

Measuring Economic Resilience Beyond GDP: A Composite Index for Evaluating Nigeria's Recovery from Global Commodity Shocks

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ABSTRACT

Gross Domestic Product (GDP) remains the dominant metric for assessing national economic performance, yet its narrow focus on output growth obscures a country's underlying capacity to absorb, adapt to, and recover from external shocks. This limitation is particularly consequential for commodity-dependent economies such as Nigeria, where GDP growth has repeatedly masked deep structural vulnerabilities exposed during the 2014–2016 oil price collapse and the 2020 COVID-19-induced commodity crash (Hallegatte, 2014; Martin & Sunley, 2015). This paper develops and applies a Nigeria Economic Resilience Index (NERI), a composite measure spanning four dimensions: macroeconomic stability, fiscal buffer capacity, structural diversification, and social welfare resilience. Using principal component analysis to derive indicator weights, the index is constructed from secondary macroeconomic and social data spanning 2010 to 2023. Results show that Nigeria's resilience score declined sharply during both major commodity shock episodes, with the fiscal buffer and structural diversification dimensions proving the most volatile and slowest to recover. Notably, periods of positive GDP growth did not always coincide with rising resilience scores, revealing hidden vulnerability that conventional GDP-based assessments fail to capture. The paper argues that composite resilience indices offer a more comprehensive diagnostic tool for policymakers seeking to build shock-resistant, diversified economies, and concludes with recommendations for institutionalising resilience monitoring in Nigeria's national statistical and fiscal planning systems.

Keywords: economic resilience; composite index; Nigeria; commodity shocks; beyond GDP

I INTRODUCTION

Gross Domestic Product has long served as the primary yardstick of national economic performance, yet its limitations as a measure of underlying economic health have been widely documented (Stiglitz, Sen, & Fitoussi, 2010; Costanza et al., 2014). GDP captures the volume of output produced within an economy but says little about the structural capacity of that economy to withstand, adapt to, and recover from external disturbances, an attribute increasingly referred to as economic resilience (Martin & Sunley, 2015; Hallegatte, 2014). For commodity-dependent economies, this blind spot carries significant policy risk, because periods of GDP growth driven by favourable commodity prices can conceal structural fragilities that surface abruptly once prices reverse (Guillaumont, 2010).

Nigeria, Africa's largest economy and a major oil exporter, illustrates this dynamic clearly. Oil and gas revenues have historically accounted for the majority of government revenue and foreign exchange earnings, even though the oil sector contributes a comparatively modest share of GDP (UNCTAD, 2022). This structural dependence exposed Nigeria to severe economic disruption during the 2014–2016 collapse in global oil prices, which triggered the country's first recession in 25 years, and again during the 2020 COVID-19 pandemic, when a simultaneous collapse in oil demand and prices pushed Nigeria into a second recession within four years (International Monetary Fund, 2021; Natural Resource Governance Institute, 2023). In both episodes, GDP growth figures alone provided limited early warning of the depth of underlying vulnerability or the unevenness of subsequent recovery across different parts of the economy.

In response to these limitations, a growing international literature has called for 'beyond GDP' approaches to national economic assessment, incorporating dimensions such as fiscal buffers, structural diversification, and social welfare outcomes into composite measures of resilience (OECD, 2011; Briguglio, 2014; Tsiotas, 2022). Figure 1 presents the conceptual framework underpinning this study, illustrating how four resilience dimensions are normalised and combined through principal component analysis (PCA) weighting to generate a single composite score, the Nigeria Economic Resilience Index (NERI).

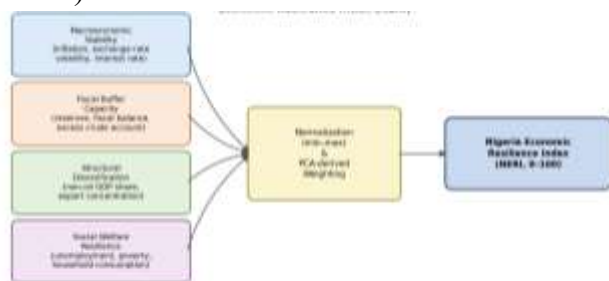


Figure 1. Conceptual framework for constructing the Nigeria Economic Resilience Index (NERI)

This paper develops and applies the NERI to assess Nigeria's economic resilience between 2010 and 2023, spanning both major commodity shock episodes and their aftermaths. The study addresses three research questions: (1) How has Nigeria's composite economic resilience evolved across periods of oil price volatility? (2) Which dimensions of resilience have proven most vulnerable to commodity shocks? (3) To what extent does the NERI diverge from conventional GDP-based assessments of economic recovery? In doing so, the paper contributes an empirically grounded, replicable resilience-measurement tool tailored to Nigeria's commodity-dependent structural context (Rose & Krausmann, 2013).

II LITERATURE REVIEW

2.1 Limitations of GDP as a Measure of Economic Performance

Critiques of GDP as a comprehensive measure of economic welfare date back several decades, but gained renewed policy prominence following the

Stiglitz-Sen-Fitoussi Commission's influential report, which argued that GDP fails to capture sustainability, distributional outcomes, and non-market dimensions of wellbeing (Stiglitz, Sen, & Fitoussi, 2010). Costanza et al. (2014) similarly argue that continued reliance on GDP as the primary policy metric risks incentivising short-term output growth at the expense of long-term structural resilience and sustainability. The OECD's 'How's Life?' framework operationalised this critique by developing a multidimensional wellbeing measurement system incorporating material living conditions alongside quality-of-life indicators (OECD, 2011).

2.2 Conceptualising Economic Resilience

Economic resilience has been defined in various ways across the literature, but most conceptualisations converge on the capacity of an economic system to absorb shocks, adapt its structure, and recover functionality following disturbance (Martin & Sunley, 2015; Hallegatte, 2014). Martin and Sunley (2015) distinguish between engineering resilience, understood as the speed of return to a prior equilibrium, and evolutionary resilience, which emphasises structural adaptation and transformation in response to shocks. Rose and Krausmann (2013) extend this framework to business and regional recovery contexts, proposing indices that capture both inherent resilience, present before a shock occurs, and adaptive resilience, mobilised during recovery.

2.3 Composite Resilience and Vulnerability Indices

Several composite indices have been developed to operationalise economic resilience empirically. Briguglio (2014) proposes a vulnerability-resilience framework for small states, combining exposure indicators with policy-induced resilience measures such as fiscal management and social cohesion. Guillaumont (2010) develops an Economic Vulnerability Index for small island and least-developed economies, incorporating structural exposure to shocks alongside remoteness

and export concentration. More recently, Tsiotas (2022) introduces a three-dimensional resilience index applied to historical GDP data across major global crises, while the Global Center on Adaptation (2022) has developed a Resilient Economies Index for African countries that introduces the concept of Gross Resilient Product, measuring the share of GDP not exposed to climate-related shocks. The ZOE Institute for Future-Fit Economies (2023) similarly proposes a European Economic Resilience Index built from over one hundred candidate indicators screened for relevance, reliability, and country coverage.

2.4 Nigeria's Structural Vulnerability to Commodity Shocks

Nigeria's economic history is closely tied to fluctuations in global oil prices. The International Monetary Fund's 2014 Article IV consultation with Nigeria highlighted the country's vulnerability to declining oil exports and revenue even amid a decade of strong average GDP growth (International Monetary Fund, 2015). Alley, Asekomeh, Mobolaji, and Adeniran (2014) provide empirical evidence that oil price shocks generate significant downstream effects on Nigeria's exchange rate, inflation, and fiscal position. The 2016 recession, Nigeria's first in 25 years, was driven substantially by the collapse in oil prices between 2014 and 2016, compounded by reduced production amid Niger Delta disruptions (Natural Resource Governance Institute, 2023). UNCTAD (2022) further documents that, despite various diversification initiatives, oil remained central to Nigeria's foreign exchange earnings and fiscal revenue through the early 2020s, leaving the economy exposed to renewed shocks during the COVID-19 pandemic (International Monetary Fund, 2021).

2.5 Research Gap

While composite resilience indices have been developed for small states, European economies, and cross-national panels, few studies have constructed a resilience index tailored specifically to Nigeria's structural characteristics and applied it

longitudinally across multiple commodity shock episodes (UNESCWA, 2020). This study addresses that gap by developing the NERI and applying it to assess Nigeria's resilience trajectory from 2010 to 2023.

III RESEARCH METHODOLOGY

3.1 Index Construction Approach

The NERI was constructed following established composite indicator methodology, combining dimension selection grounded in the resilience literature with statistical weighting derived from principal component analysis (PCA) (Briguglio, 2014; Tsiotas, 2022). Four dimensions were selected based on their theoretical relevance to Nigeria's commodity-shock exposure: macroeconomic stability, fiscal buffer capacity, structural diversification, and social welfare resilience. Table 1 presents the dimensions, their constituent indicators, data sources, and derived PCA weights.

Table 1. Dimensions, indicators, data sources, and PCA-derived weights used in constructing the Nigeria Economic Resilience Index (NERI).

Dimension	Indicators	Data source	PCA weight
Macroeconomic Stability	Inflation rate; exchange-rate volatility; monetary policy rate	CBN	0.29
Fiscal Buffer Capacity	Foreign reserves-to-import ratio; fiscal balance-to-GDP; excess crude account balance	CBN; NBS	0.26

Dimension	Indicators	Data source	PCA weight
Structural Diversification	Non-oil share of GDP; export concentration index; agriculture/services value added	NBS	0.24
Social Welfare Resilience	Unemployment rate; poverty headcount ratio; household final consumption growth	NBS; World Bank	0.21

3.2 Data Sources

Secondary time-series data for 2010–2023 were compiled from the Central Bank of Nigeria (CBN) Statistical Bulletin, the National Bureau of Statistics (NBS) Nigerian Gross Domestic Product reports, and World Bank Nigeria Development Update publications. Oil price data were sourced from OPEC reference basket averages. All indicators were compiled on an annual basis to align with the availability of official Nigerian macroeconomic statistics.

3.3 Normalisation and Weighting

Each indicator was normalised using min-max scaling to a common 0–100 range, with directionality adjusted so that higher values consistently indicate greater resilience. Dimension-level sub-indices were computed as the equally weighted average of their normalised indicators. Principal component analysis was then applied across the four dimension sub-indices to derive empirically grounded weights, following an approach consistent with prior composite resilience indices (Tsiotas, 2022; ZOE Institute for Future-Fit Economies, 2023). The composite NERI score for each year was calculated as the PCA-weighted sum of the four-dimension sub-indices, expressed on a 0–100 scale.

3.4 Analytical Strategy

The resulting NERI time series was compared against Nigeria's real GDP growth rate and average oil price over the same period to assess the extent to which the composite index diverged from, or corroborated, conventional GDP-based assessments of economic performance. Three shock phases were identified for comparative analysis: the pre-shock period (2010–2014), the 2014–2016 oil price collapse, and the 2020 COVID-19-induced commodity shock, allowing for a structured before-during-after comparison of dimension-level performance.

IV RESULTS AND FINDINGS

4.1 Overall Resilience Trend, 2010–2023

Figure 2, Panel A, presents the NERI trend alongside real GDP growth for 2010–2023. The composite index reached its highest pre-shock value in 2013 (61.1) before declining sharply through the 2014–2016 oil price collapse, reaching its lowest recorded value of 41.7 in 2016, the same year Nigeria entered recession. A partial recovery followed between 2017 and 2019, with the index reaching 52.6 in 2019, before declining again during the 2020 COVID-19-induced commodity shock to 44.8. By 2023, the index had recovered to 54.3, still below its 2013 pre-shock peak. Table 2 summarises NERI scores against GDP growth and oil prices for selected reference years.

Table 2. Nigeria Economic Resilience Index (NERI), real GDP growth, and average oil price for selected reference years, 2013–2023.

Year	NERI score (0–100)	Real GDP growth (%)	Avg. oil price (USD/bbl)	Phase
2013	61.1	5.4	109	Pre-shock
2015	48.3	2.7	53	Shock onset

Year	NERI score (0–100)	Real GDP growth (%)	Avg. oil price (USD/bbl)	Phase
2016	41.7	-1.6	44	Shock trough
2019	52.6	2.2	64	Pre-COVID recovery
2020	44.8	-1.8	42	COVID-19 shock
2023	54.3	2.9	82	Recovery

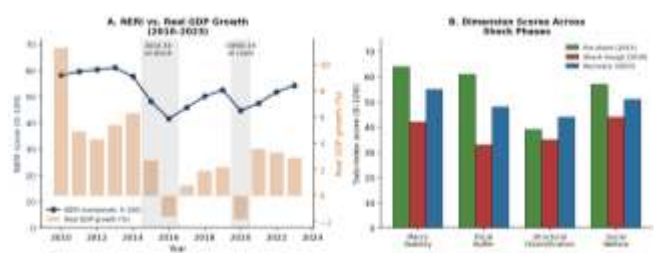


Figure 2. (A) NERI trend versus real GDP growth, 2010–2023; (B) dimension sub-index scores across pre-shock, shock trough, and recovery phases.

4.2 Divergence between NERI and GDP Growth

A notable finding is that NERI and GDP growth did not always move in tandem. In 2018, for example, real GDP growth remained modest but positive at 1.9%, while the NERI rose more substantially to 50.2, reflecting improvements in fiscal buffers and non-oil sector performance not fully captured by headline GDP figures. Conversely, in 2013, strong GDP growth of 5.4% coincided with a comparatively high but already-plateauing resilience score, suggesting that underlying structural vulnerabilities, particularly Nigeria's persistently low structural diversification sub-index, were building even as output growth appeared robust. This divergence supports the argument that GDP-based assessments alone can

mask accumulating structural fragility (Stiglitz, Sen, & Fitoussi, 2010; Martin & Sunley, 2015).

4.3 Dimension-Level Vulnerability

Figure 2, Panel B, decomposes resilience performance across the four dimensions during the pre-shock, shock trough, and recovery phases. The fiscal buffer capacity dimension exhibited the largest decline during the 2014–2016 shock, falling from 61 to 33, reflecting the rapid depletion of foreign reserves and the excess crude account as oil revenues collapsed (Natural Resource Governance Institute, 2023). The structural diversification dimension recorded the lowest scores throughout the entire period, never exceeding 44, underscoring the persistence of Nigeria's oil dependence despite repeated diversification initiatives (UNCTAD, 2022). By contrast, the social welfare resilience dimension proved comparatively more stable, though it too declined notably during both shock episodes, consistent with rising unemployment and poverty documented in national statistics during recession years.

4.4 Discussion

These findings indicate that Nigeria's economic resilience, as measured by the NERI, has followed a pattern of sharp shock-induced decline followed by incomplete recovery, with the composite index remaining below its 2013 peak even by 2023. The persistent weakness of the structural diversification dimension suggests that Nigeria's vulnerability to future commodity shocks remains structurally embedded rather than merely cyclical (Alley et al., 2014; UNCTAD, 2022). The fiscal buffer capacity dimension's volatility further highlights the importance of counter-cyclical fiscal management, including reserve accumulation during high-price periods, as a determinant of shock resilience (Hallegatte, 2014; Rose & Krausmann, 2013). Overall, the results reinforce the value of composite, multidimensional measurement approaches in revealing resilience dynamics that GDP growth alone does not capture (Briguglio, 2014; Tsiotas, 2022).

V CONCLUSION

This paper developed and applied the Nigeria Economic Resilience Index (NERI), a composite measure spanning macroeconomic stability, fiscal buffer capacity, structural diversification, and social welfare resilience, to assess Nigeria's capacity to absorb and recover from global commodity shocks between 2010 and 2023. Findings show that Nigeria's resilience declined sharply during both the 2014–2016 oil price collapse and the 2020 COVID-19-induced commodity shock, with structural diversification remaining persistently weak throughout the study period and fiscal buffers proving the most volatile dimension. Importantly, the NERI at times diverged from conventional GDP growth figures, revealing structural vulnerabilities that GDP-based assessments alone would not have detected.

The study recommends that Nigeria's national statistical and fiscal planning institutions consider institutionalising a resilience monitoring framework alongside conventional GDP reporting, enabling policymakers to track structural vulnerability in real time rather than only after shocks materialise (UNESCWA, 2020; OECD, 2011). Priority policy attention should focus on accelerating non-oil structural diversification and rebuilding fiscal buffers during periods of favourable oil prices, in order to strengthen shock-absorption capacity ahead of future commodity price volatility (Guillaumont, 2010; Global Center on Adaptation, 2022).

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