Scientific Research Publishing

Voice of the Publisher, 2024, 10, 1-20
https://www.scirp.org/journal/vp
ISSN Online: 2380-7598
ISSN Print: 2380-7571

COVID-19 Control Measure and Economic Growth Resilience in Central Africa: Does Corruption Matter?

Ongo Nkoa Bruno Emmanuel[1], Ngono Aristide Merlin[2]

[1]Centre for Studies and Research in Management and Economics (CERME), University of Dschang-Cameroon, Association of Development Economics Researchers (ACEDA), Dschang, Cameroon
[2]Association of Development Economics Researchers (ACEDA), Association of Economists and Managers of Cameroon (CEMA) University of Dschang-Cameroon, Dschang, Cameroon
Email: ongoema@yahoo.com, aristidemerlin1994@gmail.com

How to cite this paper: Emmanuel, O. N. B., & Merlin, N. A. (2024). COVID-19 Control Measure and Economic Growth Resilience in Central Africa: Does Corruption Matter? *Voice of the Publisher, 10,* 1-20.
https://doi.org/10.4236/vp.2024.101001

Received: April 16, 2023
Accepted: January 19, 2024
Published: January 22, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/

Open Access

Abstract

This study assesses the effects of COVID-19 control measures on the resilience of economic growth. We applied the ordinary least squares method on a sample of 11 Central African countries with daily data from 2020 to 2021. According to the results, measures to combat COVID-19 (income support, fiscal debt relief, closure of schools and workplaces, cancellation of public events, quarantine, handwashing and lockdown) decrease the ability of economic growth to withstand the COVID-19 shock and to return to equilibrium after the shock. Furthermore, the results of the mediation analysis show that the effects of COVID-19 control measures (income support and debt relief) on the resilience of economic growth is mediated by corruption. From a policy perspective, we suggest strengthening political, economic and health institutions to combat future shocks.

Keywords

Central Africa, Corruption, Resilience, Economic Growth

1. Introduction

The HIV-19 pandemic has pushed Africa into its worst recession in more than 50 years, resulting in a 2.1% decline in gross domestic product in 2020 and plunging an estimated 30 million Africans into extreme poverty by 2021. According to the AFDB report (2021, 2022)[1,2], the continent has lost about 22 mil-

[1]https://www.afdb.org/en/documents/annual-report-2021
[2]https://www.afdb.org/en/documents/annual-report-2022

lion jobs by 2021. Similarly, the World Bank report (2020) reveals that global economic activity will contract to 2.8% in 2020 from 2.2% in 2019. In the same vein, a recession of −4.4% is expected, which is worse than that observed during the 2008 financial crisis.

COVID-19 has been identified by economic literature as having various determinants, including urbanization (Nguimkeu & Tadadjeu, 2021), inequality (Okoi & Bwawa, 2020), poverty (Ngono et al., 2023; Koudjom et al., 2022; Henao-Cespedes et al, 2022), the informal sector (Nguimkeu & Okou, 2022), population density (Nguimkeu & Tadadjeu, 2021; Koudjom et al., 2022), and the population aged 65 and over (Nguimkeu & Tadadjeu, 2021). Research has focused on the impact of COVID-19 on poverty (Ngono et al., 2023; Ehigie et al, 2021; Valensisi, 2020), inequality (Ngono et al., 2023; Blundell et al., 2022; Dang & Nguyen, 2021), digitalization (Amankwah-Amoah et al., 2021), employment (Ngono et al., 2023; Su et al., 2022), and resilience (Asongu et al., 2021; Diop et al., 2021).

Although this literature is dense, to our knowledge no study has focused on measures to combat COVID-19 and resilience of economic growth by linking corruption. This is unfortunate, as studies show that COVID-19 has resulted in a loss of 0.3 to 2.2% of global GDP McKibbin and Fernando (2021). This slowdown in economic growth is also greater than that observed during the financial crisis of 2008-09. The worst outcome of the pandemic is the massive loss of output of 24.3% due to the high costs of health policies worldwide, (Acemoglu et al. 2021). Sub-Saharan Africa, which had maintained an average growth rate of 4.5% between 2010 and 2019, recorded a negative economic growth rate of −1.4% in 2020, marking the first time in at least 25 years.

According to the AFDB report (2021)[3] to slow the spread of the coronavirus, fewer than 42 African countries have imposed restrictions such as lockdowns, curfews, border closures, travel bans, and suspension of sports and recreational activities, all of which have impeded income-generating activities. Governments and international agencies have implemented various economic support programmes to mitigate the effects of the pandemic on vulnerable households and businesses (World Bank, 2020; UNDP Africa Regional Bureau, 2021).

Stimulus packages have been implemented in order to safeguard impoverished households. However, numerous studies reveal that less than two out of every ten citizens and businesses received COVID-19 government aid in 2020 (African Union, 2020; Human Rights Watch, 2021a; International Labour Organization, 2021). Although states have promised transparency in their use of COVID-19 funds, corruption, fraud, embezzlement, and lack of transparency regarding procurement processes, disbursements, and beneficiaries have plagued these aid initiatives (Human Rights Watch, 2021b; Oduor, 2021; United Nations Office on Drugs and Crime, 2020). Afrobarometer surveys conducted across 16 African countries in 2020-2021 indicate that few citizens have reported receiving emergency financial aid offered by their government, with nearly 80% of citizens

[3]https://www.afdb.org/en/documents/annual-report-2021

considering their government's aid distribution unfair and suspecting that at least some of the funds allocated for COVID-19 response have been siphoned off through corruption.

Reducing corruption is target 16.5[4] of the 2030 SDGs (UNDP, 2015)[5]. Although often difficult to detect and measure, "corruption is an insidious evil with multiple and deleterious effects that affect every country in the world, and particularly developing countries, where resources that should be devoted to development are diverted[6]". Indeed, according to data from the latest UN Secretary General's report on the Sustainable Development Goals[7], collected from 38 countries over the past 10 years, it appears that high-income countries have the lowest prevalence of corruption (3.7% on average), while low-income countries pay the most bribes to access public services (22.3%).

Thus, the aim of this project is to fill this gap in the literature by empirically analysing the effects of COVID-19 on the resilience of economic growth through the corruption channel in a sample of 11 Central African countries. Central Africa is the ideal field for such a study for several reasons: first, the area has been less contaminated but has the lowest growth rate - 4.4%; second, it is the region that has benefited most from IMF COVID-19 grants; and third, it is the region that hosts countries with considerable rankings on the list of the most corrupt countries (Human Rights Watch, 2021b).

The study is based on the hypothesis that measures to combat COVID-19 contribute negatively to the resilience of economic growth through the mediated effect of corruption in Central Africa. Thus, the present study is built around the following question: ***what are the effects of measures to combat COVID-19 on the resilience of economic growth in Central Africa?*** From this question stems the objective ***of assessing the effects of measures to combat COVID-19 on the resilience of economic growth in Central Africa.*** Three subsidiary objectives emerge from this main objective, namely To ***assess the effect of COVID-19 control on the resilience of economic growth (direct effect). To assess the effect of the fight against COVID-19 on the recovery (return to equilibrium) of economic growth (direct effect). To assess the effects of measures to combat COVID-19 on the sensitivity (resistance) and recovery of economic growth with the mediated effect of corruption.***

This study makes four contributions to the literature. First, unlike previous studies (Barro, 1991; Pongou et al., 2022), which have focused on assessing the effect of COVID-19 on economic growth, this study highlights three points.

[4]To significantly reduce corruption and bribery in all its forms

[5]The 2030 Agenda for Sustainable Development was adopted on 25 September 2015 at the United Nations General Assembly. Also known as the 2030 Agenda for Sustainable Development, this programme, in force since January 2016, constitutes the new global reference framework for sustainable development for 15 years, from 2016 to 2030, and takes over from the Millennium Development Goals, which expired in December 2015.

[6]Statement by Mr. Kofi Annan, Secretary-General of the United Nations, at the ceremony for the adoption by the General Assembly of the United Nations Convention against Corruption.

[7]https://unstats.un.org/sdgs/report/2020/The-SustainableDevelopment-Goals-Report-2020_French.pdf

First, the study models sensitivity and recovery indices for the period 2020-2021. Secondly, the study calculates the resilience and recovery and then assesses the effect of COVID-19 control measures on these indicators through the corruption channel. The second contribution is on the theoretical and empirical level. Indeed, to our knowledge, no study has assessed the effects of COVID-19 measures on the resilience of economic growth with corruption as a mediated effect. Therefore, this study contributes to the theoretical and empirical literature on the relationship between the three concepts.

Third, studies that deal with the resilience of economic growth in general analyse it in the long run (Briguglio, 2016; Talandier & Calixte, 2021) yet the work of Martin, et al. (2016) shows that it is better to analyse it in the short run. Fourthly, on the empirical level the study proposes the calculation of daily volume data starting from annual data. Also, the study proposes a three-legged methodology. The modelling of indicators, structural equations and the application of the N-SIRD model.

Generally speaking, the study is based initially on the modelling of sensitivity (resistance) and recovery (return to equilibrium) indicators. These indicators capture resilience in terms of resistance in 2020 and recovery in 2021. Therefore, it builds on the methodologies of Talandier & Calixte (2021) and Martin et al., (2016). These indicators are modelled using a mathematical formalisation before being prepared for machine calculations. Similarly, the study is based on the Siefu (2022) structural equation model, and the N-SIRD mathematical model used by (Pongou et al., 2022) and will be estimated by the ordinary least squares (OLS) technique.

2. Brief Literature Review

Wars, man-made disasters and catastrophes breed fraud and corruption at the same time as they enhance acts of selflessness and open-handedness. Openhandedness entails a lot, as individuals give not from the abundance of their pockets but from the pockets of institutions and as such bump up against institutions and practices designed for ordinary times. The concept of corruption is very complex and may at times go unnoticed. The COVID 19 pandemic was a deadly pandemic that claimed the lives of many people. Despite the devasting effects of this pandemic, it was a great opportunity for the corruption to thrive, where vaccines could be stolen, the theft of emergency funding and opportunities for nepotism, favoritism, and corrupted procurement systems. All of the above is frightening, given that during a health pandemic, qualities like self-sacrifice and love need to be at the fore front, but corruption is worse than any pandemic, because not only does it lag the economy behind, it leads to vicious cycle of poverty that will keep making a few rich and murdering the victims.

Due to the urgent requirement for medical supplies and protective equipment, the Healthcare Sector is particularly susceptible to vulnerability, resulting in the simplification of public procurement regulations. An April 2020 survey of an-

ti-fraud professionals from 58 countries revealed a high prevalence of fraudulent practices in the procurement of personal protective equipment, black market merchandise, and defective equipment. Cases of embezzlement were reported by 19 percent of respondents from 58 percent of the surveyed countries, with uneven distribution. Three percent of respondents from 22 percent of countries reported instances of bribery. These reports demonstrate how corruption coexists with crises such as the COVID-19 pandemic. The unavailability of COVID-19 vaccines highlights the influence of external factors such as corruption. Sommer contends that corruption in the health sector diminishes the available funds for health, amplifies patient expenses, and hampers service improvement, reduces the quality of care and generally hinders reform and improvement (El-Gabalawy & Sommer, 2021). Countries with health sectors that suffered from corruption prior to the crisis could be less effective during the COVID-19 pandemic.

As the COVID 19 pandemic was unfolding, there was an accompanying economic recession that led to fierce competition for essential resources. Governments therefore rapidly mobilized public funds (for both healthcare and for maintaining economic equilibrium) at an unprecedented scale, the government began creating opportunities for rent-seeking of many kinds, including outright corruption. This outright corruption was noticed as some governments scouted for funds, yet the proof of how these funds were fully put in use is not clear. Politicians, bureaucrats and medical professionals exercise substantial discretion in the allocation of resources. A lack of transparency and weak oversight and enforcement have exacerbated the problems of corruption and fraud, and public measures against these offenses have not kept pace with the developing crisis, making the international community to question the accountability of these pandemic regions.

Amongst the variables that can lag an economy behind is Pandemics. Evidence of this is how the COVID 19 pandemic wrecked several economies, distorting their development agendas keeping them away from achieving sustainable economic growth. The COVID 19 pandemic halted development and led to the stagnation of several economies. Several authors like Eichengreen et al., (2020) argue that there will possibly be long-term damages from a prolonged economic shutdown, should the pandemic persist. Bankrupt firms could disrupt the supply chains of surviving firms, and unemployed workers could lose their skills, competences and even their long-term relationships with firms (Apergis & Apergis, 2020). Thus, having further negative effects on labor productivity and output growth.

Like disasters, epidemics can cause supply shortages, leading to destruction of production capacity and supply chain disruptions. Epidemics lead to disruptions in economic activity, spillover effects from production substitution, reconstruction needs, and all related paths to economic recovery (Kousky, 2016). An epidemic is the sudden loss of a factor of production to which the economy adapts,

whether to return to a pre-pandemic equilibrium or to transition to a new normal. A meta-analysis by Klomp & Valckx (2014) shows that the real negative impact on economic growth increases over time. Growth can be the result of technological progress, even if it is the destruction of human capital, as long as production supplies embody the latest methods of product innovation and adaptation to change (Caballero & Hammour, 1998). Pandemic disasters can have severe impacts on human health (Kousky, 2016) and life satisfaction (Hudson et al., 2019), all of which are fundamental elements necessary for economic growth. Bray et al. (2020) use the Spanish flu as an example to support concerns about the long-term effects of epidemics. There is no way to prevent new viruses from evolving and infecting humans (Martin & Pindyck, 2015). Therefore, we are developing response strategies to understand that despite recurring pandemics such as COVID-19, economic growth should not be disrupted.

It is not a myth, that corruption is a threat to development and economic growth, corruption not only involves a few individuals, hoarding resources and accumulating them to their own advantage, while the suffering majority is left to wallow in poverty and to accept suffering as a way of life. There has been no agreement about the effect of corruption on economic growth. Some researchers suggest that corruption might be desirable (Leff, 1964; Acemoglu & Verdier, 1998). This perspective however is very contrasting when we look at the devastating effects of corruption on the development indices of several countries today.

Mauro (2017) conducted an empirical analysis of corruption by examining the relationship between investment and corruption in 58 countries. Its corruption variable is defined as the extent to which business transactions involve corruption and questionable payments. The average ratios of total investment and private investment to GDP for the period 1970 to 1985 are from Barro (1991), while the corruption indicator is a simple average across countries for the period 1980 to 1983 from Business International (1984). Mauro finds that corruption has a significant negative impact on the investment-to-GDP ratio.

3. Methodology

3.1. Modelling of Sensitivity and Recovery Indices

Let pib_{P1_m}, $PIB_{P_{Cm}}$ and pib_{P2_m} as the growth rates at the peak $P1_m$ at the trough C_m and at peak $P2_m$. Thus, I_m^r denotes the rate of decline of economic growth, i.e., its percentage decrease. It is calculated between $P1_m$ and C_m (recession phase (r)), as follows:

$$I_m^r = \frac{pib_{C_m} - pib_{P1_m}}{pib_{p1_m}}$$

I_m^e The rate of decline of economic growth or the intensity of recovery of the gdp. It is calculated between points C_m and $P2_m$ (recession phase (e)) as follows:

$$I_m^e = \frac{pib_{P2_m} - pib_{C_m}}{pib_{C_m}}$$

From the resilience intensity variables, we can construct the sensitivity index (SI) which corresponds to the rate of decline of economic growth (I_m^r) of the Δpib_m^r relative to the national average decline.

$$IS_{pib_m} = \frac{\Delta pib_m^r - \Delta pib_n^r}{\Delta pib_n^r}$$

Also, we can construct the recovery index (RI) defined as the economic growth rate I_m^e of Δpib_m^e in relation to the average expansion of the country Δpib_m^e after the crisis the formulation:

$$RI_{pib_m} = \frac{\Delta pib_m^e - \Delta pib_n^e}{\Delta pib_n^e}$$

The following model allows us to evaluate the temporality of the shock in terms of both the decline and the recovery. For the duration of the decline Δt_C it is measured in years before the first peak $P1_m$ and the trough C_m with:

$$\Delta tC = tC - tP1$$

The rebound can be described as rapid when the duration of the decline calculated for each country is less than or equal to that of the reference cycle, i.e., 1 to 2 years. For the recovery time, Δt_R it is measured in years between the first peak $P1_m$ and the recovery point R_m[8]:

$$\Delta tR = tR - tP1$$

Recovery is said to be rapid when this duration is less than or equal to that of the reference cycle, which is 2 to 3 years, otherwise it is slow.

3.2. Analysis models

3.2.1. Structural Equation Model: Mediation Analysis

We deepen the study by conducting a mediation analysis. The study uses a mediation: corruption. The approach followed in this study is inspired by Ang (2013) and taken up by Ndoya et al. (2023) and illustrated in the **Figure 1** below.

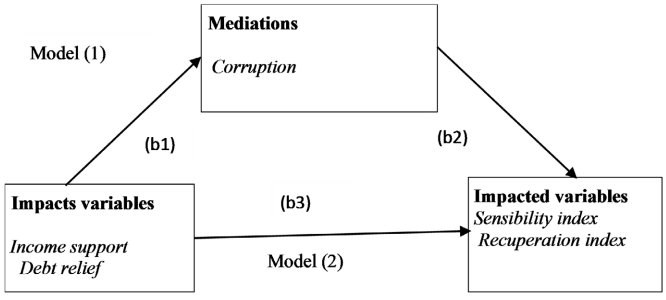

Figure 1. Modelling the mediation effect of mediation. Source: Ang Inspirational Authors (2013).

[8]The recovery point here is observed at the same time as the second peak $P2_m$ therefore we will consider the year of the last peak.

This approach involves the subsequent estimation of two regression equations which are:

Model 1: $Medit = \alpha_1 + \beta_1 soutien\_rev_{it} + \beta_2 alle\_dette_{it} + c_1' X_{it} + \mu_{it}$

Model 2:

$Indicateursrésilience = \alpha_2 + \beta_1 soutien\_rev_{it} + \beta_2 alle\_dette_{it} + \beta_3 Medit + c_1' X_{it} + v_{it}$

Where Medit represents the mediation (corruption) variable. The composition effect is derived from the above two models as follows:

Indirect effect: b1*b3; direct effect: b2 and total effect: (b1*b3) + b2.

In a first step we estimate Model (1), which is the effect of the impact variables (income support and debt relief) on the mediator (corruption); b1 is the parameter describing this effect. The second step is to estimate model (2), where the resilience of growth is regressed through the sensitivity and recovery on debt support and the fiscal balance controlling for the mediator. The magnitude of this effect is provided by the coefficient on the income support and debt relief variables (b2). The indirect effect is obtained from the product of b1 and b3, where b3 measures the strength of correlation between income support, debt relief and the mediators in model (2). This term also reflects the size of the mediation, which essentially depends on the extent to which income support and debt relief affect the mediators (b1) and the extent to which the mediator influences the resilience of economic growth (b3).

3.2.2. N-SIRD Model

Thus, the study adopts the N-SIRD model used by Pongou et al., (2022). The equation of the model is the following:

$$\begin{aligned} covid\_death_{ijs} = {} & \alpha_0 \lambda_s + \alpha_1 Eig\_Cent_{ijs} + \alpha_2 Country\_ssa_{ijs} \\ & + \alpha_3 D\_Profit_{ijs} + \beta_1 \lambda_s * Eig_{Centijs} + \beta_2 \lambda_s * ountry_{ssaijs} \\ & + \beta_3 \lambda_s * D\_Profit_{ijs} + c' X_{ijs} + \theta_j + \varepsilon_{ijs} \end{aligned} \quad (1)$$

where $covid\_death_{ijs}$ is a variable counting the total number of deaths due to Covid19 in nursing home i, county j and US state S; λ_s is the tolerable incidence of infection in US state s; Eig_Cent_{ijs} is the centralised eigenvector index for the nursing home; $Country\_ssa_{ijs}$ is the average socio-economic status of county j ; D_Profit_{ijs} is an indicator of whether nursing home i is for-profit (1 if for-profit and 0 otherwise); X_{ijs} represents other exogenous characteristics of the nursing home, including the constant and θ_j is the effet fixe of the county, α_0; α_1; α_2; α_3 and β_1; β_2 and β_3 are the parameters of interest. We take this linear equation from Pongou et al., (2022) by integrating our analysis variables. Thus, we will rewrite this equation in the simplest possible way as the index i will indicate the individual and j the period of application of the COVID-19 control measures. Also, we replace the dependent variable with our sensitivity indices (SI) in the first equation of 2020 and the recovery index (RI) in the second equation of 2021. In addition, the variables of interest are of two orders, the health measures and the economic measures; we keep the differences coefficients of interest. The following linear equations will be estimated.

$$\begin{aligned} SI\_pib_{ij} = {} & \alpha_c + \beta_1 soutien\_rev_{ij} + \beta_2 all\_dette_{c,t} + \beta_3 indice\_confi_{c,t} \\ & + \beta_4 lav\_main_{c,t} + \beta_5 fer\_eco_{c,t} + \beta_6 fer\_trav_{c,t} \\ & + \beta_7 anu\_evepub_{c,t} + \beta_8 restri\_rassem_{c,t} + \beta_9 com\_sejdomi_{c,t} \\ & + \beta_{10} restri\_cirintern_{c,t} + \beta_{11} trans\_com_{c,t} + \beta_{12} corruption_{c,t} \\ & + c'X_{ijs} + \theta_j + \varepsilon_{ijs} \end{aligned} \quad (2)$$

$$\begin{aligned} RI\_pib_{ij} = {} & \alpha_c + \beta_1 soutien\_rev_{ij} + \beta_2 all\_dette_{c,t} + \beta_3 indice\_confi_{c,t} \\ & + \beta_4 lav\_main_{c,t} + \beta_5 fer\_eco_{c,t} + \beta_6 fer\_trav_{c,t} \\ & + \beta_7 anu\_evepub_{c,t} + \beta_8 restri\_rassem_{c,t} + \beta_9 com\_sejdomi_{c,t} \\ & + \beta_{10} restri\_cirintern_{c,t} + \beta_{11} trans\_com_{c,t} + \beta_{12} corruption_{c,t} \\ & + c'X_{ijs} + \theta_j + \varepsilon_{ijs} \end{aligned} \quad (3)$$

These equations are estimated by the ordinary least squares (OLS) method (Pongou et al., 2022). Other methods can be used to estimate these equations. For example, quantiles and generalized least squares. These methods are valid from the econometric tests

3.3. Data

The study is conducted on a sample of 11 Central African countries over a period from 2020 to 2021. Thus, it uses daily data for the year 2020 and 2021 on anti-corruption measures. These daily data are derived from two sources, Oxford University[9] which has been online since 1er January 2020. This database provides data on measures to combat COVID-19, specifically public health measures and economic measures. The Afrobarometer survey database on corruption will be online in 2020. In addition, the study uses World Bank data on economic growth rates over the periods 2020-2021. This data is used to model the sensitivity and recovery indices. In addition, after calculating these indices, they are made daily by the following formula:

$$V_j = \frac{V^{cal}}{N_j} * 100$$

with V_j as the daily value to be obtained, V^{cal} as the global calculated value with the global data, N_j as the total number of days. With j ranging from 1 to 365 days. We multiply by 100 to get the estimable coefficients[10]. Secondary data on the variables used in the analysis were collected as follows:

Health policy measures taken as indicators. These indicators are 11 in number, namely, school closures, workplace closures, cancellation of public events, restriction on gatherings, public transport, home stay orders, restriction on internal circulation. These measures are categorised on a scale from 0 to 100 for some and 0 and 1 for others. We also have the hand washing index. The eco-

[9]https://github.com/OxCGRT/covid-policy-tracker

[10]This is the formula used by Oxford to calculate daily GDP per capita data and we use the same formula to render our daily indices. In addition, Oxford's calculations do not use the value 100 to multiply, as the data is in volume terms, but here our data is in rate terms, so to have estimable coefficients it is necessary to multiply by this value.

nomic measures taken as indicators are also four namely, income support, debt relief. Also, income support measures. Economic growth is taken in terms of GDP[11].

4. Results

4.1. Analysis of the Direct Relationship

Baseline Result on the Relationship between the Control Measure COVID-19 and the Sensitivity Index

The analytical results reported in Table 1 above show the relationship between the COVID-19 control measures and economic resilience as measured by the sensitivity index. These results are analysed for the 2020 period. Indeed, the OLS estimation of the simple linear regression model shows us that income support has a statistically significant and negative effect on the sensitivity index. In other words, the income support provided by EMAC governments to households in 2020 could not allow economic growth to absorb the health shock. This result can be seen from Models 1, 4, 7 and 8 in Table 1. Similarly, the tax debt relief granted to businesses did not allow economic growth in the CEMAC countries to be resilient. Indeed, the analysis table still indicates that debt relief contributes to lowering the capacity of economic growth to resist or absorb the 2020 health shock (models 2, 5, 7 and 8). In the same vein, school closures, workplace closures, quarantine and containment contributed to lowering the capacity of economic growth to absorb the health shock. It is clear in Models 5 and 6 that school and workplace closures reduced the sensitivity of economic resilience. Also, in model 8 the negative effect of quarantine and containment on the same sensitivity variable of economic growth is confirmed. Hu & Liu (2022) showed that the COVID-19 shock weakened the resilience of large metropolises in China. This result is similar to the one found in this work.

4.2. Mediation Effect

The results presented in Table 2 above show the mediation effect. Thus, model (1) uses corruption as a mediator respectively. The estimators of model (2) use the mediator as a control reported in columns (1b) and (2a) accordingly.

Overall, the results suggest: (i) income support and debt relief affect the mediator and the effects are statistically significant at the 1% level (columns 1a, 2a). (ii) the mediator has a significant distinguishing effect on the resilience of economic growth (1b, and 2b). (iii) Income support and debt relief significantly affect the resilience of economic growth in the absence of the mediators (see Table 1). (iv) the coefficients of income support and debt relief on the resilience of economic growth increase once a mediator is included (column 1b and 2b Table 2 and column model 1 and 2 Table 1). Taken together, the results suggest that mediation may have occurred where some influences of income support and debt relief on economic growth sensitivity are mediated by corruption.

[11]Gross Domestic Product.

Table 1. OLS estimates.

	1	2	3	4	5	6	7	8
VARIABLES	IS_gdp	IS_gdp	IS_gdp	IS_gdp	IS_gdp	IS_gdp	IS_gdp	IS_gdp
Income support	−0.0302**			−0.0528***			−0.0314**	−0.0211*
	(0.0119)			(0.0126)			(0.0123)	(0.0125)
Debt relief		−0.0580***			−0.0955***		−0.0922***	−0.0873***
		(0.00769)			(0.00762)		(0.00777)	(0.00794)
Corruption			−0.383***			−0.192***		−0.149***
			(0.0231)			(0.0262)		(0.0271)
School closure				−0.0987***	−0.0831***	−0.101***	−0.0898***	−0.0986***
				(0.0111)	(0.0103)	(0.0106)	(0.0110)	(0.0112)
Closure of workplaces				−0.0312***	−0.0427***	−0.0626***	−0.0366***	−0.0549***
				(0.0102)	(0.00954)	(0.0107)	(0.00976)	(0.0109)
Cancellation of events				−0.0737***	0.0665***	−0.110***	−0.0659***	−0.0940***
				(0.0182)	(0.0170)	(0.0201)	(0.0170)	(0.0190)
Quarantine				−0.0565***	−0.0721***	−0.0612***	−0.0746***	−0.0803***
				(0.00741)	(0.00740)	(0.00776)	(0.00731)	(0.00744)
Containment index				−0.0448***	−0.0530***	−0.0315**	−0.0489***	−0.0345**
				(0.0139)	(0.0132)	(0.0152)	(0.0133)	(0.0146)
Hand washing				−0.240***	−0.218***	−0.260***	−0.216***	−0.230***
				(0.0124)	(0.0123)	(0.0129)	(0.0123)	(0.0131)
Restriction on assembly				−0.167***	−0.183***	−0.202***	−0.183***	−0.211***
				(0.0105)	(0.0104)	(0.0111)	(0.0105)	(0.0108)
Public transport				−0.00983***	−0.00615***	−0.0112***	−0.00595***	−0.00686***
				(0.00106)	(0.00111)	(0.00106)	(0.00111)	(0.00111)
Traffic restrictions				−0.0131***	−0.0109***	−0.0133***	−0.0113***	−0.0119***
				(0.000414)	(0.000400)	(0.000475)	(0.000407)	(0.000461)
Constant	0.169***	0.126***	0.148***	0.288***	0.324***	0.297***	0.329***	0.339***
	(0.00902)	(0.0103)	(0.00708)	(0.0250)	(0.0248)	(0.0260)	(0.0248)	(0.0255)
Comments	3,199	3,199	3,199	2,906	2,906	2,906	2,906	2,906
R-squared	0.002	0.017	0.079	0.428	0.448	0.434	0.450	0.455

Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1. Source: Author.

Table 2. Mediation effect.

	1 (1a)	2 (1b)	3 (2a)	4 (2a)
VARIABLES	Corruption	IS_gdp	Corruption	IS_gdp
Income support			−0.104***	0.0392***
			(0.00727)	(0.0130)

Continued

	Debt relief	−0.0416***	0.0893***			
		(0.00441)	(0.00807)			
	Corruption		−0.155***		−0.178***	
			(0.0248)		(0.0262)	
	School closure		−0.0946***		−0.109***	
			(0.0100)		(0.0112)	
	Closure of workplaces		−0.0598***		−0.0535***	
			(0.0106)		(0.0112)	
	Cancellation of events		0.0956***		0.107***	
			(0.0174)		(0.0191)	
	Quarantine		−0.212***		−0.201***	
			(0.0108)		(0.0111)	
	Containment index		0.00703***		0.0107***	
			(0.00112)		(0.00110)	
	Hand washing		−0.0117***		−0.0137***	
			(0.000478)		(0.000431)	
	Restriction on assembly		0.0789***		0.0645***	
			(0.00741)		(0.00763)	
	Public transport		−0.0366**		−0.0279*	
			(0.0146)		(0.0153)	
	Traffic restrictions		−0.232***		−0.255***	
			(0.0127)		(0.0136)	
	Constant	0.141***	0.336***	0.144***	0.303***	
		(0.00861)	(0.0246)	(0.00788)	(0.0260)	
	Comments	2,906	2,906	2,906	2,906	
				Mediation effect through corruption		
	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
(A) Mediation test						
Delta	−0.018	0.003	0.000	−0.006	0.001	0.000
Sobel	−0.018	0.003	0.000	−0.006	0.001	0.000
Monte Carlos	−0.019	0.003	0.000	−0.007	0.001	0.000
(A) Composition of the effect						
Indirect effect (Sobel)	0.4			0.054		
Direct effect	0.15			0.02		
Total effect	0.55			0.074		
Of the total mediation effect	32%			7%		

Source: Author.

Below the table, we report formal assessments of mediation effects using several statistical methods. Several mediation tests are considered to analyze whether the indirect effects of income support and debt relief on sensitivity through the impact of corruption are statistically different from zero. For example, if the mediating effect of corruption is taken into account, the Sobel test statistics are estimated to be −0.018 and −0.006 respectively. The P value is less than 5%, indicating that the null hypothesis of no mediation is rejected. Results were similar when using alternative mediation tests (Delta and Monte Carlos). It's also worth noting that using bootstrap confidence intervals does not change the results. Indeed, the evidence presented shows that the mediating effect of corruption is significant, accounting for approximately 32% of the total effect of income support on the sensitivity of economic growth.

4.3. Baseline Result on the Relationship between the VOCID-19 Control Measure and the Recovery Index

4.3.1. Basic estimate

Overall, the measures to combat COVID-19 did not contribute to the recovery or the recovery of economic growth in 2021. Table 3 confirms this. Indeed, income support significantly reduces the recovery of economic growth to 1% model 1 Table 4. So does debt relief. The same effect is generated by school closures, workplace closures, cancellation of public events, quarantine and containment (from Model 1 to Model 8).

4.3.2. Mediation Effect

The results presented in Table 4 above also show the mediation effect. Thus, model (1*) uses the same mediators, namely corruption, respectively. The estimators of model (2*) use this mediator as controls reported in columns (1b) and (2b) accordingly.

As in the first mediation analysis, the results suggest the same responses, i.e.: (i) income support and debt relief affect the mediator and the effects are statistically significant at the 1% level (columns 1a, 2a). (ii) the mediator has a significant distinctive effect on the recovery of economic growth (1b, 2b). (iii) Income support and debt relief significantly affect the recovery or return to equilibrium of economic growth in the absence of the mediator (see Table 4). (iv) the coefficients of income support and debt relief on the recovery of economic growth increase once a mediator is included (column 1b, 2b, Table 3 and counter model 1). Thus, the results suggest that mediation may have taken place where some of the influences of income support and debt relief on the recovery or return to equilibrium of economic growth are mediated by corruption.

Below Table 4, we report a formal evaluation of the mediation effects on several statistical approaches. As in the previous analysis, we use the same considerations and tests. Therefore, multiple mediation tests are considered to analyze whether the indirect effects of income support and debt relief on economic recovery or return to equilibrium through corruption effects are statistically different

Table 3. Estimation by OLS.

	1	2	3	4	5	6	7	8
VARIABLES	IR_gdp	IR_gdp	IR_gdp	IR_gdp	IR_gdp	IR_gdp	IR_gdp	IR_gdp
Income support	−0.227***			−0.242***			−0.0785***	−0.0521***
	(0.0230)			(0.0162)			(0.0165)	(0.0171)
Debt relief		−0.190***			−0.204***		−0.185***	−0.182***
		(0.0121)			(0.00974)		(0.0102)	(0.0100)
Corruption			−0.228***			−0.330***		−0.222***
			(0.0298)			(0.0295)		(0.0298)
School closure				−0.143***	−0.143***	−0.180***	−0.142***	−0.166***
				(0.0113)	(0.0111)	(0.0132)	(0.0110)	(0.0124)
Closure of workplaces				−0.134***	−0.122***	−0.131***	−0.118***	−0.104***
				(0.00950)	(0.00927)	(0.0102)	(0.00932)	(0.00978)
Cancellation of events				−0.311***	−0.319***	−0.347***	−0.319***	−0.343***
				(0.0152)	(0.0147)	(0.0162)	(0.0147)	(0.0156)
Quarantine				−0.214***	−0.219***	−0.187***	−0.220***	−0.205***
				(0.0101)	(0.00962)	(0.0104)	(0.00967)	(0.0102)
Containment index				−0.0894***	−0.126***	−0.120***	−0.122***	−0.141***
				(0.0163)	(0.0166)	(0.0175)	(0.0166)	(0.0175)
Hand washing				−0.0783***	−0.0372***	−0.0437***	−0.0454***	−0.0331**
				(0.0125)	(0.0127)	(0.0134)	(0.0126)	(0.0131)
Restriction on assembly				−0.183***	−0.211***	−0.245***	−0.201***	−0.226***
				(0.0114)	(0.0110)	(0.0115)	(0.0112)	(0.0112)
Public transport				−0.00729***	−0.00882***	−0.00687***	−0.00836***	−0.00732***
				(0.000864)	(0.000843)	(0.000921)	(0.000850)	(0.000893)
Traffic restrictions				−0.000638***	−0.000654***	−0.000679***	−0.000662***	−0.000712***
				(1.80e−05)	(1.73e−05)	(1.72e−05)	(1.76e−05)	(1.69e−05)
Constant	0.241***	0.297***	0.213***	0.676***	0.725***	0.602***	0.725***	0.686***
	(0.00985)	(0.0107)	(0.00898)	(0.0185)	(0.0183)	(0.0210)	(0.0184)	(0.0208)
Comments	4,015	4,015	4,015	4,015	4,015	4,015	4,015	4,015
R-squared	0.024	0.058	0.014	0.466	0.501	0.457	0.503	0.509

Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1. Source: Author.

Table 4. Estimated mediation 2021.

	1	2	3	4
VARIABLES	Corruption	IR_gdp	Corruption	IR_gdp
Income support	−0.142***	−0.210***		
	(0.00728)	(0.0171)		

Continued

	Debt relief			−0.105***	−0.194***	
				(0.00525)	(0.00935)	
	Corruption		0.244***		0.237***	
			(0.0298)		(0.0293)	
	School closure		−0.169***		−0.168***	
			(0.0125)		(0.0123)	
	Closure of workplaces		−0.118***		−0.105***	
			(0.00961)		(0.00983)	
	Cancellation of events		−0.338***		−0.345***	
			(0.0158)		(0.0152)	
	Quarantine		0.211***		0.234***	
			(0.0114)		(0.0110)	
	Containment index		−0.00616***		−0.00754***	
			(0.000882)		(0.000871)	
	Hand washing		−0.000694***		−0.000711***	
			(1.67^{e}−05)		(1.72^{e}−05)	
	Restriction on assembly		0.198***		0.204***	
			(0.0106)		(0.0102)	
	Public transport		0.111***		0.145***	
			(0.0177)		(0.0173)	
	Traffic restrictions		−0.0642***		−0.0269**	
			(0.0126)		(0.0123)	
	Constant	0.121***	0.634***	0.149***	0.683***	
		(0.00606)	(0.0208)	(0.00726)	(0.0205)	
	Comments	4,015	4,015	4,015	4,015	
				Mediation effect through corruption		
	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
(A) Mediation test						
Delta	−0.035	0.005	0.000	−0.025	0.003	0.000
Sobel	−0.035	0.005	0.000	−0.025	0.003	0.000
Monte Carlos	−0.035	0.005	0.000	−0.025	0.003	0.000
(A) Composition of the effect						
Indirect effect (Sobel)	0.55			0.45		
Direct effect	0.20			0.11		
Total effect	0.70			0.56		
Of the total mediation effect	14%			11%		

Source: Author.

from zero. For example, when considering the mediating effect of corruption, the Sobel test statistics are estimated to be −0.035 and −0.025 respectively. The P value is less than 5%, indicating that the null hypothesis of no mediation is rejected. Results were similar when using alternative mediation tests (Delta and Monte Carlos). It's also worth noting that using bootstrap confidence intervals does not change the results. Indeed, the evidence presented shows that the effect of mediating corruption is significant, accounting for approximately 14% of the total impact of income support and 11% of the total impact of debt relief on the recovery or return to equilibrium of economic growth.

5. Conclusion

While there is a large and growing body of literature that has analysed the effects of COVID-19 on economic growth, the relationship between government responses and the resilience of economic growth is not known. The objective of this paper is to fill this major gap. Using a sample of 11 Central African countries for a period 2020-2021 (daily case) and applying the ordinary least squares method and the mediation model, we test three hypotheses. First, COVID-19 control measures reduce the sensitivity of economic growth in 2020; second, COVID-19 control measures reduce the resilience of economic growth in 2021; and third, COVID-19 control measures reduce the sensitivity and resilience of economic growth in the presence of the mediator (corruption).

Overall, our results show that COVID-19 control measures (income support, debt relief, school closures, workplace closures, cancellation of public events, quarantine and containment) reduce the ability of economic growth to withstand the health shock of COVID-19 and to return to equilibrium after the shock. This result corroborates that of Hu & Liu (2022) who showed that COVID-19 reduces the ability of large metropolises to withstand shocks during COVID-19. Finally, we conduct a transmission channel analysis and without being exhaustive, we find that corruption is a channel through which COVID-19 control measures affect the resilience of economic growth.

From a political point of view, as states and organisations seek sustainable solutions to economic, health and other crises, despite the measures taken during the COVID-19 health shock, economic growth is struggling to resist or to recover instantly. Therefore, we suggest a strengthening of political, economic and health institutions to fight the next shocks. Also, the re-education of the authorities in policy decisions in the presence of a shock. Similarly, the authorities need to learn from previous crises and, above all, go back and read the solutions adopted by the major economies during the shocks before 1950.The study obviously leaves room for future research, particularly with regard to the consideration of the corruption channel.

Ethics Approval and Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Acemoglu, D., & Verdier, T. (1998). Property Rights, Corruption and the Allocation of Talent: A General Equilibrium Approach. *The Economic Journal, 108,* 1381-1403. https://doi.org/10.1111/1468-0297.00347

Acemoglu, D., Chernozhukov, V., Werning, I., & Whinston, M. D. (2021). Optimal Targeted Lockdowns in a Multigroup SIR Model. *American Economic Review: Insights, 3,* 487-502. https://doi.org/10.1257/aeri.20200590

African Union (2020). *Survey Reveals 95 Percent of African SMEs Did Not Receive Government Aid during COVID-19 Pandemic.*

Amankwah-Amoah, J., Khan, Z., Wood, G., & Knight, G. (2021). COVID-19 and Digitalization: The Greatacceleration. *Journal of Business Research*, *136*, 602-611.

Ang, J. B. (2013). Are Modern Financial Systems Shaped by State Antiquity? *Journal of Banking & Finance, 37,* 4038-4058. https://doi.org/10.1016/j.jbankfin.2013.07.023

Apergis, E., & Apergis, N. (2020). Can the COVID-19 Pandemic and Oil Prices Drive the Us Partisan Conflict Index? *Energy Research Letters, Vol. 1.* https://doi.org/10.46557/001c.13144

Asongu, S. A., Diop, S., & Nnanna, J. (2021). Health Vulnerability versus Economic Resilience to the COVID-19 Pandemic: Global Evidence. *World Affairs, 184,* 472-500. https://doi.org/10.1177/00438200211052045

Barro, R. J. (1991). Economic Growth in a Cross-Section of Countries. *The Quarterly Journal of Economics, 106,* 407-443. https://doi.org/10.2307/2937943

Blundell, R., Costa Dias, M., Cribb, J., Joyce, R., Waters, T., Wernham, T., & Xu, X. (2022). Inequality and the COVID-19 Crisis in the United Kingdom. *Annual Review of Economics, 14,* 607-636. https://doi.org/10.1146/annurev-economics-051520-030252

Bray, D. P., Stricsek, G. P., Malcolm, J., Gutierrez, J., Greven, A., Barrow, D. L., Refai, D. et al. (2020). Letter: Maintaining Neurosurgical Resident Education and Safety during the COVID-19 Pandemic. *Neurosurgery, 87,* E189-E191. https://doi.org/10.1093/neuros/nyaa164

Briguglio, L. P. (2016). Exposure to External Shocks and Economic Resilience of Countries: Evidence from Global Indicators. *Journal of Economic Studies, 43,* 1057-1078. https://doi.org/10.1108/JES-12-2014-0203

Caballero, R. J., & Hammour, M. L. (1998). The Macroeconomics of Specificity. *Journal of Political Economy, 106,* 724-767. https://doi.org/10.1086/250028

Dang, H. A. H., & Nguyen, C. V. (2021). Gender Inequality during the COVID-19 Pan-

demic: Income, Expenditure, Savings, and Job Loss. *World Development, 140,* Article ID: 105296. https://doi.org/10.1016/j.worlddev.2020.105296

Diop, S., Asongu, S. A., & Nnanna, J. (2021). COVID-19 Economic Vulnerability and Resilience Indexes: Global Evidence. *International Social Science Journal, 71,* 37-50. https://doi.org/10.1111/issj.12276

Ehigie, B. O., Ehigie, R. I., Sholarin, A. M., Elizabeth, O., & Agoha, B. (2021). African Perspective of Social Distancing in Pandemics: Adoption Challenges. *Psychological Studies, 66,* 259-269. https://doi.org/10.1007/s12646-021-00607-w

Eichengreen, B., Perkins, D. H., & Shin, K. (2020). *From Miracle to Maturity: The Growth of the Korean Economy.* Harvard University Asia Center.

El-Gabalawy, R., & Sommer, J. L. (2021). "We Are at Risk Too": The Disparate Mental Health Impacts of the Pandemic on Younger Generations. *The Canadian Journal of Psychiatry, 66,* 634-644. https://doi.org/10.1177/0706743721989162

Henao-Cespedes, V., Garcés-Gómez, Y. A., Ruggeri, S., & Henao-Cespedes, T. M. (2022). Relationship Analysis between the Spread of COVID-19 and the Multidimensional Poverty Index in the City of Manizales, Colombia. *The Egyptian Journal of Remote Sensing and Space Science, 25,* 197-204. https://doi.org/10.1016/j.ejrs.2021.04.002

Hu, Q., & Liu, Y. (2022). Crisis Management and National Responses to COVID-19: Global Perspectives. *Public Performance & Management Review, 45,* 737-750. https://doi.org/10.1080/15309576.2022.2079692

Hudson, B., Hunter, D., & Peckham, S. (2019). Policy Failure and the Policy Implementation Gap: Can Policy Support Programs Help? *Policy Design and Practice, 2,* 1-14. https://doi.org/10.1080/25741292.2018.1540378

Human Rights Watch (2021a). *"We're All Vulnerable Here": Kenya's Pandemic Cash Transfer Program Riddled with Irregularities.*

Human Rights Watch (2021b). *IMF: Scant Transparency for Covid-19 Emergency Loans.*

International Labour Organization. (2021). *World Social Protection Database.*

Klomp, J., & Valckx, K. (2014). Natural Disasters and Economic Growth: A Meta-Analysis. *Global Environmental Change, 26,* 183-195. https://doi.org/10.1016/j.gloenvcha.2014.02.006

Koudjom, E., Tamwo, S., & Kpognon, K. D. (2022). Does Poverty Increase COVID-19 in Africa? A Cross-Country Analysis. *Health Economics Review, 12,* Article No. 51. https://doi.org/10.1186/s13561-022-00399-3

Kousky, C. (2016). Impacts of Natural Disasters on Children. *The Future of Children, 26,* 73-92. https://doi.org/10.1353/foc.2016.0004

Leff, N. H. (1964). Economic Development through Bureaucratic Corruption. *American Behavioral Scientist, 8,* 8-14. https://doi.org/10.1177/000276426400800303

Martin, I. W., & Pindyck, R. S. (2015). Averting Catastrophes: The Strange Economics of Scylla and Charybdis. *American Economic Review, 105,* 2947-2985. https://doi.org/10.1257/aer.20140806

Martin, R., Sunley, P., Gardiner, B., & Tyler, P. (2016). How Regions React to Recessions: Resilience and the Role of Economic Structure. *Regional Studies, 50,* 561-585. https://doi.org/10.1080/00343404.2015.1136410

Mauro, P. (2017). The Effects of Corruption on Growth and Public Expenditure. In P. Mauro (Ed.), *Political Corruption* (pp. 339-352). Routledge. https://doi.org/10.4324/9781315126647-31

Ndoya, H., Okere, D., laureBelomo, M., & Atangana, M. (2023). Does Icts Decrease the Spread of Informal Economy in Africa? *Telecommunications Policy, 47,* Article ID:

102485. https://doi.org/10.1016/j.telpol.2022.102485

Ngono, A. M., Ongo Nkoa, B. E., Yazid, H. S., Jean, T., & Jean-Marie, G. (2023). Socio-Economic Impact of the COVID-19 Pandemic in Cameroon: An Assessment of Poverty, Underemployment and Inequality Levels. *Underemployment and Inequality Levels.* https://doi.org/10.2139/ssrn.4356583

Nguimkeu, P., & Okou, C. (2022). Does Informality Increase the Spread of COVID-19 in Africa? A Cross-Country Examination. *Applied Economics Letters, 29,* 1111-1115. https://doi.org/10.1080/13504851.2021.1910128

Nguimkeu, P., & Tadadjeu, S. (2021). Why Is the Number of COVID-19 Cases Lower than Expected in Sub-Saharan Africa? A Cross-Sectional Analysis of the Role of Demographic and Geographic Factors. *World Development, 138,* Article ID: 105251. https://doi.org/10.1016/j.worlddev.2020.105251

Oduor, M. (2021). Africa's Covid-19 Corruption That Outweighs Pandemic. *Africanews.*

Okoi, O., & Bwawa, T. (2020). How Health Inequality Affects Responses to the COVID-19 Pandemic in Sub-Saharan Africa. *World Development, 135,* Article ID: 105067. https://doi.org/10.1016/j.worlddev.2020.105067

Pongou, R., Ahinkorah, B. O., Mabeu, M. C., Agarwal, A., Maltais, S., & Yaya, S. (2022). Examining the Association between Reported COVID-19 Symptoms and Testing for COVID-19 in Canada: A Cross-Sectional Survey. *BMJ Open, 12,* e056229. https://doi.org/10.1136/bmjopen-2021-056229

Siefu, D. D. (2022). Infrastructures De Transport Routier: Facteur De Croissance Economique Et Des Echanges En Zone Cemac-Cas Du Cameroun, Du Congo Et De La Rca, De 1995 A 2017. *Revue Française d'Economie et de Gestion, 3,* 224-258.

Su, C. W., Dai, K., Ullah, S., & Andlib, Z. (2022). COVID-19 Pandemic and Unemployment Dynamics in European Economies. *Economic Research-EkonomskaIstraživanja, 35,* 1752-1764. https://doi.org/10.1080/1331677X.2021.1912627

Talandier, M., & Calixte, Y. (2021). Economic Resilience and Territorial Disparity: What Lessons Can Be Learned from the 2008 Crisis? *Revue d'ÉconomieRégionale&Urbaine, 3,* 361-396. https://doi.org/10.3917/reru.213.0361

UNDP Africa Regional Bureau. (2021). *Analysing Long-Term Socio-Economic Impacts of COVID-19 across Diverse African Contexts.*

United Nations Office on Drugs and Crime (2020). *Covid-19 Emergency Support Packages in West and Central Africa.*

Valensisi, G. (2020). COVID-19 and Global Poverty: Are LDCs Being Left behind? *The European Journal of Development Research, 32,* 1535-1557. https://doi.org/10.1057/s41287-020-00314-8

World Bank (2020). *Joint Statement from the World Bank Group and the International Monetary Fund Regarding a Call to Action on the Debt of IDA Countries.*

Abreviations

AFBD: African Developpment Bank
GDP: Growth Domestic Product
IMF: International Monetary Fund
N-SIRD: Population-Susceptible-Infected-Recovered-Deceased
OLS: Ordinary Least Squares
SEM: Structure Equation Model
UN: United Nations
UNDP: United Developpment Programme