British Journal of Multidisciplinary and Advanced Studies:
Health and Medical Sciences 4 (3),84-96, 2023
Print ISSN: 2517-276X
Online ISSN: 2517-2778
Website : https://bjmas.org/index.php/bjmas/index
Published by European Centre for Research Training and Development UK

The Covid-19 Crisis and the Impact of Vulnerability on Economic Growth

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doi: https://doi.org/10.37745/bjmas.2022.0220 Published June 10 2023

Citation: Aloui A. (2023) The Covid-19 crisis and the impact of vulnerability on economic growth, *British Journal of Multidisciplinary and Advanced Studies*: Health and Medical Sciences 4 (3),84-96

ABSTRACT: *The present study, aimed at determining the level of resilience of a country, identified the effects of the health crisis as a form of external shock on the impact relationship between vulnerability and economic growth. Using a macroeconomic perspective, we conducted panel data estimates on a sample of countries classified by level of vulnerability (high, medium, and low) using the FGLS method for panel data with cross-sectional and serial correlation over the period 2000-2021.*

KEYWORDS: Covid 19 crisis, economic growth, vulnerability, FGLS, Comparative studies.
JEL Classifications: I15, O47, O57, C32

INTRODUCTION

The year 2020 started with a health context that gradually slowed down and then almost blocked entire sectors of the world economy, plunging the world into its worst recession since the Second World War (World Bank 2020) and, for the first time in 30 years, a decline in human development in the world.

The Covid-19 pandemic has had a devastating effect on the entire planet, both in health and economic and social terms, particularly overexposing vulnerable populations to the pandemic and to the loss of income and jobs caused by the virus prevention measures. Indeed, these vulnerable populations have had their livelihoods deeply affected by the pandemic.

THEORETICAL/CONCEPTUAL BACKGROUND

Economic vulnerability is considered to be the probability that a country's economic development process will be hampered by the occurrence of unforeseen exogenous events,

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often referred to as external shocks (Guillaumont, 2008, 2009, Cariolle, 2011). The review of the literature on economic vulnerability leads to the identification of two components, namely the level of exposure and resilience.

First, some authors define the economic vulnerability of a geographic entity as its level of exposure to exogenous negative economic shocks (Briguglio, 1998, Briguglio, 2004; Turvey, 2007; Briguglio et al., 2008; Naudé et al. 2008; UN and CDP, 2008). An exogenous economic shock is any economic change in the supply or demand for products or services that is beyond the control of the economic entity under study. The level of exposure is therefore the probability that the economy will be hit by this type of negative shock by identifying its level of resilience[2].

Indeed, when analyzing the economic vulnerability of geographical entities (countries, islands, regions, cities, etc.), the aim is often to prevent the situation from deteriorating from what it currently is. An economy could suffer a negative shock, but recover very quickly due to its high resilience, and policy makers would not pay much attention.

As a result, resilience is a very important element in the analysis of economic vulnerability. It is derived from three main determinants: the size and probability of shocks, exposure to these shocks, and resilience or the ability to respond to them (Guillaumont, 2009).

The first two determinants depend essentially on the structural characteristics of the country (geographical location, human capital, economic diversification, etc.), while resilience depends rather on the country's current economic policy.

The problematization

It is within this framework that the problematic of our work is to study the impact of economic vulnerability on pre and post Covid-19 economic growth. In order to provide some answers to this question, we would like to:

- Identify the vulnerabilities of developed and developing countries to show that shocks have a greater effect on economic growth in developing countries because of their external dependence.

- Find actions that aim to reduce the adverse effects of shocks by lowering the country's resilience

- Integrating development policies with resistance.

The Covid-19 pandemic causes shocks on demand (decrease in consumption due to the distancing and confinement of the population) and on supply (disruption of the international production chain from China, which is one of the main world suppliers), and leads to

[2] Some authors add the concept of resilience (Easter, 1999; Briguglio et al., 2008; Naudé et al., 2008; UN and CDP, 2008; Shearmur and Ribichesi, 2008; Alasia et al.) Resilience refers to the ability of an economy to recover from a shock. In its Economic Vulnerability Index, the UN and CDP (2008) explain well how the concept of resilience is added to the level of exposure to form vulnerability.

speculation on the financial markets. The mobility of factors is weakened by the reduction in transport and travel flows imposed by the spread of the Covid-19 pandemic.

This pandemic leads to a drop in production and, in turn, to a drop in profits for firms, a drop in salaries, a drop in demand, and an increase in social pressures and uncertainty. This leads us to say that the world is facing twin shocks or a twin crisis, both health and economic.

Baldwin R. and Tomiura E. (2020) estimate that the Covid-19 pandemic would exert health and economic contagion effects; they also note that this virus is a supply and demand shock, it affects international trade in goods and services.

According to the IMF (2020), the Covid-19 health crisis is accompanied by an economic crisis through three important shocks that it creates, namely:

- ✓ Declines in production and demand
- ✓ The deceleration of global growth and the tightening of financial conditions (and their spillover effects),
- ✓ The significant drop in commodity prices, particularly oil prices, which have fallen by around 50% since the beginning of 2020 (the lowest level in 18 years).

METHODOLOGY

To carry out this evaluation, a quantitative data collection and analysis methodology was applied. For this purpose, we have opted for an approach based on panel data models. Before presenting the estimation results, we calculate an economic vulnerability index and present the methodology adopted.

To do this, we discuss the method of constructing an economic vulnerability indicator and then the method of estimating the econometric model.

Economic vulnerability indicator

The literature provides numerous indicators that can capture economic vulnerability. Thus, authors such as Rodrik (1998, 1999) and Chauvet and Guillaumont (2003) have used the standard deviation of the terms of trade as an indicator of economic vulnerability. They measure vulnerability as the standard deviation of the terms of trade weighted by the degree of openness.

This indicator, they argue, is appropriate for capturing external instability. In doing so, the methodology adopted is that of Rodrik (1998, 1999). The standard deviation of the terms of trade weighted by the degree of openness is thus used as a proxy for economic vulnerability.

The vulnerability is thus determined according to the following formula:

$$\mathbf{IV} = \sigma\,\mathbf{TDE}\,[(\boldsymbol{X}+\boldsymbol{M})\,/\,]$$

With σ **TDE**: the standard deviation of the terms of trade

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$X+M/PIB$: The commercial opening rate and standard deviations are calculated over sub-periods of two years due to the availability of data.

Formalization of the econometric model

In the literature, the procedure used to estimate the relationship between vulnerability and growth is generally the panel data regression method. Thus, many studies have used dynamic panels to highlight the effects of vulnerability on growth. These include authors such as Rodrik (1999), Easterly and Kraay (2000), Samimi et al. (2011), Zaouali and Zaouali (2015) and Brueckner and Carneiro (2016).

By definition, a dynamic model is one in which one or more lags of the dependent variable are included as explanatory variables. Thus, the following model examines the impact of vulnerability on economic growth.

$$\mathbf{Yit = \beta 1 Yt\ -1 - + \beta 2\ Ouv\ it + \beta 3\ Vul\ it + \beta 4\ X\ it + \beta 5\ Inst\ it + \sigma\ i + \varepsilon\ it}$$

Yit is the growth rate of GDP in country i at date t

Ouv it is the trade openness rate of country i at date t

Vul it is the index of economic vulnerability measured by the standard deviation of the terms of trade weighted by the trade openness rate of country i at date t.

X it is a vector of control variables considered as determinants of economic growth in the literature. The components of Xit are:

- The initial level of GDP per capita (in logarithm)

- Government final consumption expenditure (in logarithm)

Inst it: the vector of institutional variables that contains the World Bank's good governance indicators.

σ i : the specific effect for each country i

ε it: the error term.

Estimation method

Conventional estimation methods such as OLS are not appropriate for the estimation of such a model. Indeed, the presence of the lagged growth rate in the model creates an endogeneity problem and the OLS estimators would be biased. Moreover, as Rodrik (2000) points out, a country's trade openness, measured by the ratio of trade to GDP, is endogenous. He argues that a country with a large GDP will have a low volume of trade relative to its size, whereas a smaller country will tend to be more extroverted. Therefore, the explanatory variable trade openness can be correlated with the error term.

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To estimate this model correctly, the models must necessarily be instrumented to overcome this endogeneity problem Generalized least squares estimation (GLS) is an estimation of the parameters of a linear regression model with dependent errors and heterogeneous variance. In FGLS, the modeling proceeds in two steps:

(1) The model is estimated by OLS and the residuals are used to construct a consistent estimator of the error covariance matrix; and

(2) Using the consistent estimator of the error covariance matrix, one can implement the GLS ideas. The estimator is feasible is, provided that the error covariance matrix is estimated consistently, asymptotically more efficient.

Our sample focuses on the countries most exposed to natural disasters, which are ranked according to their World Risk Index calculated by the United Nations Institute for Environment and Human Security (UNU-EHS), we have chosen 8 countries from the most vulnerable to the least vulnerable to risk.

Rank	Country	WRI2019	WRI2021	WRI2022	Exhibition	Vulnerability
1	India	6.77	6.56	42.31	35.99	49.75
2	China	5.84	5.87	28.70	64.59	12.75
3	Turkey	5.06	5.11	16.23	8.90	29.58
4	Morocco	5.83	5.82	10.29	7.63	13.87
5	Tunisia	5.74	5.85	9.87	2.88	33.84
6	Algeria	7.66	7.66	9.58	2.62	35.05
7	France	2.37	2.51	6.67	2.70	16.50
8	Germany	2.43	2.66	3.92	1.99	7.74

It should be noted that the economies of these countries are marked by structural fragilities accentuated by the crisis and their economic vulnerability to external shocks. The annual data used in this article cover the period 2000-2021, justified by data availability. The variables GDP growth and trade openness are taken from the World Bank database.

We calculated the economic vulnerability variable defined by the economic vulnerability index. We use GDP growth as the dependent variable (Acemoglu et al, 2001, Isham, Kaufman and Pritchett 1997, Acemoglu, Johnson and Robinson 2004, Kaufmann et al 2004).

The impact of institutional quality on economic growth is measured by the World Bank's Kaufmann et al. global governance index, available from 1996 for 215 countries. In addition to the variables mentioned, we consider other control variables as determinants of economic growth, which are widely cited in the literature. These variables are: GDP per capita and government final consumption expenditure; and the trade openness rate, defined as the ratio of the sum of imports and exports to GDP.

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RESULTS

Cross-sectional dependence (CD) test

The cross-section independence test of global significance of the model gave a p-value equal to 0.000 which shows that the coefficients of the model are globally significant. Moreover, Pesaran's (2004) tests of serial autocorrelation show an average correlation of the coefficients. In addition, in all regressions, the results of Pesaran (2004) tests accept the null hypothesis of crosssection independence according to which the instruments used are valid. The estimates are therefore robust.

Unit root test (CIPS)[3]

The results obtained are presented in the appendices, and allow us to conclude that only the GDP growth rate and the vulnerability index are stationary at level, the rest of the variables about the opening rate, the GDP per capita, the final consumption expenditure of the governments, the population growth rate are stationary in first differentiation.

Descriptive statistics of the data

Variable	Obs	Mean	Std. dev.	Min	Max
txcrois	176	3.9875	3.860816	-8.7	14.2
ouveco	176	.5107822	.1497993	.1897965	.9602904
vul	160	3.103016	5.346886	.1014201	28.44088
Lpibh	176	8.722201	1.257789	6.111667	10.84428
lncon	176	4.57846	1.821343	1.275363	7.832014
txcroispop	176	.9732955	.5839006	-1.9	2.1
corruption	176	.1495464	.8649127	-.9872982	1.932908
ruleoflaw	176	.1899662	.8262495	-1.245844	1.850373

Source: author

In order to detect a possible relationship between the different variables, we will present the different correlation coefficients to test the correlation between these variables in the following table:

[3] This test allows us to study the stationarity of our series, for this we have performed the unit root tests on panel data developed by Pesaran (2007), if the p-value of the tests are less than 0.05, we say that our series is stationary.

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	txcrois	Lpibh	lncon	louveco	ltxcro~p	lvul	corrup~n
txcrois	1.0000						
Lpibh	-0.4055 0.0000	1.0000					
lncon	0.0780 0.3035	0.5686 0.0000	1.0000				
louveco	-0.2541 0.0007	0.3078 0.0000	-0.2992 0.0001	1.0000			
ltxcroispop	0.1355 0.0730	-0.5557 0.0000	-0.5862 0.0000	-0.0789 0.2981	1.0000		
lvul	-0.0158 0.8431	-0.3458 0.0000	-0.4666 0.0000	0.2689 0.0006	0.4688 0.0000	1.0000	
corruption	-0.4155 0.0000	0.8634 0.0000	0.5341 0.0000	0.2246 0.0027	-0.6146 0.0000	-0.4518 0.0000	1.0000
ruleoflaw	-0.3897 0.0000	0.7761 0.0000	0.5279 0.0000	0.1029 0.1742	-0.5795 0.0000	-0.5511 0.0000	0.9652 0.0000

	ruleof~w
ruleoflaw	1.0000

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Source: author

According to the table that shows the different correlation coefficients, there is a strong positive correlation between **lncon** and **Lpibh**, between corruption and **Lpibh** and corruption and **Lncon**. Also a strong positive correlation between rule of law and **Lpibh**, rule of law and **lncon** and a strong positive correlation between rule of law and corruption.

Effect of vulnerability on economic growth in the presence of the covid -19 crisis:

Variables	Coefficient	p-value
Txcrois	-.1761965	0.172
Ouveco	-1.079895	0.091
Vul	-0.0425855	0.642
Lnpibh	6.719731	0.000
Lncon	-5.81938	0.003
Corruption	-0.1138862	0.637
Rule of law	0.0759592	0.762
Dumcrise	-0.1711347	0.331
Cons	-0.1730115	0.127

Source: author

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DISCUSSION

The estimation results of our panel data model show that economic vulnerability has a negative effect on economic growth. The negative and significant sign of the coefficient of economic vulnerability is expected. Indeed, terms of trade shocks contribute to the instability of economic growth. Indeed, commodity price shocks in world markets contribute to fluctuations in economic growth. Thus, greater exposure to external disruption is associated with significant declines in economic growth.

The "covid-19" shock evokes a recession in some countries, the most affected countries are those whose economies are based on exports, also developing countries that face a series of financial and debt vulnerabilities that aggravate their ability to withstand another external shock. It is noted that the covid-19 health crisis is exacerbating the effect of vulnerability on economic growth.

Impact of vulnerability on economic growth without a dummy variable:

Variables	coefficients	P-value
Dltxcrois	-0.5028648	0.000
Dlouveco	-0.4759001	0.264
Dvul	0.047668	0.519
Dlpibh	4.638425	0.000
Dlcon	-3.848418	0.000
Corruption	-0.4835132	0.087
Ruleoflaw	0 .4692959	0.025
Cons	-0.0501716	0.575

Source: author

We see that the effect of vulnerability on economic growth decreases in the absence of the covid-19 crisis. This is confirmed by the significance of the dummy crisis variable covid-19 for all countries in explaining economic growth.

Impact of vulnerability on economic growth for developing countries (gdp <8)

Variables	Coefficient	p-value
Txcrois	-0.5344852	0.000
Ouveco	-0.6477947	0.026
Vul	0.1492478	0.000
Lnpibh	6.472374	0.000
Lncon	-4.12434	0.000
Corruption	0.3951524	0.099
Rule of law	-0.896641	0.489
Dumcrise	-4.563567	0.029
Cons	0.0427766	0.718

Source: author

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The vulnerability variable is highly significant (p-value =0.000) which can be explained by the fact that the decline in the growth rate of developing countries is not essentially due to fluctuations in the terms of trade, also the variable trade openness has a negative effect on the economic growth of developing countries, because these countries import more than they export and for the institutional variables, where compliance with the law impacts positively on economic growth, we note that they influence negatively the growth, where also the health crisis covid -19 has a significant negative effect on the economy of these countries.

Effect of vulnerability on economic growth in developed countries (GDP/H >8)

Variables	Coefficient	p-value
Txcrois	-0.4120063	0.000
Ouveco	0.4049223	0.514
Vul	-0.0529845	0.383
Lnpibh	5.441679	0.000
Lncon	-5.607602	0.000
Corruption	-0.6597739	0.124
Rule of law	0.5613842	0.161
Dumcrise	-0.318243	0.036
Cons	0.0002654	0.997

Source: author

We note that economic vulnerability has a negative effect on developed countries and not on developing countries because economic growth in developed countries is based on exports.

CONCLUSION

The purpose of this work is to identify the effects of vulnerability and health crisis as a form of external shock on economic growth. Theoretical and empirical work has shown that there is a positive relationship between economic vulnerability and endogenous variables. Thus, all countries in the world, whether developed or developing, are ineluctably affected by vulnerability.

The 2020 decade is the decade of the acceleration of the Sustainable Development Goals and the 2030 Agenda, but the COVID-19 pandemic has had an enormous negative impact in terms of human development, which is regressing for the first time since 1990. Minimizing the negative impacts of the COVID-19 pandemic requires action at two levels:

(1) In the short term, provide an urgent response to support populations and alleviate the effects of the pandemic,

(2) In the long term, to strengthen the resilience of populations in the face of possible future shocks and to rethink the socio-economic model for greater inclusion and for a more human centered development.

The COVID-19 crisis has aggravated income inequalities, but also inequalities of opportunity in the sense that not all populations have access to the same opportunities for financing, digitalization, means of communication, etc., and are therefore differentially exposed to COVID-19 and its negative effects.

In order to strengthen macroeconomic resilience, developing economies should recognize the need to reflect on a new model of economic and social development that is more human centered, inclusive and inclusive of all people by following these recommendations:

- ✓ Strengthening the connection between people and regions is a way to unleash the economic potential of inland regions by catalyzing regional development dynamics
- ✓ Encourage a circular economy dynamic through the emergence of cooperatives in all sectors and economic branches.
- ✓ Adjust the amount of financial aid to the vulnerable population and better target the different categories
- ✓ Strengthen transparency in the management of public finances combined with the fight against corruption for a better allocation of resources.

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