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Mitigating the Next Pandemic: An Assessment of Macroeconomic Resilience and Social Vulnerability in Sub-Saharan Africa

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Declaration

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C.E participated in the conception and writing of the manuscript. C.V.M participated in the conception and writing of the manuscript. S.K.D participated in the conception and writing of the manuscript. S.A.A participated in the conception and writing of the manuscript. All authors read and approved the final version of the manuscript.

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Abstract

Mindful of the dismal macroeconomic position and welfare performance of most countries in the Sub-Saharan African (SSA) region, this study sets out to investigate the nexus between macroeconomic resilience and social vulnerability in the wake of the COVID-19-induced global economic meltdown. The study adopted a panel data analysis technique via the Panel Vector Autoregression (PVAR) approach alongside other econometric tests. The study revealed that fiscal deficit to GDP ratio (FDGDP), external debt to GDP ratio (EDGDP), discomfort index (DISCO) (the sum of inflation and unemployment rates), governance index (GOVN), and exchange rate (EXCR) significantly impact on the socially vulnerable and constitute a serious impediment to the ability of SSA economies to mobilize the needed resources to offset any external shock. The novelty of this study rests on its inventive endeavour to empirically assess the nexus between macroeconomic resilience and social vulnerability. The focus on SSA makes it more compelling given the dismal macroeconomic position and welfare performance of SSA, which poses a possible threat for the prospects for the attainment of the Sustainable Development Goals (SDGs) in the region by 2030.

Keywords: Pandemics; Macroeconomic resilience; Social Vulnerability; SSA

Paper Type: Research Paper

1. Introduction

The global economic climate of the last three decades has presented most economies with opportunities for prosperity premised on cooperation and integration (Guillaumont, 2017). Many developing economies have leveraged on these avenues to advance friendly economic collaborations to attain growth levels previously thought unattainable (Devarajan and Kasekende, 2011). However, these opportunities are not without risks especially for regions like Sub-Saharan Africa (SSA) yet to evolve into a development hub (Kagochi, 2019; Anetor, 2020a; Anetor, 2020b; Ibhagui, 2020). Overtime, many economies in SSA have realized that these risks could advance macroeconomic catastrophes (Author; Kilishi et al., 2021). Specifically, the continuous prevalence of shocks and spillovers from inside and outside SSA have brought to limelight the importance of being conscious of the hazards of economic disturbances in an exposed environment (Author; Tayal, 2019). For economies that have to withstand these shocks, it is vital to pinpoint their susceptibility to unfavourable economic disturbances on time and develop resistance to the likely vulnerabilities (Author; Guillaumont, 2017).

Research into economic resilience and social vulnerability is increasingly becoming significant in a world with many uncertainties (Bergstrand et al., 2014). Understanding how economies vary concerning the level of damage that shocks could potentially inflict as well as the strategies and resources that are accessible for recovery is essential. Such information is vital to assist economies to plan for and rebound from shocks. Economic resilience and social vulnerability are two fundamental concepts for assessing risks and coping abilities when dealing with macroeconomic uncertainties. Interest in resilience has witnessed a rapid increase in the last two decades, as a reaction to the growing concern about potential shocks that affect the survival capabilities of economies. After the international economic disruptions occasioned by the global financial crisis of 2007-08, SSA was not left out of the meltdown effects (Arieff et al, 2010). The current account balance of the region deteriorated as exports stood at -4.9% relative to imports (Anyanwu, 2011; Economic Commission for Africa, 2010), foreign direct investment into Africa fell by 26.7%, while fiscal balance declined by 6% of Gross Domestic Product (GDP) (International Monetary Fund, 2009) given the necessity to provide effective stimulus during the crunch. More recently, available data has shown that though with a trade surplus of US$8.5 billion, budget deficit in SSA stood at 3.66% of the total GDP of US$1.7 trillion in 2018, a scenario predicated on the continued increase in public debt occasioned by high budget deficits in the region's top economies (World Bank, 2020). Presumptively, these shocks will continue to be part of the global economy and will undeniably present constant challenges around the globe. In the face of these problems, it becomes pertinent to recognize what makes an economy able to deal with various degrees of shocks and to constantly evaluate and monitor its coping capacities.

Despite research efforts focused on macroeconomic resilience and – recently – social vulnerability, to the best of our knowledge, sparse inquiry has been made for the SSA region. This is precarious for a region with challenges of debt (regional debt-to-GDP has risen to 59% in 2019 from 37% in 2012 – World Bank, 2020), the highest concentration of the global poor (72% of people in SSA survive on below US$ 2 a day - Author; World Bank, 2020), biggest youth population and rate of population expansion in the globe worldwide envisaged to multiply by two in 2050 to 2

billion people (United Nations, 2019; World Bank, 2020) among other dismal socioeconomic facts. Also, the recent outbreak of COVID-19 has exposed the macroeconomic fragility of the SSA region with impending repercussions for economic growth, political, social, and overall economy-wide imbalances. The corona virus pandemic is projected by the World Bank (2020) to negatively impact the majority of SSA countries across an array of networks, involving a decrease in trade, investment decline, drop-in international remittances, waning foreign aid, fiscal deficits expansion, and financial sector squeeze. The internal and external macroeconomic disequilibria resulting from the slump may persevere into the foreseeable future and negatively alter the region's chances of catching-up with other regions across the globe and meet the Sustainable Development Goals (SDGs) by 2030 (Author). This does not ultimately fit well for economies in the region faced with a pandemic-induced recession, imbalance in financial and fiscal sectors, and socioeconomic welfare.

In this study, we define macroeconomic resilience as a country's ability to absorb, adapt to, and recover from economic shocks without significant long-term damage to its fiscal, financial, and social systems. This includes both "shock-counteracting" mechanisms such as fiscal flexibility and exchange rate management, and "shock-absorbing" mechanisms such as stable inflation and unemployment rates that help preserve macroeconomic stability during crises (International Monetary Fund, 2016). On the other hand, social vulnerability refers to the susceptibility of individuals and communities to harm due to lack of access to critical resources, such as income, education, healthcare, and social protection, which limits their capacity to cope with shocks (Flanagan et al., 2011; CDC, 2024). The theoretical linkage between these constructs rests on the premise that resilient macroeconomic systems can buffer or even pre-empt increases in social vulnerability (Hallegatte, 2014; Endegnanew et al., 2025). For instance, a fiscally resilient government can deploy counter-cyclical spending to protect social services during crises, while high external debt may crowd-out such spending. Thus, macroeconomic resilience affects not only aggregate economic stability but also the ability to protect the most vulnerable populations from welfare losses during economic downturns. This framework informs our expectation that stronger resilience indicators should be inversely associated with social vulnerability.

The objective of this study is to connect two variables whose nexus is rarely investigated: macroeconomic resilience and social vulnerability. The study uses an econometric model/design to explore/investigate the association of macroeconomic resilience components (captured using three macroeconomic variables namely – the fiscal deficit to GDP ratio (FDGDP); external debt to GDP ratio (EDGDP) and the sum of inflation and unemployment rates (DISCO) often referred as the economic discomfort index (or economic misery index)) and social vulnerability.

To contribute to the literature on Social Vulnerability, we constructed a Social Vulnerability Index for SSA through standardization and transformation of the following data: age (percentage age under 5 and over 65), class (a measure of income distribution using the Gini index), income (per capita income), education index (% adults with at least secondary education), and health index (infant/under 5 mortality rate). This investigation, using the Panel Vector Auto regression (PVAR) approach is essential for individual and collective macroeconomic planning, preparation, and response of SSA economies to deal with the development effects of exogenous shocks. This positioning departs from extant COVID-19 oriented studies which have investigated the nexuses between economic resilience, social vulnerability and macroeconomic outcomes, but failed to

establish causality because the corresponding estimation techniques have only enabled the establishment of correlations between investigated factors (Author). Hence, by adopting the PVAR approach, alongside impulse response functions, findings engendering more causality are apparent.

Following this introduction, the rest of the paper is designed as follows: Section two addresses the related literature. Section three presents the research methods. The presentation of results and findings are captured in sections four. Section five contains policy prescriptions and concludes the study.

2. Literature Review

The empirical narrative on resilience is broadly discussed from two diverse viewpoints: the country and the multi-country levels (Simmie, 2014; Giannakis and Bruggeman, 2015; Palaskas et al., 2015; Lagravinese, 2015). For instance, at the country level, Simmie (2014) finds that the long-term development of the province's respective innovation systems significantly contributes to the economic resilience of their economies in the event of external economic crises in England. Similarly, Giannakis and Bruggeman (2015) employs shift-share and input-output models and confirms that relative to Greece's urban regions, rural areas have more defiance to recessionary distress, while Palaskas et al (2015) report a direct impact of industrial specialization on Greece's regional resilience. Likewise, Lagravinese (2015) survey the link between industrial structure and sectorial specialization in Italian region's ability to resist economic slump-related shocks. Findings of the study show that recurrent recessions in the country have worsened the regional disproportion involving the South and North as Southern provinces have been unable to rebound similar to the North. Martin et al (2016) find that the impact of recessions in the UK is contingent on the business cycle phase, specifically, the industry structure – are major drivers of resilience. In the same vein, Cuadrado-Roura and Maroto (2016) establish that productive specialization is essential for enhancing regional resilience in Spain. Di Caro (2014, 2017) show that the most resilient provinces in Italy (pertaining to employment performance) have the highest industrialization diversification levels - particularly in manufacturing activities - and the largest social and human capital endowments. In a recent study, Gong et al (2020) evaluate the impacts of regional recovery and the potential resilience of the COVID-19 crisis in China. The study highlights that government support schemes, regional industrial structures as well as the institutional experience of handling with prior crises could potentially influence the resilience rates of Chinese regions (Gong et al., 2020).

The second strand of studies focuses on cross country studies. Rojas-Suarez (2015) utilizes a sample of 21 countries to estimate their macroeconomic resilience to adverse external shocks. The study reports among other things that emerging Europe (Bulgaria, Lithuania, Czech Republic, Latvia, Poland, Estonia and Hungary) were the least resilient while emerging Asia were the most resilient (China, Thailand, South Korea, Indonesia and Philippines). Alessi et al. (2020) assess the resilience to financial and economic downturns by European Union member nations and report significant variations between nations in the various resilience capacities studied. Additionally, they highlight that some predetermined features like expenditures of government on social protection, conducive business environment or political stability are significantly linked with resilient outcomes. On the other hand, some studies have explored the link between resilience and institutional quality in Europe for the period of the Great Recession. For instance, exploring different combinations of European countries, Sondermann (2018) employ Vector autoregression, Ezcurra and Rios (2019) use spatial econometric methods while recently Rios and Gianmoena (2020) have applied the Bayesian Model Averaging techniques. These studies report a positive influence of institutional quality on the resilience of the European countries studied (Sondermann, 2018; Ezcurra and Rios, 2019; Rios and Gianmoena, 2020).

Some studies have examined the nexus between economic resilience and vulnerability, but these studies have majorly focused on resilience and social vulnerability to hazards particularly natural disasters (see Yoon, 2012; Lixin et al, 2013; Zhou et al., 2013; Bergstrand et al., 2014; Huang et

al., 2015; Maiti et al., 2015; Lin et al., 2017; Noy and Yonson, 2018; Xie et al., 2018 for detailed review). Aside from these studies, this strand of literature focuses on the studies that are closely related to this present study. For instance, in assessing the economic vulnerability and resilience of 68 economies across the globe, Briguglio et al (2009) concludes among other things, that GDP per capita is directly correlated to economic resilience and inversely associated with economic vulnerability. Additionally, per capita GDP is more responsive to resilience variables than to vulnerability variables. Similarly, extending the data to 183 countries, Briguglio (2016) establishes that many vulnerable economies appeared to have better resilience results indicating the implementation of policies geared towards enduring the damaging impact of exogenous shocks. Conversely, most developing nations who are adjudged to be less exposed to external disturbances owing to partial reliance on foreign trade emerged with a very low level of economic resilience. Guillaumont (2017) has focused on the vulnerability of three developing nations (Maldives, Bhutan and Nepal) of Asia. The study considered three dimensions of vulnerability which include economic, political and climatic using the economic vulnerability index, fragile state index and physical vulnerability to climate change index. The study concludes that each of the three nations appears to be most susceptible in one of the three kinds of vulnerability: Bhutan for economic vulnerability while Nepal and Maldives for state fragility and physical vulnerability to climate change respectively.

From the literature review, it is evident that the implication of resilience particularly macroeconomic resilience is yet to be explored particularly in the SSA region. Second, unlike previous studies, we uniquely constructed social vulnerability index for SSA following the recommendations by Burton et al (2018). Thirdly, methodology-wise, we advanced further by uniquely utilizing the workhorse of macroeconomic policy analysis, the Panel Vector Autoregression (PVAR) which enables the examination of the endogenous association between social vulnerability and various macroeconomic resilience indices, while shedding light on the lag effect of macroeconomic resilience indices on social vulnerability.

3. Data and Methodology

The study is based on panel data (PD), covering 20 countries within the SSA region (see countries in Appendix 1) over the period, 1999 – 2019. The SSA region is made up of African countries that are geographically located within the African continent, in an area lying south of the Sahara (United Nations Statistics Division, 2013). The choice of 20 SSA countries is based on data availability. The data for the selected countries were obtained from the World Bank, African Development Bank (AfDB) and the Organization for Economic Cooperation and Development (OECD) databases, which allow for the combined cross-sectional and time-series data for the assessment of the interaction between social vulnerability and the various indices of the macroeconomic resilience.

In measuring the social vulnerability index (SVI) for the selected SSA countries, we follow Burton et al (2018) who posit that the most significant social vulnerability dimensions are identified a priori, with usually ten or fewer variables that are standardized and aggregated into an index. These dimensions of SVI, according to Burton et al. (2018), include age (% age under 5 and over 65), gender (% female-headed households), disability (% people with disability), class (a measure of income distribution), ethnicity (% Africans), income (per capita income), education (% adults with at least secondary education), population structure (birth rate), and health (infant/under 5 mortality rate). Due to the problem of limited data across the various dimensions of the SVI, our calculation of the SVI for the 20 SSA countries was based on fewer dimensions such as age (percentage age under 5 and over 65), class (a measure of income distribution using the Gini index), income (per capita income), education index (% adults with at least secondary education), and health index (infant/under 5 mortality rate). Data relating to these dimensions of SVI were first standardized, aggregated into a single index, while the SVI is generated based on the average score of the relevant dimensions. The standardization of the various dimensions of the SVI was done by subtracting the mean value of each dimension from each data point and dividing the result by the standard deviation. The results of standardized dimensions were summed up and divided by the number of dimensions. The resulting SVI values range from 0 to 1, with 0 representing the lowest level of social vulnerability and 1 indicating the highest level of social vulnerability. The standardization procedure is empirically robust and consistent with the extant literature (Aluko and Obalade, 2020; Svirydzenka, 2016).

As suggested in the literature (Bucherie et al. 2022), we explore alternative methods such as Principal Component Analysis (PCA) to construct the SVI. However, the PCA model yielded a first component that explain less than half of the total variance, and the weights generated lacked intuitive interpretability across countries and years. This limitation is likely due to the structural diversity and data variability across the 20 SSA countries. Consequently, we retain the equal-weighting approach, as it remains transparent, robust, and replicable. Nonetheless, future research with more granular and consistent data could explore more advanced methods for index construction.

Furthermore, while important dimensions such as gender, disability, and ethnicity have been acknowledged (Burton et al., 2018), we exclude them from the index construction due to pervasive data limitations across countries and years. We explicitly recognize this as a limitation in our study and encourage more investment in cross-country social data collection in SSA.

The macroeconomic stability aspect of the resilience is constructed based on three macroeconomic variables namely – the fiscal deficit to GDP ratio (FDGDP); the sum of inflation and unemployment rates (DISCO), and the external debt to GDP ratio (EDGDP) (Briguglio et al, 2009; Briguglio, 2016). The fiscal deficit, which reflects the government budget position is standardized as the ratio of GDP and included in the resilience index because it is the result of government fiscal policy and indicates the resilience of

a shock-counteracting nature. In addition to the information contained in the fiscal deficit variable, the sum of inflation and unemployment rates are also added to the resilience index because inflation and unemployment are strongly influenced by other types of economic policies like the monetary and supply-side policies. The sum of inflation and unemployment rates is also regarded as the economic discomfort index (or economic misery index), and both indicate the resilience of a shock-absorbing nature. The external debt, which is equally standardized as a ratio of GDP is added to the resilience index to gauge the adequacy of the external policy because a country with a high level of external debt may find it more difficult to mobilise resources needed to offset the effects of external shocks. In this sense, the external debt to GDP ratio is regarded as the resilience of a shock-counteracting nature (Briguglio et al., 2009; Briguglio, 2016).

Other elements of macroeconomic resilience considered in this study include exchange rate (EXCR) and good governance (GOVN). The exchange rate is used to measure the competitiveness of a country with her trading partners in the event of external demand and supply shocks, and thus, the exchange rate could be regarded as the resilience of a shock-counteracting nature. Good governance includes the strength of the democratic system, anti-corruption, human rights, government action legitimacy, citizen involvement in decision making, linkages to local governments and civil organizations, all measured as a single index with a range of score from -2.5 to 2.5, where -2.5 indicates the worst governance, and 2.5 indicates the best governance (Burton et al., 2018). In passing, it should be noted that macroeconomic resilience is not an economic development measure but rather signifies macroeconomy ability to counteract or absorb adverse economic shocks arising from pandemics and other related global crisis.

To assess the interaction between social vulnerability and macroeconomic resilience in SSA, we employ the PVAR approach. The choice of the PVAR approach is premised on two major reasons. First, the PVAR approach gives room for the examination of the endogenous relationship between social vulnerability and the various macroeconomic resilience indices, while shedding light on the lag effect of macroeconomic resilience indices on social vulnerability. Second, the impulse response functions (IRFs) generated from the PVAR will help us to evaluate the effect of unanticipated shocks in the macroeconomic resilience indices (due to pandemics) on social vulnerability.

Following a level stationary time series PVAR model approach as in Holtz-Eakin et al. (1988), Casu and Girardone (2009), Hartwig (2010) and Bayraktar-Saglam and Boke (2017), the interaction between social vulnerability and macroeconomic resilience indices is specified as follows in Equation (1) and Equation (2):

$$SVI_{it} = \alpha_0 + \sum_{j=1}^{n} \beta_j SVI_{it-j} + \quad \delta \sum_{j=1}^{n} Z_{it\ j} + \Upsilon_i + \mu_{it} \tag{1}$$

$$Z_{it} = \Omega_0 + \sum_{j=1}^{n} \lambda_j SVI_{it-j} + \quad \theta_j \sum_{j=1}^{n} Z_{it\ j} + \pi_i + \nu_{it} \tag{2}$$

Where SVIit stands for social vulnerability index for country i at time t; Zit denotes the vector of macroeconomic resilience indices (FDGDP, EDGDP, DISCO, GOVN and EXCR) for country i at time t; Υi and πi are the individual fixed effects for the panel member i; μit and vit are the white noise error terms; α0 and Ω0 are the intercept terms; βj, δj, λj, and θj are the general reduced-form parameters to be estimated; i stands for a country (i = 1, 2, …., N); t stands for the period (t = 1, 2, ….., T); n refers to the lag length.

4. Empirical Results and Discussions

This section presents the analysis of the panel residual cross-section dependence and panel unit root tests as the core preliminary tests before the PVAR estimation. We employ the Breusch-Pagan LM test statistic for reliability and validity of result since the time coverage in our panel is greater than the number of cross-sections (i.e. T=21 > N=20) and the results are presented in Table I.

Table I Residual cross-section dependence test

Test	Statistic	Df	Prob.
Breusch-Pagan LM	357.4818	190	0.0000
Pesaran Scaled LM	8.591633		0.0000
Pesaran CD	4.507704		0.0000

Source: Authors' Calculation

NB: LM: Lagrangian multiplier; CD: Cross-section dependence

According to Table I, the value of the Breusch-Pagan LM test statistic is 357.4818 and has a probability value of 0.0000. Since the probability of the Breusch-Pagan LM test statistic is less than 0.05, we reject the null hypothesis of cross-section independence and conclude that our panel has cross-section dependencies.

Table II Panel unit root test

Variables	Method	Level	I(d)
		Stat. (Prob.)	
SVI	LLC	-3.40733** (0.0034)	I(0)
	IPS	-3.82199** (0.0001)	
	ADFF-χ^2	80.7471** (0.0001)	
	PPF-χ^2	158.109** (0.0000)	
FDGDP	LLC	-4.48897** (0.0000)	I(0)
	IPS	-3.62321** (0.0001)	
	ADFF-χ^2	78.9192** (0.0002)	
	PPF-χ^2	88.1023** (0.0000)	
EDGDP	LLC	-1.42111 (0.0776)	I(0)
	IPS	-2.01912* (0.0217)	
	ADFF-χ^2	60.7996* (0.0186)	
	PPF-χ^2	59.9493* (0.0221)	
DISCO	LLC	-3.47088** (0.0003)	I(0)
	IPS	-4.41034** (0.0000)	
	ADFF-χ^2	95.4279** (0.0000)	
	PPF-χ^2	179.916** (0.0000)	
GOVN	LLC	-2.05720* (0.0198)	I(0)
	IPS	-3.11065** (0.0003)	
	ADFF-χ^2	88.4915** (0.0000)	
	PPF-χ^2	141.151** (0.0000)	
EXCR	LLC	-2.64655** (0.0041)	I(0)
	IPS	-3.86436** (0.0001)	
	ADFF-χ^2	81.4134** (0.0001)	
	PPF-χ^2	141.305** (0.0000)	

**(*) denotes significant at the 1%(5%) level.

Source: Authors' Calculation

NB: LLC: Levin, Lin and Chu; IPS: Im, Pesaran and Shin; ADFF: Augmented Dickey-Fuller-Fisher; PPF: Philip-Perron-Fisher

In determining the stationarity properties of the relevant time-series, as well as identifying their order of integration, the ADF test is employed. From the results of the panel unit root tests, which are reported in Table II, it is discovered that all the variables (SVI, FDGDP, EDGDP, DISCO, and GOVN) are stationary at their level state. This means that the social vulnerability index (SVI), fiscal deficit to GDP ratio (FDGDP), external debt to GDP ratio (EDGDP), discomfort index (DISCO) and governance index (GOVN) are originally integrated at order zero. In other words, all variables are I(0) variables. This implies that consistent estimates of the PVAR-in-level model are evident even as the cointegration test becomes unnecessary.

4.1. The PVAR Model Results and Discussion

The first step to the PVAR model estimation is the determination of the optimal lag length based on the relevant information criteria such as the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ). As pointed out by Authors, the choice of the appropriate information criterion is entirely the researcher's, as no information criterion is considered superior to another. However, the information criterion with the least value is more efficient and preferred to the one with a higher value.

Table III PVAR lag selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-266.6097	NA	0.264766	10.02258	10.16991	10.07940
1	-34.14463	16.21197	0.000160	2.597949	3.923939	3.109331
2	-43.87181	404.2280	0.000125*	2.365623*	3.102283*	2.649724*
3	-17.05634	25.94888	0.000158	2.557642	4.472960	3.296305
4	-8.230426	12.09478	0.000216	2.823349	5.327996	3.296305
5	14.94614	28.32691	0.000180	2.557550	5.651526	3.750775

Source: Authors' Computation

NB: LogL: Log-Likelihood; LR: Likelihood ratio; FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion

From the results in Table III, all the information criteria (AIC, SC, and HQ) choose lag 2 as the optimal lag length. This implies that lag 2 is the appropriate lag order for the PVAR model estimation. The PVAR estimates are reported in Table IV. The PVAR estimates are based on a parsimonious PVAR model generated from the initial over-parameterized PVAR through the general-to-specific method.

Table IV Panel parsimonious VAR estimates

Dependent Variable: SVI				
Variable	Coefficients	Std. Error	t-Statistic	Prob.
SVI(-1)	0.814676**	0.055149	14.77241	0.0000
SVI(-2)	-0.075159	0.049183	-1.528138	0.1266
FDGDP(-1)	-0.006372**	0.001094	-5.821871	0.0000
FDGDP(-2)	0.010943**	0.000887	12.34153	0.0000
EDGDP(-1)	0.214543**	0.067567	3.175283	0.0015
DISCO(-2)	-0.000252	0.000576	-0.436454	0.6625
GOVN(-2)	0.010497	0.005635	1.862782	0.0626
EXCR(-1)	-0.008297**	0.003003	-2.762758	0.0058
C	0.144265**	0.025189	5.727337	0.0000
Adjusted R^2 = 0.945397				

******(*****) denotes significant at the 1%(5%) level.

Source: Authors' Calculation
NB: SVI: Social vulnerability; FDGDP: fiscal deficit to GDP ratio; EDGDP: External debt to GDP ratio; DISCO: Discomfort index, GOVN: Governance index; EXCR: Exchange rate

As shown in Table IV, the first period past realization in social vulnerability (SVI) significantly and positively influences its current realization to the tone of 0.81%. This means that the existing or initial level of social vulnerability contributes to current social vulnerability in the SSA region. Therefore, any attempt to reduce social vulnerability within the SSA region should consider the initial or the existing level of social vulnerability. The fiscal deficit to GDP ratio (FDGDP), which reflects the resilience of a shock-counteracting nature, at lag 1 influences SVI negatively, and at lag 2 influences SVI positively and the influences were significant at both lags. This means that the shock-counteracting resilience nature of FDGDP plays out significantly towards reducing social vulnerability, especially during the time of adverse economic shocks like pandemics and other global crises. Thus, a healthy government fiscal position in the SSA region allows easy adjustments taxation and expenditure policies when confronted with adverse economic shocks. The external debt to GDP ratio (EDGDP), which reflects the adequacy of external policy, also stands as the resilience of a shock-counteracting nature. From the PVAR results, the EDGDP, at lag 1, exerts a significant positive influence on social vulnerability. This does not reflect a true picture of external debt to GDP ratio as the resilience of shock-counteracting nature in the SSA region. This suggests that the debt position of the SSA countries constitutes a serious impediment to their ability to mobilise the needed resources to offset any external shock.

The discomfort index (DISCO), which is the sum of inflation and unemployment rates, is used to capture the resilience of a shock-absorbing nature since high inflation and unemployment usually impose significant costs on the people. According to our results, the DISCO has negative but not a significant influence on social vulnerability. This means that the shock-absorbing nature of the sum of inflation and unemployment rates does not significantly manifest in the SSA region during the period of adverse economic shocks. This means that people of SSA countries can barely withstand adverse shocks because they are faced with severe welfare costs during a crisis. Also, we discovered that the governance index (GOVN) has a positive but not a significant influence on social vulnerability. It is believed that countries with good governance should be able to contain or absorb adverse economic shocks since they exhibit a strong anti-corruption, democratic system, legitimacy of government action human rights, citizen participation in decision making as well as linkages to local governments and civil organizations. However, going by our results, it appears that these qualities of good governance are missing in most, if not all, SSA countries. The exchange rate (EXCR), which is used to gauge how competitive a country is when compared to her trading partners, serves as the resilience of a shock-counteracting nature. This is because the exchange rate is expected to adjust (depreciation or appreciation) when a country is confronted with external demand shocks. From our results, this particular role of the exchange rate holds for the SSA countries as the EXCR reduces social vulnerability through its adjustments to adverse shocks.

4.2. Impulse Response Functions (IRFs)

It is widely known that unanticipated shocks in fiscal deficit to GDP ratio (FDGDP), external debt to GDP ratio (EDGDP), the sum of inflation and unemployment rates (DISCO), governance (GOVN), and exchange rate (EXCR), arising from pandemics and other global crisis can lead to distortions in social vulnerability (SVI) (Fatemi et al., 2017; Painter et al., 2024). The effect of these unanticipated shocks on the level of social vulnerability can be explained using the impulse response functions of a reduced-form PVAR model. This information will enable the policymakers to be able to predict the consequences of unanticipated shocks to be well prepared to react accordingly to these changes in the future. In this study, we present only the impulse responses of social vulnerability index (SVI) to the one standard deviation shock in the innovations of itself (SVI), FDGDP, EDGDP, DISCO, GOVN, and EXCR in Figure 1.

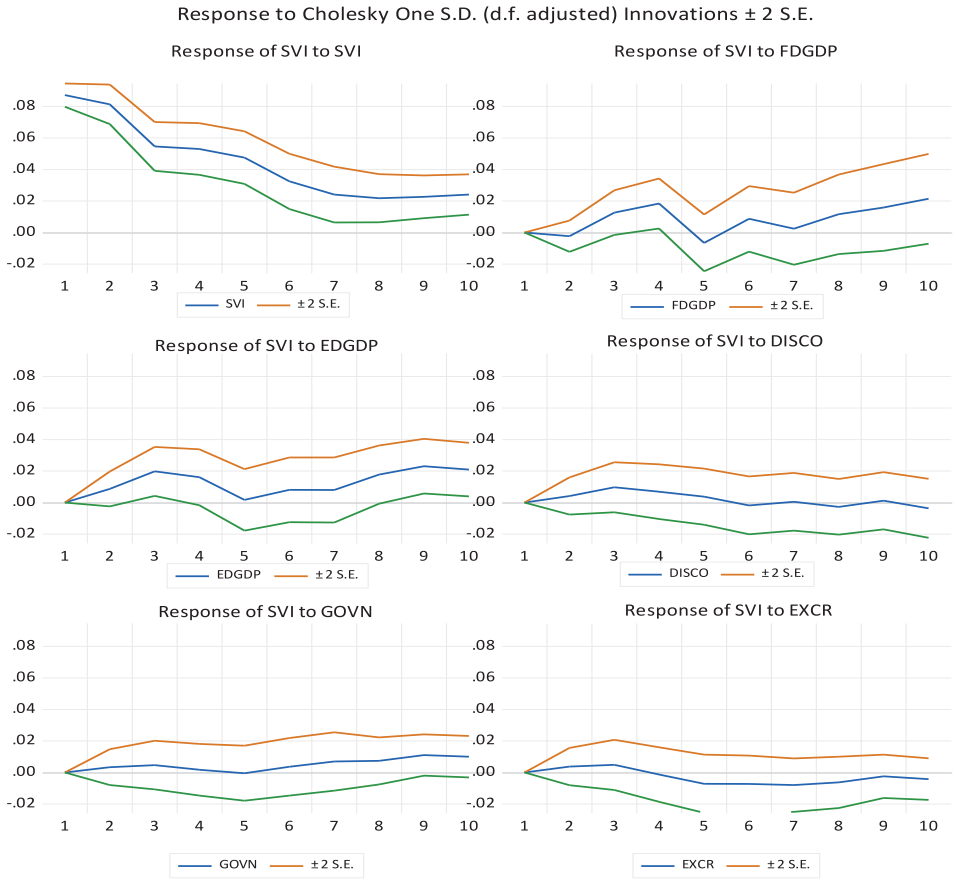

Fig. 1. Impulse response function
Source: Authors' Calculation

As shown in Figure 1, it is evident that any unanticipated increase in social vulnerability (SVI) will increase the level of social vulnerability (SVI) from period 1 to 10. However, the marginal increase in the response of social vulnerability to itself decreases gradually from period 1 to 7 and stabilises after period 7 through the remaining periods. This means that the current level of SVI depends significantly on the past realizations in itself. Any unanticipated increase in fiscal deficit to GDP

(FDGDP) ratio will reduce social vulnerability only at periods 2 and 5, and increases SVI in the remaining periods. This means that, in the event of future adverse shocks, the shock-counteracting resilience nature of FDGDP can only manifest at periods 2 and 5. Any unanticipated shock in external debt to GDP ratio (EDGDP) will increase social vulnerability (SVI) from period 1 to 10, meaning that the shock-counteracting resilience nature of EDGDP will not play out in SSA in the time of adverse shocks. This is in support of the conclusion earlier drawn from the PVAR estimates in Table IV.

The SVI will respond negatively to any unanticipated increase in the sum of inflation and unemployment rates (DISCO) only at periods 6 and 8 and increases to any unanticipated increase in DISCO throughout the remaining periods. This means that the shock-absorbing resilience nature of DISCO will only play out during the 6th and 8th period in the event of adverse shocks. The SVI will respond negatively to any unanticipated increase in governance (GOVN) only at period 5, and positively throughout the remaining periods, meaning that the shock-absorbing resilience nature of GOVN will manifest only at period 5 during the time of adverse shocks. Any unanticipated increase in the exchange rate (EXCR) will increase SVI from period 1 to 3, while it reduces throughout the remaining periods. This means that the EXCR will exhibit its true resilience of a shock-counteracting nature after the 3rd period in the time of adverse shocks.

Customary to the PVAR analyses, we have conducted a stability test to gauge the constancy of the estimates using the inverse roots of AR characteristic polynomial plot, and the result is reported in Figure 2. It is evident from Figure 2 that the PVAR estimates are generally stable throughout the sample period since the fitted points fall within the unit circle. This means that the estimates of the PVAR model can be relied upon for drawing inferences and for forecasting.

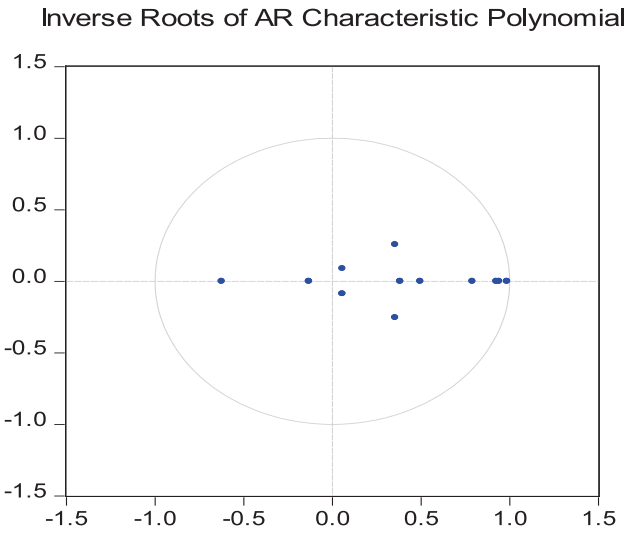

Fig. 2 Panel VAR stability test
Source: Authors' Calculation

5. Conclusion

This study set out to investigate the nexus between macroeconomic resilience and social vulnerability in the SSA region. As evidenced by the results and discussions above, the study confirms that past vulnerability reinforces vulnerability in the future. We, therefore, recommend the adoption of long-term social investment in education and health across the region to improve the welfare of the people and mitigate generational susceptibility to social vulnerability. Again, the shock-counteracting resilience nature of FDGDP significantly contributes to lessening social vulnerability. Thus, country-specific fiscal policies in the SSA region should diversify revenue sources away from natural resources to improving taxation revenue and responsible government spending targeted to quality infrastructure, productive sectors and social needs. On the debt front, our findings suggest that a debt problem in SSA economies could exacerbate social vulnerability. Hence, in the wake of the unpredictable external demand occasioned by COVID-19, governments need to be creative with the exploitation of available fiscal space to maintain macroeconomic stability. In countries with little or no savings, the competence to raise fiscal stimulus and finance fiscal deficits beckons on policymakers to pay attention to expenditure choices and how they impact stability and prosperity. This would help mitigate a surge in fiscal deficits and the attendant crowding-out of private investment.

Furthermore, the result on the discomfort index (DISCO), which is the sum of inflation and unemployment rates beckons for low, stable, predictable price level policies that do not worsen the shock-induced economic misery borne by individuals. Similarly, targeted labour market interventions are needed to cater for adverse adjustments and cushion the effect of job losses. Emphasis should also be placed on providing constant vocational training, skill acquisition intercession in various fields, capital provision, internship schemes and concessions for start-ups. This will engender self-empowerment and business resilience. The insignificant nature of the governance index necessitates the enthronement of good governance in a region in dire need of it, given a chequered history of bad administration. Purposeful and responsible leadership with the political will is paramount to put the region on the right path and banish a dismal record of corruption, insecurity, promotion of citizen rights and rule of law.

Countries in the region should vigorously pursue economic diversification and industrialization efforts. This better enables them to leverage on the African Continental Free Trade Area (AfCFTA) (an offshoot of the African Continental Free Trade Agreement AfCFTA) to make export promotion policies bear fruit and minimize continuous primary commodity export and the increasing import-led consumption in SSA. This would boost the export base of the region's economy and enhance international competitiveness, thereby reducing imports and the current account deficit. More importantly, as more countries are switching to protectionist policies internationally to mitigate the impact of COVID-19 shocks, this has wider ramifications for international trade and economic relations within and outside the region. While the restrictive trade policies could seem appealing to shield domestic economies in the interim, SSA countries should not follow that path given the long-term costs occasioned by a likely protracted international economic recovery which provides ample opportunity for SSA to take advantage of potential economic gains of AfCFTA. Finally, effective exchange rate targeting policies should be encouraged in the region. This would help create a balance between prices of domestic and foreign financial assets in the region, thereby mitigating the financial account deficit, and

enhancing the proposed benefits of the AfCFTA in the region. Hence, monetary and exchange policies should be cautiously synchronised to circumvent a likely devaluation-inflation spiral.

The empirical results from the PVAR model highlight that fiscal deficit, when managed prudently, can play a stabilizing role in reducing social vulnerability in SSA. Therefore, fiscal policy should focus on increasing efficiency in public spending, particularly in sectors that have multiplier effects on health, education, and employment. Our findings also show that high levels of external debt increase social vulnerability, underscoring the need for debt sustainability strategies such as debt restructuring, better concessional loan targeting, and domestic resource mobilization. Additionally, the significant role of prior vulnerability levels implies that social investment, especially in early childhood care, basic education, and public health infrastructure, must be prioritized as long-term countermeasures to recurring shocks. Hence, aligning public budgets with these priorities will not only mitigate immediate vulnerabilities but also build structural resilience over time.

In conclusion, the findings of this study hope to make a modest contribution to policy efforts to aid SSA to cope with exogenous shocks in the wake of COVID-19 and suggest pathways to make the region economically resilient and proactive. By explaining the link between macroeconomic resilience and social vulnerability, the study concludes that the macroeconomic fragility in SSA inherently aggravates the vulnerable status of countries in the region and other concomitant socioeconomic quandaries. It is believed that the policy recommendations will help SSA countries become economically successful overtime and resilient in the face of the shock-stimulated vulnerability.

Finally, we recognize that our Social Vulnerability Index (SVI) does not capture all critical dimensions, such as gender, disability, and ethnicity, due to limited data availability. Future research efforts should prioritize collecting consistent social data across countries to allow for more comprehensive index construction.

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Appendix 1

List of the 20 SSA countries surveyed

1. Benin	11. Guinea-Bissau
2. Botswana	12. Kenya
3. Burkina Faso	13. Madagascar
4. Cameroon	14. Malawi
5. Central African Republic	15. Mali
6.Cote d'Ivoire	16. Mauritania
7.Equatorial Guinea	17. Mauritius
8. Gabon	18. Mozambique
9. Ghana	19. Niger
10. Guinea	20. Nigeria