the existence of a negative effect of inequality on economic growth around the COVID-19 crisis. We, thus, add to prior research on the nature of development, and we show that shifting the analysis from the utilitarian perspective of income attribute (Streeten, 1979) to the vector of possible opportunities, economic growth suffers from exogenous shocks in countries with limited opportunities available to individuals (Ranis, 2004).

The remaining of the paper is as follows. In Section 2, we present our data and methodologies. In Section 3, we discuss our empirical results and run some robustness tests in Section 4. In Section 5, we conclude.

Data and Methodologies

To estimate the impact of income inequality on economic growth around the COVID-19 crisis, we use the following Ordinary Least Squares regression model:

$$\text{Change in GDP per capita (\%)} = \alpha + \beta_1 \times \text{Gini index} + \text{Controls} + \varepsilon \quad (1)$$

where *Change in GDP per capita* (%) is calculated as the percentage change in the GDP per Capita over the periods 2019 to 2020 and 2019 to 2021. GDP per capita is the gross domestic product, that is, the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products, divided by midyear population. Data on GDP per Capita are in current U.S. dollars and are extracted from the IMF database.[3]

Gini index is a statistical measure showing the inequality of income distribution. This index ranges from 1 and 100 points (or 0 and 1), and the higher its value the greater is the inequality. Our empirical investigations use the 2019 Gini index from Statista database.[4] In our sample, the Gini coefficient ranges from 24.5 to 62.73, and in line with prior research, it is higher for developing countries.[5]

We validate the robustness of our results using two indicators for inequality: *the inequality-adjusted human development index (IHDI)* and the *SPI*. The *IHDI*, published by the UNDP in its 2019 Human Development Report, measures 'the level of human development when inequality is accounted for', where the Human Development Index captures 'potential human development', that is, the maximum IHDI that could be achieved in the absence of inequality. The IHDI index measures the HDI of the average person in society when there is inequality in the distribution of health, education and income. The *SPI* measures the extent to which countries provide for the social and environmental needs of their citizens. It is equal to the average of the scores given to three dimensions, namely, basic human needs, foundations of well-being and opportunity. This index, published by the nonprofit Social Progress Imperative, measures the well-being of a society using social and environmental outcomes rather than economic factors

(Porter et al., 2013). We expect the change in GDP per Capita to be positively associated with both the IHDI and the SPI.

In further investigations, we use two different dependent variables as proxies for economic growth, namely the change in unemployment rate and the change in government revenues calculate as a percentage of GDP. We expect the change in unemployment rate (change in government revenues) to be positively (negatively) associated with income inequality around the COVID-19 crisis.

In terms of control variables, we include the *GDP* in billions of U.S. dollars as calculated in current prices in World Bank database. We also use the *Change in inflation rate*, measured by the change in the annual percent change in consumer prices over the periods 2019–2020 and 2019–2021. Further, we include *General government gross debt* calculated as a percentage of GDP, and the *Education* level of each country, which is equal to the mean number of years of schooling among people 25 years of age and older. Finally, we add the *Corruption perception index* as our data are extracted from the World Bank database.

Empirical Results

Table 1 presents the descriptive statistics for the studied sample in mean, standard deviation and the correlation matrix. Our data include 178 countries with information on their expected change in GDP per capita over the period 2019–2020, and 177 countries with expected change in GDP per capita over the period 2019–2021. The average expected change in GDP per capita over 2019–2020 is –7.2%, which indicates the overall negative impact of the COVID-19 crisis on economic growth globally. The average expected change in GDP per capita over the period 2019–2021 is almost nil at –0.7%, which suggests an expected global economic recovery in the year 2021.

The data cover 130 countries for which we have data on Gini index in 2019. The average Gini index is equal to 37.5 and is negatively and significantly associated with the expected change in GDP per Capita over a one- and two-year period.

Figure 1 exhibits the changes in the GDP per Capita around the COVID-19 crisis for three groups of countries divided according to the level of Gini index: low, medium and high level. The figure shows that countries with a high Gini index have a higher expected economic recovery following the crisis than countries with low Gini index.

The regression models in Table 2 investigate the effects of *Gini index* on the *Change in GDP per capita* as per equation (1). The results confirm our predictions. We find that the expected change in GDP per capita over a one- and two-year period is negatively associated with Gini index at the 1% level. Specifically, a 10% increase in income inequality decreases the GDP per capita by 0.4% over a one-year period and by 0.5% over a two-year period. This suggests that income inequality negatively affects economic growth around an exogenous shock such as the COVID-19 crisis.

In terms of control variables, the expected change in GDP per Capita is positively associated with the pre-crisis GDP growth rate in 2019, and the change over a two-year period is also positively associated with the change in the inflation rate over the same period.

Table 1. Inequality and Changes in GDP Growth Rate Around the COVID-19 Crisis.

	N.	Mean	s.d.	1	2	3	4	5	6	7	8	9
1. Exp. change in GDP (2019 to 2020)	178	–0.072	0.098	1.000								
2. Exp. change in GDP (2019 to 2021)	177	–0.007	0.116	0.838	1.000							
3. Gini index$_{2019}$	130	37.530	7.540	–0.305	–0.443	1.000						
4. GDP growth$_{2019}$	180	2.494	3.953	0.453	0.449	–0.128	1.000					
5. GDP per capita 2019	179	13820.2	19589.5	–0.020	0.137	–0.348	–0.097	1.000				
6. General government gross debt$_{2019}$	177	57.916	38.163	–0.225	–0.108	0.013	–0.386	0.057	1.000			
7. Change in inflation (2019 to 2020)	178	–15.372	232.057	0.107	0.192	–0.022	0.700	0.038	–0.323	1.000		
8. Change in inflation (2019 to 2021)	177	–19.942	235.034	0.175	0.257	–0.068	0.745	0.050	–0.336	0.987	1.000	
9. Education$_{2019}$	178	8.498	3.163	–0.115	0.081	–0.418	–0.199	0.620	0.008	–0.052	–0.044	1.000
10. Corruption perception index$_{2019}$	173	42.751	18.987	0.042	0.203	–0.305	0.006	0.809	0.051	0.100	0.120	0.655

Source: The authors (Statista, IMF and World Bank database).

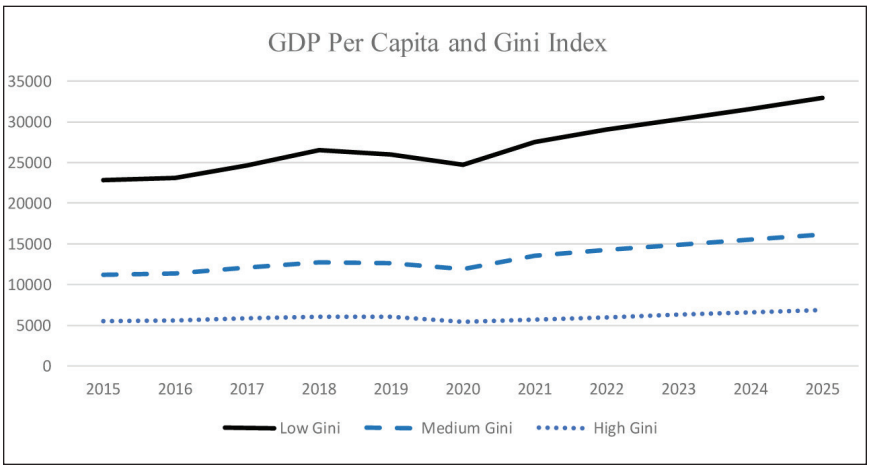

Figure 1. Income Inequality and Expected Change in GDP Per Capita Around the COVID-19 Crisis.

Source: The authors (Statista, IMF and World Bank database).

Table 2. Inequality and Changes in GDP Per Capita Around the COVID-19 Crisis.

	Change in GDP per Cap. (%) 2019 to 2020		Change in GDP per Cap. (%) 2019 to 2021	
Dependent Variable:	(1a)	(1b)	(2a)	(2b)
Constant	0.071	0.162*	0.005	0.176
	0.077	*0.085*	*0.087*	*0.108*
Gini index$_{2019}$	–0.004***	–0.004***	–0.005***	–0.005***
	0.001	*0.001*	*0.001*	*0.001*
GDP growth rate$_{2019}$	0.016***	0.010***	0.018***	0.010***
	0.003	*0.003*	*0.003*	*0.004*
LnGDP per cap$_{2019}$	–0.006	–0.019	0.014**	–0.011
	0.006	*0.012*	*0.006*	*0.015*
General government gross debt$_{2019}$		0.000		0.000
		0.000		*0.000*
Change in inflation 2019 to 2020		0.000		
		0.000		
Change in inflation 2019 to 2021				0.001***
				0.000
Education$_{2019}$		–0.002		–0.001
		0.004		*0.005*
Corruption perception index$_{2019}$		0.001**		0.002**
		0.001		*0.001*
N.	129	95	128	95
Adjusted R-squared	0.311	0.367	0.337	0.554

(Table 2 continued)

(Table 2 continued)

	Change in GDP per Cap. (%) 2019 to 2020		Change in GDP per Cap. (%) 2019 to 2021	
Dependent Variable:	(1a)	(1b)	(2a)	(2b)
F-Statistics	20.210	8.770	22.540	17.690
Prob.	0.000	0.000	0.000	0.000

Source: The authors (Statista, IMF and World Bank database).

Note: This table examines the impact of inequality on the changes in GDP growth rate around the COVID-19 crisis. Panel A includes the core explanatory variables, and panel B includes additional controls usually used in the literature. Both panels present the GDP growth rate over a one-year period (2019 to 2020) and two-year period (2019 to 2021). Empirical tests use three indicators for inequality: Income inequality measured by Gini index, IHDI and SPI. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. The standard errors are in italics below the coefficients. The t-statistics are based on heteroskedasticity-consistent standard errors and covariances.

Robustness Tests

Economic Growth and Alternative Inequality Indexes

Previous studies suggest that economic growth is not limited to the traditional utilitarian approach related to income attribute and should consider the vector of possible available opportunities to the people (Ranis, 2004). Sen (1985) considers human development as an indicator of welfare and defines it as 'a person's capability to have various functioning vectors and to enjoy the corresponding well-being achievements'. More recently, Porter et al. (2013) develop an SPI which provides an objective outcome-based measure of well-being, which is unrelated to economic indicators. They argue that social progress is related to policy choices, investments and implementation capabilities by the community members. They define social progress as 'the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential'.

Figure 2 presents our robustness tests on the impact of inequality on economic growth using two additional proxies for inequality. Specifically, Figure 2a exhibits the association between the expected change in GDP per capita and IHDI and Figure 2b shows the relation with SPI. Both figures indicate a significant increase in the expected change in GDP per Capita for countries with a higher human development index and SPI compared to the other subgroups of medium and low HDI and SPI.

Table 3 repeats the empirical tests in Table 2 using both IHDI andSPI. Models (1) to (4) confirm our prediction on the positive association between the change in GDP per capital and both IHDI and SPI at the 10% level or more. This confirms that countries with a greater human development or social progress are more

Figure 2a. Inequality-adjusted human.

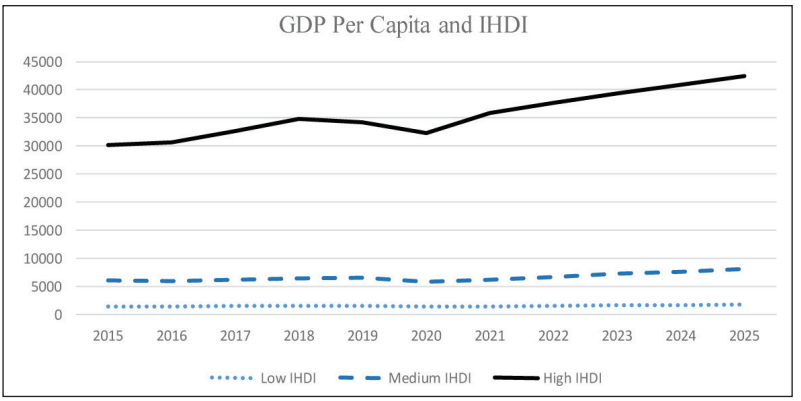

Figure 2b. SPI. development index.

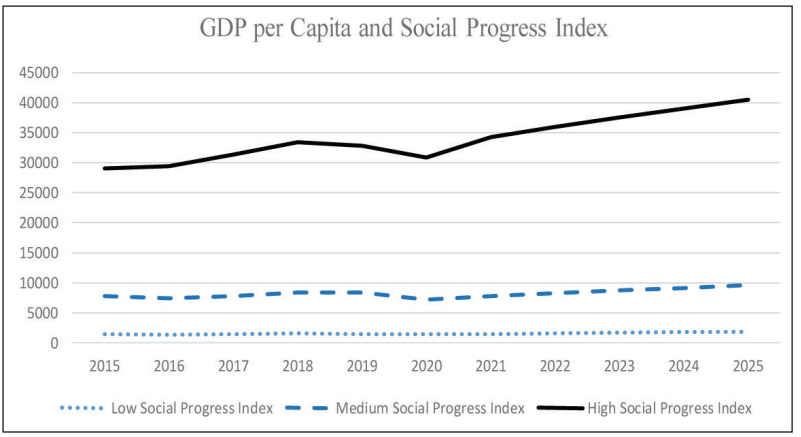

Figure 2. Inequality and Changes in GDP Growth Rate Around the COVID-19 Crisis.
Source: The authors (Statista, IMF and World Bank database).

Table 3. Inequality and Changes in GDP Growth Rate Around the COVID-19 Crisis.

	Inequality-Adj. HD Index	Social Progress Index	Inequality-Adj. HD Index	Social Progress Index
Panel A: Empirical Investigations Using Core Explanatory Variables				
	Change in GDP per Cap. (%) 2019 to 2020		Change in GDP per Cap. (%) 2019 to 2021	
Dependent Variable:	(1a)	(1b)	(2a)	(2b)
Constant	0.024	–0.094**	–0.087	–0.197***
	0.057	*0.046*	*0.074*	*0.055*
Inequality index$_{2019}$	0.195**	0.002*	0.246**	0.002**
	0.093	*0.001*	*0.121*	*0.001*
GDP growth rate$_{2019}$	0.009***	0.018***	0.014***	0.021***
	0.002	*0.002*	*0.002*	*0.003*

(Table 3 continued)

(Table 3 continued)

	Inequality-Adj. HD Index	Social Progress Index	Inequality-Adj. HD Index	Social Progress Index
Panel A: Empirical Investigations Using Core Explanatory Variables				
	Change in GDP per Cap. (%) 2019 to 2020		Change in GDP per Cap. (%) 2019 to 2021	
Dependent Variable:	(1a)	(1b)	(2a)	(2b)
LnGDP per cap_{2019}	–0.027**	–0.018*	–0.011	–0.004
	0.012	*0.011*	*0.016*	*0.013*
N.	150	158	150	157
Adjusted R-squared	0.177	0.296	0.240	0.274
F-Statistics	11.640	23.040	16.690	20.610
Prob.	0.000	0.000	0.000	0.000
Panel B: Empirical Investigations Using All Explanatory Variables				
	Change in GDP per Cap. (%) 2019 to 2020		Change in GDP per Cap. (%) 2019 to 2021	
Dependent Variable:	(3a)	(4b)	(3a)	(4b)
Constant	0.056	–0.075	–0.081	–0.143**
	0.067	*0.050*	*0.091*	*0.061*
Inequality $index_{2019}$	0.304**	0.002**	0.299	0.002*
	0.148	*0.001*	*0.198*	*0.001*
GDP growth $rate_{2019}$	0.012***	0.015***	0.018***	0.018***
	0.003	*0.003*	*0.004*	*0.003*
LnGDP per cap_{2019}	–0.037***	–0.020*	–0.018	–0.009
	0.014	*0.011*	*0.018*	*0.013*
General government gross $debt_{2019}$	0.000	0.000	0.000	0.000
	0.000	*0.000*	*0.000*	*0.000*
Change in inflation 2019 to 2020	0.000***	0.001***		
	0.000	*0.000*		
Change in inflation 2019 to 2021			0.000*	0.001***
			0.000	*0.000*
$Education_{2019}$	–0.008	–0.003	–0.005	0.002
	0.006	*0.004*	*0.008*	*0.005*
Corruption perception $index_{2019}$	0.001**		0.001	
	0.001		*0.001*	
N.	146	156	146	155
Adjusted R-squared	0.230	0.337	0.252	0.325
F-Statistics	7.170	14.120	7.960	13.350
Prob.	0.000	0.000	0.000	0.000

Source: The authors (Statista, IMF and World Bank database).

Note: This table examines the impact of inequality on the changes in GDP growth rate around the COVID-19 crisis. Panel A includes the core explanatory variables, and panel B includes additional controls usually used in the literature. Both Panels present the GDP growth rate over a one-year period (2019 to 2020) and two-year period (2019 to 2021). Empirical tests use three indicators for inequality: Income inequality measured by Gini index, IHDI andSPI. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. The standard errors are in italics below the coefficients. The t-statistics are based on heteroskedasticity-consistent standard errors and covariances.

Table 4. The Impact of Inequality on Unemployment and Government Revenues Around the COVID-19 Crisis: Robustness Test.

	Gini Inequality-Adj. Social Progress Index HD Index Index			Gini Inequality-Adj. Social Progress Index HD Index Index		
Panel A: Empirical Investigations Using Changes in Unemployment Rate around the COVID-19 Crisis						
	Change in Unemployment Rate					
	2019 to 2020			2019 to 2021		
Dependent Variable:	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
Constant	–3.135	2.774	5.778*	–1.260	1.112	0.779
	4.206	*4.044*	*3.341*	*2.418*	*2.297*	*1.830*
Inequality $index_{2019}$	0.137***	–15.869**	0.006	0.078***	–12.312	0.022
	0.045	*6.540*	*0.083*	*0.025*	*3.653*	*0.045*
Unemployment $rate_{2019}$	0.085	0.118**	0.143**	0.098***	0.114	0.129***
	0.063	*0.059*	*0.067*	*0.036*	*0.033*	*0.036*
GDP growth $rate_{2019}$	0.167	0.110	–0.089	–0.065	–0.080	–0.132*
	0.133	*0.125*	*0.137*	*0.075*	*0.069*	*0.074*
LnGDP per cap_{2019}	–0.145	0.884	–0.251	–0.285	0.489	–0.080
	0.607	*0.664*	*0.638*	*0.348*	*0.374*	*0.349*
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N.	79	84	77	79	84	77
Adjusted R-squared	0.117	0.100	0.020	0.223	0.246	0.147
F-Statistics	2.140	2.030	1.119	3.490	4.380	2.640
Prob.	0.036	0.048	0.319	0.001	0.000	0.014

(Table 4 continued)

(Table 4 continued)

	Gini Inequality-Adj. Social Progress Index HD Index Index			Gini Inequality-Adj. Social Progress Index HD Index Index		
Panel B. Empirical Investigations Using Changes in Government Revenues around the COVID-19 Crisis						
	Change in Government Revenues					
	2019 to 2020			2019 to 2021		
Dependent Variable:	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
Constant	1.852	–1.738	–2.842*	2.569	0.286	–0.342
	2.530	*2.335*	*1.488*	*2.267*	*2.321*	*1.515*
Inequality $index_{2019}$	–0.082**	–3.720	0.059	–0.082***	–1.029	0.070*
	0.032	*4.963*	*0.040*	*0.027*	*4.791*	*0.039*
Government $revenue_{2019}$	–0.047*	–0.029	–0.043*	–0.043*	–0.042*	–0.067***
	0.026	*0.026*	*0.023*	*0.022*	*0.025*	*0.023*
GDP $growth\ rate_{2019}$	–0.118	–0.028	–0.041	–0.152**	–0.085	–0.089
	0.078	*0.079*	*0.075*	*0.075*	*0.082*	*0.078*
LnGDP $per\ cap_{2019}$	0.292	0.142	0.018	0.301	–0.093	–0.358
	0.357	*0.474*	*0.320*	*0.325*	*0.462*	*0.315*
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N.	96	102	108	96	102	108
Adjusted R-squared	0.064	0.001	0.080	0.142	0.023	0.171
F-Statistics	1.810	0.446	1.230	2.970	1.290	2.940
Prob.	0.086	0.990	0.291	0.001	0.257	0.008

Source: The authors (Statista, IMF and World Bank database).

Note: This table presents our robustness tests and examines the impact of inequality on the changes in the unemployment rate and government revenues around the COVID-19 crisis. Panel A presents the results for changes in the unemployment rate, and panel B presents the results for changes in government revenues. Both Panels presents the changes over a one-year period (2019 to 2020) and two-year period (2019 to 2021). Empirical tests use three indicators for inequality: Income inequality measured by Gini index, IHDI andSPI. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. The standard errors are in italics below the coefficients. The t-statistics are based on heteroskedasticity-consistent standard errors and covariances.

resilient and are expected to better resist to the COVID-19 exogenous shock in generating a higher economic growth.

Changes in Economic Indicators and Inequality Indexes

Prior research suggests that a country's success goes beyond economic growth to include human development and social progress (Porter et al., 2013). Economic measures alone do not fully capture human development and social progress.

Table 4 presents the regression results for changes in unemployment rate and government revenues on all our used inequality indexes. The results are consistent with our main predictions using economic growth as a dependent variable. They show that countries with higher pre-COVID-19 income inequality are more likely to suffer from an expected increase in their unemployment rate and an expected decrease in their government revenues around the COVID-19 crisis (at the 5% level or better). The results are consistent, yet less significant, using IHDI and SPI as proxies for inequality.

Conclusions

Economic growth, measured by the GDP per Capita, indicates the extent to which a country is successful. It represents the personal income and governmental resources needed to meet human and societal needs. However, economic variables mostly adopt a utilitarian approach, which omits the critical impact of the characteristics of the society in facing exogenous shocks. We argue that the negative effect of the COVID-19 crisis, used as a global exogenous shock, is endogenously related to the level of income inequality. Using a cross-country analysis, we empirically confirm that the negative effect on economic growth is stronger in countries with higher income inequality. Our empirical investigations use different proxies for inequality, namely IHDI and SPI; they use different proxies for development such as unemployment rate and government revenues.

Our results contribute to the debate on the association between economic growth and inequality. From a theoretical perspective, we provide a testable framework for both real and EBC theories using an exogenous shock, the COVID-19 crisis. Our results suggest that the effect of an exogenous shock on economic output arises from endogenous characteristics such as inequality.

Our empirical investigations use different measures economic development and of inequality, which contributes to a better understanding of the effects of inequality (Bennett & Nikolaev, 2017). This also adds to prior research on the nature of development, as it expands the analysis from a basic utilitarian perspective of income attribute (Streeten, 1979) to the vector of possible opportunities and show the impact of exogenous shocks on economic growth in different contexts of inequality (Ranis, 2004). This help regulators and policymakers understand the importance of investing in a balanced society to better manage the negative impact of growing risk related to exogenous shocks.

Acknowledgment

The first author, Salim Chahine, acknowledges that the views and opinions expressed in this paper are his own and do not reflect the views or positions of the Central Bank of Lebanon.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

ORCID iD

Salim Chahine https://orcid.org/0000-0002-9301-414X

Notes

1. The authors conclude to the existence of a 'vulnerability paradox' in which a disaster leads to lower damages in depressed economy given the offsetting effect of reconstruction efforts. On the contrary, the cost of a disaster is higher in a expansion context as it amplifies pre-existing disequilibria in the real and monetary sectors.
2. An extensive literature has suggested many causes of inequality. This includes technological progress (Acemoglu, 2002; Bound & Johnson, 1992), demographics (Karahan & Ozkan, 2013), the structure of the labor market (Jaumotte & Osorio Buitron, 2015), the accommodative monetary policy (Acemoglu & Johnson, 2012; Stiglitz, 2015) and globalization (Feenstra & Hanson, 1999, Furceri & Loungani, 2018).
3. https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD
4. https://www.statista.com/forecasts/1171540/gini-index-by-country
5. All used data come from public sources and are available upon request.

References

Acemoglu, D. (2002). Technical change, inequality and the labor market. *Journal of Economic Literature*, *40*, 1, 7–72.

Acemoglu, D., & Johnson, S. (2012). *Who captured the ded*? (p. 29). New York Times.

Aghion, P., Caroli, E., & Garcia-Penalosa, C. (1999). Inequality and economic growth: The perspective of the new growth theories. *Journal of Economic Literature*, *37*, 4, 1615–1660.

Alesina, A., & Perotti, R. (1996). Income distribution, political instability and investment. *European Economic Review*, *40*, 1203–1228.

Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *Quarterly Journal of Economics*, *109*, 465–490.

Banerjee, A. V., & Duflo, E. (2003). Inequality and growth: What can the data say? *Journal of Economic Growth*, *8*, 267–299.

Benabou, R. (1996). Inequality and growth. NBER Working Paper no. 5658.

Bennett, D. L., & Nikolaev, B. (2017). On the ambiguous economic freedom–inequality relationship. *Empirical Economics*, *53*, 717–754.

Benson, C., & Clay, E. (2004). *Understanding the economic and financial impact of natural disasters.* The International Bank for Reconstruction and Development/The World Bank.

Bound, J., & Johnson, G. (1992). Changes in the structure of wages in the 1980s: An evaluation of alternative explanations. *American Economic Review*, *83*, 371–392.

Bruno, M. (1993). *Crisis, stabilization, and economic reform: Therapy by consensus*. Clarendon Press.

Chiarella, C., Flaschel, P., & Franke, R. (2005). *Foundations for a disequilibrium theory of the business cycle*. Cambridge University Press.

De Dominicis, L., Florax, R. J. G. M., & de Groot, H. L. F. (2008). A meta-analysis on the relationship between income inequality and economic growth. *Scottish Journal of Political Economy*, *55*(5), 654–682.

Feenstra, R. C., & Hanson, G. H. (1999). The impact of outsourcing and high-technology capital on wages: Estimates for the U.S., 1979–1990. *Quarterly Journal of Economics*, *114*(3), 907–940.

Forbes, K. J. (2000). A reassessment of the relationship between inequality and growth. *American Economic Review*, *90*, 869–887.

Frisch, R. (1933). Propagation problems and impulse problems in dynamic economics. Economic Essay in honor of Gustav Cassel. George Allen and Unwin.

Furceri, D., & Loungani, P. (2018). The distributional effects of capital account liberalization. *Journal of Development Economics*, *130*, 127–144.

Furman, J., & Stiglitz, J. E. (1998). *Economic consequences of rising income inequality*. *Income inequality: Issues and policy options*. Federal Reserve Bank of Kansas City, Kansas, MO, 221–63.

Gallo, C. (2002). Economic growth and income inequality: Theoretical background and empirical evidence. Working Paper N. 119, Development Planning Unit, University College London.

Galor, O., & Zeira, J. (1993). Income distribution and macroeconomics. *Review of Economic Studies*, *60*, 35–52.

Goodwin, R. (1967). A growth cycle. In C. Feinstein (Ed.), *Socialism, capitalism and economic growth*. Cambridge University Press.

Guner, N., Lopez-Daneri, M., & Ventura, G. (2016). Heterogeneity and government revenues: Higher taxes at the top? *Journal of Monetary Economics*, *80*, 69–85.

Hahn, F., & Solow, R. (1995). *A critical essay on modern macroeconomic theory*. The MIT Press.

Hallegatte, S., & Ghil, M. (2007). Endogenous business cycles and the economic response to exogenous shocks, Nota di Lavoro, No. 20.2007, Fondazione Eni Enrico Mattei (FEEM), Milano.

Harrod, R. (1939). An essay on dynamic economic theory. *Economic Journal*, *49*, 14–33.

Jaumotte, F., & Osorio Buitron, C. (2015). *Inequality and labor market institutions* (IMF Staff Discussion Note. No. 15/14). IMF.

Juglar, C. (1862). Des Crises commerciales et leur retour périodique en France, en Angleterre, et aux Etats-Unis, Strasbourg, Imprimerie de Veuve.

Kaldor, N. (1957). Alternative theories of distribution. *Review of Economic Studies*, *23*, 83–100.

Karahan, F., & Ozkan, S. (2013). On the persistence of income shocks over the life cycle: Evidence, theory, and implications. *Review of Economic Dynamics*, *16*(3), 452–476.

Kuznets, S. (1955). Economic growth and income inequality. *American Economic Review*, *45*(1), 1–28.

Kydland, F. E., & Prescott, E. C. (1982). Time to build and aggregate fluctuations. *Econometrica*, *50*, 1345–1370.

Li, H., & Zou, H. (1998). Income inequality is not harmful for growth: Theory and evidence. *Review of Development Economics*, *2*, 318–334.

Loeuille, N., & Ghil, M. (2004). Intrinsic and climatic factors in North-American animal population dynamics. *BMC Ecology*, *4*, 6. https://doi.org/10.1186/1472-6785-4-6.

Pasinetti, L. (1962). Rate of profit and income distribution in relation to the rate of economic growth. *Review of Economic Studies*, *29*, 267–279.

Piketty, T. (2014). *Capital in the twenty-first century*. Belknap Press.

Porter, M., Stern, S., & Artavia Loria, R. (2013). Social progress index 2013. http://www.competitividad.org.do/wp-content/uploads/2013/05/SocialProgressIndex2013.pdf

Priester, M., & Mendelson, A. (2015). Income inequality. http://inequality.org/income-inequality/

Ranis, G. (2004). *Human development and economic growth*. Center Discussion Paper No. 887, Economic Growth Center, Yale University.

Ricardo, D. (1810). *The high price of bullion, a proof of the depreciation of bank notes*. John Murray.

Rodrik, D. (1998). Where did all the growth go? External shocks, social conflict, and growth collapses. National Bureau of Economic Research Working Paper No. 6350.

Samuelson, P. (1939). A synthesis of the principle of acceleration and the multiplier. *Journal of Political Economy*, *47*, 786–797.

Scheuermeyer, P., & Grundler, K. (2015). Income inequality, economic growth and the effect of redistribution. Würzburg Economic Papers, No. 95, University of Würzburg.

Sen, A. (1985). Well-being, agency and freedom: The Dewey lectures 1984. *The Journal of Philosophy*, *82*(4), 169–221.

Shariff, Z. (1996). Inequality and government. In *Inequality*, Edited by Dugger, W. M, Greenwood Publishing Group.

Slutsky, E. (1927). The summation of random causes as a source of cyclic processes, III(1), Conjuncture Institute, Moscow, Reprinted in Econometrica, *5*, 105–146.

Smith, A. (1776). *An inquiry into the nature and causes of the wealth of nations*. (Reprinted London: Methuen, 5th ed., Ed., E. Cannan, 1904).

Stiglitz, J. E. (2015). The origins of inequality, and policies to contain it. *National Tax Journal*, *68*(2), 425–448.

Streeten, P. P. (1979). Basic needs: Premises and promises. *Journal of Policy Modelling*, World Bank Reprint Series: Number Sixty-two.

Sullivan, A., & Sheffrin, S. M. (2006). *Economics: Principles in action*. Pearson Prentice Hall.

Tabassum, A., & Majeed, M. (2008). Economic growth and income inequality relationship: Role of credit market imperfection. *The Pakistan Development Review*, *47*(4), 727–743. https://www.researchgate.netpublication/46532500_Economic_Growth_and_Income_Inequality_Relationship_Role_of_Credit_Market_Imperfection.

United Nations. (2013). Inequality matters. [online]. http://www.un.org/esa/socdev/documents/reports/InequalityMatters.pdf

World Bank. (1999). Turkey: Marmara earthquake assessment. World Bank Working Paper.