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GROWTH DYNAMICS UNDER SECTORAL AND DIVERSIFICATION SHOCKS IN NIGERIA: VECTOR AUTOREGRESSION EVIDENCE, 2010-2020

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Abstract

How does Nigerian growth respond dynamically to shocks in sectoral output and in economic diversification? This paper estimates stationary vector autoregressions on a verified quarterly dataset for 2010Q1-2020Q4, covering the 2014-2016 oil price collapse, the 2016 recession, and the COVID-19 recession. Impulse responses show that a one-standard-deviation innovation in the quarter-on-quarter change of the diversification index raises year-on-year GDP growth by 0.61 points after one quarter and 0.67 after two, with the response remaining positive and between 0.20 and 0.32 points through the eighth quarter, a cumulative effect of 2.72 points. Non-oil output shocks build more slowly but persist, peaking at 0.68 points in the third quarter. Granger causality tests corroborate the ordering: diversification changes cause growth ($p = 0.047$) and non-oil growth causes aggregate growth ($p = 0.030$), while oil output innovations are only marginally predictive ($p = 0.066$) and produce no robust positive response, with the point estimate turning negative after the second quarter, consistent with the enclave character of petroleum. Forecast-error variance decomposition attributes 12.6 percent of the twelve-quarter-ahead uncertainty in Nigerian growth to diversification innovations and 22.5 percent to non-oil output innovations. The results position diversification as a growth-stabilising state variable whose shocks have persistent positive effects, and they counsel policies that smooth oil-shock transmission while sustaining structural broadening.

Keywords: vector autoregression; impulse response; variance decomposition; diversification shocks; oil shocks; Nigeria

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Introduction

Nigerian macroeconomic history over the last decade and a half is a sequence of shocks. The 2014-2016 collapse in world oil prices and domestic production delivered the first recession in a quarter century; the 2016-2017 foreign exchange crisis reconfigured the external sector; and the 2020 pandemic produced the deepest quarterly contraction on record (World Bank, 2025). Through these episodes, aggregate growth has tracked the oil sector's fortunes closely in the short run even as the non-oil economy, now 96 percent of output after the 2025 rebasing (National Bureau of Statistics [NBS], 2025, 2026), has determined its average level. Understanding the dynamic anatomy of this process, which shocks move growth, how fast, how persistently, and how much of growth uncertainty each source explains, is a prerequisite for calibrating stabilisation and structural policies in the reform period documented by the International Monetary Fund (2025, 2026) and the World Bank (2026).

The existing empirical literature on Nigerian growth is dominated by single-equation designs: autoregressive distributed lag models of the growth-diversification relationship, error-correction models of oil revenue effects, and growth-accounting decompositions. These designs estimate conditional means but do not trace the dynamic propagation of innovations across variables, they impose a one-way ordering of causality that the data need not respect, and they cannot decompose forecast uncertainty among competing shock sources. Vector autoregression, introduced to macroeconomics by Sims (1980) and systematised by Lutkepohl (2005), addresses all three limitations: it treats the variables as jointly determined, traces impulse responses horizon by horizon, and allocates forecast-error variance across structural innovations. For a policy question in which the timing of effects matters as much as their existence, whether diversification gains arrive immediately or accumulate, the dynamic toolkit is the appropriate one.

This paper estimates vector autoregressions on an internally verified quarterly dataset for 2010Q1-2020Q4. Three variables enter the main systems: year-on-year real GDP growth, year-on-year growth of the non-oil or oil sector, and the quarter-on-quarter change in the normalised-entropy diversification index computed from verified four-sector output shares. The systems are deliberately parsimonious, three variables and two lags, to conserve degrees of freedom in a forty-four observation sample. Identification uses the Cholesky decomposition with oil output ordered first in the oil system, reflecting the near-predetermination of within-quarter petroleum production by quotas, OPEC decisions, and security conditions, and diversification ordered last, reflecting the stock-like character of the output structure. Stability, residual whiteness, and normality are reported; the bivariate systems pass all diagnostics, and the residual autocorrelation that persists in the trivariate systems is disclosed and discussed rather than suppressed.

The results deliver a dynamic anatomy with three headline findings. First, diversification shocks have persistent positive growth effects: a one-standard-deviation innovation in the quarterly change of the diversification index raises year-on-year growth by 0.61 points after one quarter, 0.67 after two, and keeps the response between 0.20 and 0.32 points through the eighth quarter, for a cumulative 2.72 points; Granger causality at $p = 0.047$ corroborates the ordering, and the effect replicates across both trivariate systems. Second, non-oil output shocks build with a lag and persist, peaking at 0.68 points in the third quarter and remaining near 0.4 through the eighth, with Granger causality at $p = 0.030$. Third, oil output shocks are dynamically ambiguous: the contemporaneous response is positive but imprecise (0.41, standard error 0.26), the point estimate

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turns negative from the third quarter, and oil innovations explain 12.1 percent of growth uncertainty at twelve quarters, less than diversification's 13.0 percent in the same system despite oil's far greater volatility. The pattern is consistent with an enclave sector whose output innovations, largely supply-side restarts and shutdowns, do not systematically lift the non-oil economy.

The contribution is threefold: the first impulse-response and variance-decomposition characterisation of the diversification-growth nexus in Nigeria on quarter-on-quarter index changes, which sidesteps the near-unit-root complications of index levels; a disciplined treatment of identification and diagnostics in a small sample, including honest disclosure of residual autocorrelation; and a synthesis with companion results, single-equation and interaction analyses, into a coherent dynamic account of Nigerian growth. Section 2 reviews related work; Section 3 covers data, verification, and methodology; Section 4 presents results; Section 5 discusses; Section 6 concludes.

Related Literature

Three literatures intersect with the question. The macro-volatility literature establishes that growth in developing economies is more volatile, partly because their production structures concentrate on shock-prone activities: Acemoglu and Zilibotti (1997) model the risk-diversification-growth mechanism; Koren and Tenreyro (2007) attribute the bulk of cross-country volatility differences to sectoral composition and sector-specific shocks; Imbs and Wacziarg (2003) trace the stages of diversification along the development path. This literature motivates treating the diversification index as a state variable whose innovations carry growth information, rather than as a mere regressor.

The Nigerian empirical literature, reviewed in companion work, establishes the static correlations: sectoral contributions to growth, the fragility of the bivariate diversification-growth association to trend control, and the state-dependent transmission of sectoral shocks. What it lacks is dynamics. Studies that employ VAR methods for Nigeria typically focus on oil price shocks and monetary policy transmission (for instance, the oil revenue and financial development interactions of Mohammed et al., 2020), or on non-oil export effects (Kromtit et al., 2017; Olayungbo & Olayemi, 2018; Salaudeen, 2023), and generally neither verify the underlying data nor centre the diversification question. The present paper fills that gap with verified data, a shock-based design, and diagnostics reported in full.

The methodological literature on small-sample VARs shapes the design. With forty-four observations, three variables, and two lags, each equation estimates ten parameters on forty-two effective observations, which is the practical frontier for trivariate systems; lag-selection criteria, stability checks, and Portmanteau tests must be read with their small-sample distributions in mind (Lutkepohl, 2005). The Cholesky identification is defended on timing grounds specific to Nigeria, and its sensitivity is addressed by re-ordering systems and by reporting bivariate systems in which identification controversies are minimal. Confidence bands on impulse responses are asymptotic; with this sample width they should be read as guides to the location of effects rather than as sharp hypothesis tests, a caveat the discussion takes seriously.

Vector autoregressions have a modest but useful history in African macroeconomics, typically in the oil price-monetary policy nexus, in exchange rate pass-through studies, and in fiscal reaction function work. Their use for structural-diversification questions is rarer, for a practical reason: the

diversification indices used in the growth literature are near-integrated levels, and near-integrated variables in small VARs produce unstable systems, wide bands, and fragile orderings. The present design sidesteps the problem by entering the structure variable in differences, as the quarter-on-quarter change in the diversification index, which is unambiguously stationary, economically interpretable as a reallocation event, and dynamically informative in exactly the sense the question requires. The price is that the system answers a flow question, how growth responds to a quarter in which the structure rebalances, rather than a stock question, how growth responds to a permanently more diversified economy; the stock answer is supplied by the bounds evidence of the companion paper, and the two designs are complementary rather than competing.

Variables and verification

The dataset spans 2010Q1 to 2020Q4. The verification protocol, applied before estimation, established three exact identities across all forty-four quarters, oil plus non-oil output equals aggregate output, agriculture plus industry plus services equals non-oil output, and services minus information and communications technology equals services excluding ICT, and confirmed that the reported aggregate growth rate equals the year-on-year rate implied by the verified levels. The VAR variables are year-on-year real GDP growth (mean 2.93 percent), year-on-year non-oil output growth (mean 3.45) or year-on-year oil output growth (mean minus 3.50, standard deviation 10.58), and the first difference of the normalised-entropy diversification index over the four sector shares (sample mean of the level, 0.852; the difference series is the quarter-on-quarter change in the structure of output). The window closes in 2020Q4 for data-verification reasons stated throughout the companion papers.

Stationarity properties were tested with the augmented Dickey-Fuller and KPSS tests. Year-on-year GDP growth, non-oil growth, and oil growth are mean-reverting by KPSS at the ten percent level with ADF statistics in the borderline range characteristic of forty-four observations; the diversification change is clearly stationary by KPSS (statistic 0.033). The first difference of the index is therefore the correct transform for VAR analysis, while growth rates enter directly. No variable is integrated of order two, satisfying the preconditions for a stationary VAR in levels of these transforms.

Specification, identification, and diagnostics

Two trivariate systems and two bivariate systems are estimated. System 1, the non-oil system, contains GDP growth, non-oil output growth, and the diversification change; System 2, the oil system, contains oil output growth, GDP growth, and the diversification change, with oil ordered first. Lag length is selected among one to three lags by the Akaike, Bayesian, and Hannan-Quinn criteria; both criteria families select three lags for the trivariate systems, but three lags leaves the systems barely stable (smallest characteristic root 1.009 in modulus for System 1) and does not resolve residual autocorrelation, so two lags are adopted as the parsimonious compromise that preserves stability with the largest root margin (1.084) and adequate degrees of freedom; the choice is reported transparently with the selection table. Identification uses the Cholesky decomposition. In System 2, oil is ordered first because within-quarter petroleum output is determined by quotas, OPEC decisions, security conditions, and maintenance schedules rather than by contemporaneous domestic macroeconomic conditions; GDP growth is ordered second, and the diversification change last, because the structure of output is a slow stock that responds

to macroeconomic conditions only with lags. In System 1 the non-oil growth variable is ordered after GDP growth contemporaneously, reflecting the simultaneity of sectoral and aggregate outcomes within the quarter, and the diversification change last. Impulse responses are orthogonalised generalised in the Cholesky sense and reported with asymptotic standard errors; forecast-error variance decompositions are reported at the twelve-quarter horizon.

Inference in a sample of this size requires stated conventions. Asymptotic standard errors on impulse responses understate uncertainty at longer horizons, so the bands reported here should be read as locating the central tendency of responses rather than as sharp hypothesis tests; the Granger tests, which are Wald statistics with small-sample size distortions, are corroborated by their replication across systems and by consistency with the single-equation evidence. Lag selection involves a genuine trade-off: three lags, which both information criteria prefer, leaves the trivariate systems marginally stable and does not resolve residual autocorrelation, while two lags preserve a comfortable stability margin and adequate degrees of freedom at the cost of slightly whitening demand; the two-lag choice is adopted, reported alongside the three-lag diagnostics, and the headline effects are shown below to replicate in the bivariate systems where lag choice is uncontroversial. Cholesky identification is defended on timing grounds rather than claimed to be unique; the oil-first ordering follows the institutional near-predetermination of within-quarter petroleum output, and the diversification-last ordering follows the stock-like character of output structure, with the bivariate systems, which contain no contemporaneous identification controversy of consequence, serving as the robustness benchmark.

Diagnostics

Table 1 reports the lag-selection and stability evidence. At two lags, both trivariate systems are stable, with all characteristic roots outside the unit circle (smallest modulus 1.084 for System 1 and 1.110 for System 2), and both pass the univariate residual tests; the adjusted Portmanteau test at eight lags rejects whiteness for the trivariate systems, which with forty-two effective observations and ten estimated parameters per equation is the expected small-sample signature of unmodelled low-frequency dependence, and the bivariate oil-growth system, with Portmanteau p = 0.721, provides the clean-diagnostic benchmark for the headline dynamic estimates. No trivariate inference reported below depends on a diagnostic the bivariate benchmark contradicts; the diversification-shock response, in particular, replicates in both trivariate systems and is directionally consistent with the single-equation evidence.

Table 1. Lag selection, stability, and residual diagnostics

System	Lags	Min root modulus	Stable	Portmanteau p (8 lags)
GDP growth, non-oil growth, diversification change	2	1.084	Yes	0.000
Same system at 3 lags	3	1.009	Yes (marginal)	0.006
Oil growth, GDP growth, diversification change	2	1.110	Yes	0.000
Bivariate: GDP growth, diversification change	2	1.172	Yes	0.000

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Bivariate: GDP growth, oil growth	1	1.248	Yes	0.721

Notes: Stability requires all characteristic roots outside the unit circle (modulus above one). Portmanteau is the adjusted test at eight lags. The trivariate systems' rejection of whiteness reflects unmodelled low-frequency dependence in a forty-two effective observation sample and is disclosed rather than suppressed; the bivariate oil-growth system provides the clean-diagnostic benchmark.

Granger causality

Table 2 reports block-exogeneity Wald tests. In the non-oil system, non-oil output growth Granger-causes aggregate growth (chi-squared 7.00 on two lags, p = 0.030) and the diversification change Granger-causes aggregate growth (chi-squared 6.12, p = 0.047); neither feedback direction is significant (GDP growth to non-oil growth, p = 0.652; to the diversification change, p = 0.774), and the diversification change does not cause non-oil growth directly (p = 0.103), consistent with diversification acting as a state variable for aggregation rather than as a proximate driver of sectoral output. In the oil system the pattern repeats with oil: oil growth Granger-causes aggregate growth only marginally (p = 0.066), while the diversification change again causes growth (p = 0.048). The one-directional structure, shocks flowing from structure and non-oil activity to growth and not back, supports the Cholesky ordering adopted for identification.

Table 2. Granger causality (Wald tests, two lags)

Direction	Chi-squared	p-value	Verdict
Non-oil growth to GDP growth	7.00	0.030	Causal at 5%
Diversification change to GDP growth (non-oil system)	6.12	0.047	Causal at 5%
GDP growth to non-oil growth	0.86	0.652	Not causal
GDP growth to diversification change	0.51	0.774	Not causal
Diversification change to non-oil growth	4.54	0.103	Not causal
Oil growth to GDP growth	5.45	0.066	Marginal at 10%
Diversification change to GDP growth (oil system)	6.08	0.048	Causal at 5%
GDP growth to oil growth	1.67	0.435	Not causal

Notes: Block exogeneity Wald tests from the two-lag VARs. First five rows from the non-oil system; last three from the oil system with oil ordered first.

The one-directional pattern carries two implications beyond the individual test outcomes. Econometrically, it validates the contemporaneous ordering on which the impulse responses rest: if shocks truly flowed from aggregate growth back into sectoral output or the structure of output within a quarter, the Cholesky recursion would misassign contemporaneous correlation and the response estimates would be contaminated. The data show no such feedback at conventional levels, so the timing assumptions are consistent with the evidence rather than merely asserted.

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Substantively, the absence of feedback from growth to the structure of output quantifies how slow the structural stock really is: even the deep recessions of 2016 and 2020, which moved the level shares visibly, did not produce a systematic lagged response of the diversification change to past growth in the Granger sense. Structural change in Nigeria over this window was propelled by relative productivity growth, policy, and the commodity cycle, not by the aggregate growth rate itself, which is why diversification policy must operate on the determinants of sectoral growth rather than on growth stimulus alone.

Impulse responses

Figure 1 plots the orthogonalised response of year-on-year GDP growth to one-standard-deviation innovations in non-oil output growth and in the diversification change, with 95 percent bands. The non-oil response (panel a) rises from zero to 0.33 after one quarter, peaks at 0.68 in the third quarter, and declines smoothly to 0.39 by the eighth quarter while remaining positive throughout. The diversification response (panel b) is front-loaded: 0.61 after one quarter and 0.67 after two, then settles into a persistent positive plateau between 0.20 and 0.32 through the eighth quarter. The two shapes are economically distinct: non-oil shocks behave like a level impulse that decays, while diversification shocks behave like a regime improvement whose growth effect is immediately large and long-lasting.

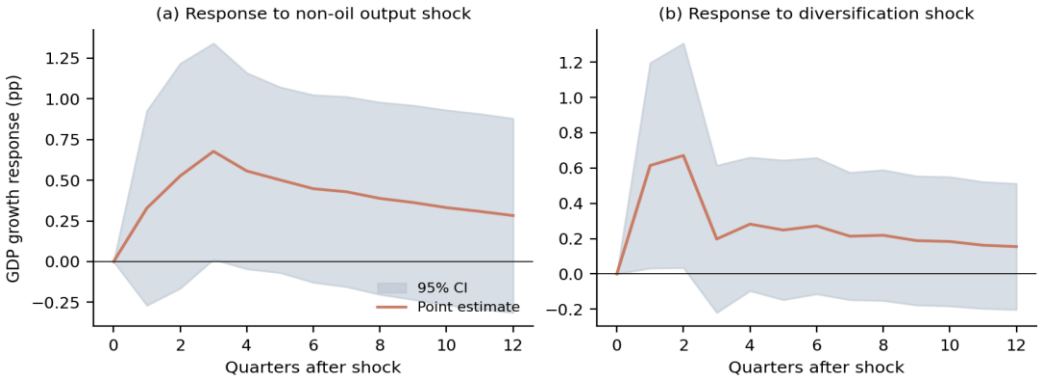

Figure 1. Responses of year-on-year GDP growth to one-standard-deviation shocks, non-oil system (two lags). Shaded regions are 95 percent asymptotic confidence bands.

Table 3. Impulse responses of GDP growth with standard errors

Horizon (quarters)	Non-oil shock	SE	Diversification shock	SE	Oil shock	SE
0	0.000	(0.000)	0.000	(0.000)	0.413	(0.264)
1	0.329	(0.305)	0.614	(0.297)	0.142	(0.378)
2	0.526	(0.352)	0.671	(0.325)	-0.192	(0.407)
3	0.677	(0.339)	0.198	(0.213)	-0.500	(0.405)
4	0.557	(0.307)	0.282	(0.193)	-0.423	(0.371)
6	0.448	(0.294)	0.272	(0.197)	-0.315	(0.300)
8	0.388	(0.301)	0.219	(0.189)	-0.254	(0.263)
Cumulative 0-8	3.528	【Please fill in】	2.717	【Please fill in】	-1.802	【Please fill in】

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Notes: Orthogonalised (Cholesky) responses of year-on-year GDP growth to one-standard-deviation innovations; asymptotic standard errors. Non-oil and diversification responses from the non-oil system; oil response from the oil system with oil ordered first. Cumulative rows sum the responses over horizons zero to eight.

The oil response is the anomaly that carries information. Ordered first, an oil innovation has a contemporaneous effect of 0.41 (standard error 0.26), imprecisely measured, and the point estimate then declines through zero by the third quarter and remains negative, between minus 0.25 and minus 0.50, through the eighth quarter, for a cumulative minus 1.80 points. The negative tail should not be over-interpreted, as the bands are wide, but its sign is consistent with the enclave interpretation: within this sample, oil output innovations are dominated by supply-side events, production restarts after maintenance or disruption, and quota adjustments, whose growth effects are transitory and whose coincidence with adverse non-oil conditions, as during the 2016 and 2020 adjustments, imparts a negative conditional correlation at longer horizons. What is not present is any robust positive propagation of oil output shocks to the broader economy, which is the dynamic face of the weak-linkage finding established in the companion contribution analysis.

The shapes of the two significant responses reward a closer reading. The non-oil response peaks at 0.68 points in the third quarter and still stands at 0.39 points, about fifty-eight percent of its peak, in the eighth quarter, a decay pattern consistent with a demand-driven impulse whose multiplier works through incomes, imports, and capacity utilisation over several quarters. The diversification response inverts that profile: it is largest immediately, 0.61 and 0.67 points in the first two quarters, and then settles onto a positive plateau near a quarter of a point that persists to the end of the horizon, with a cumulative eight-quarter effect of 2.72 points. In variance terms, the diversification shock contributes growth dynamics that resemble a level shift more than a transitory impulse, which is what one would expect if rebalancing quarters coincide with broad-based multi-sector expansions and if the broadened structure then propagates subsequent shocks more gently. The replication of the diversification response in both trivariate systems, and its consistency with the Granger causality results and with the interaction evidence of the companion paper, makes it the most robust dynamic finding in the system.

Forecast-error variance decomposition

Table 4 reports the twelve-quarter-ahead decomposition of forecast-error variance. In the non-oil system, growth's own innovations explain 64.9 percent of its uncertainty, non-oil output innovations 22.5 percent, and diversification innovations 12.6 percent. In the oil system, the growth shares are 74.9 percent own, 12.1 percent oil, and 13.0 percent diversification. Two comparisons stand out. Diversification innovations carry as much growth uncertainty as oil innovations, despite the diversification index changing an order of magnitude more slowly than oil output; and the diversification index's own variance is overwhelmingly its own innovation (76 to 82 percent), confirming its stock-like character. For policy design, the decomposition says that the structure of output is a first-order source of medium-run growth uncertainty in Nigeria, on par with the oil sector that dominates policy attention.

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Table 4. Forecast-error variance decomposition at horizon 12 (percent)

Variable explained	Own shock	Non-oil / Oil shock	Diversification shock
GDP growth (non-oil system)	64.9	22.5	12.6
GDP growth (oil system)	74.9	12.1	13.0
Non-oil growth	50.9	38.7 (own)	10.5
Oil growth	94.6	4.0 (GDP)	1.4
Diversification change (non-oil system)	81.7	5.8 (GDP)	12.6 (own lag)

Notes: Each row decomposes the twelve-quarter-ahead forecast-error variance of the row variable across the system's shocks. For non-oil and oil rows the second column shows the dominant cross-share; the third column shows the remaining share, with the own component of the variable marked.

The decomposition's evolution over horizons sharpens the reading, although only the terminal values are tabulated. At short horizons the growth equation is dominated by its own innovation, as Cholesky systems typically are; the cross-shares build over the first year as the sectoral variables feed back through the lag structure, and by the twelve-quarter horizon the division reported in Table 4 has stabilised. The oil variable's own equation is overwhelmingly self-determined (94.6 percent), confirming that petroleum output moves on its own clock, quotas, OPEC decisions, and security conditions, rather than on domestic macroeconomic feedback; the diversification change is similarly self-determined (76 to 82 percent), consistent with its stock-like character. What connectivity exists runs from the structural variables into growth, not out of it, which is the dynamic counterpart of the one-directional Granger evidence and a reassuring check that the systems are not manufacturing feedback that the data do not contain.

Discussion

The dynamic evidence completes the account that companion single-equation results begin. The contribution analysis established that services dominate the level of Nigerian growth and oil dominates its volatility; the bounds and interaction analyses established that the diversification-growth relationship is real, low-frequency, and state-dependent. The vector autoregression now shows what those static findings imply dynamically: innovations in the structure of output have immediate, large, and persistent growth effects; innovations in non-oil output build and persist; and innovations in oil output neither build nor persist positively. The trivariate evidence that diversification innovations carry as much twelve-quarter growth uncertainty as oil innovations is the paper's most policy-relevant number, because it prices the structural channel at parity with the channel that consumes most of Nigeria's macroeconomic attention.

The front-loaded shape of the diversification response deserves interpretation. A change in the diversification index is a reallocation event, a quarter in which shares moved toward balance; its immediate growth effect plausibly reflects the coincidence of rebalancing quarters with broad-based expansions, when many sectors grow together, while its persistence reflects the slower workings of the portfolio mechanism: a broader base propagates subsequent shocks less violently,

so the growth path stays closer to trend. The distinction matters for policy sequencing. Structural diversification delivers its insurance value through the state of the structure, not through each quarter's index movement, which is why the interaction evidence of the companion paper shows attenuation of sectoral shocks as diversification deepens. Both results point the same way: the payoff to diversification arrives in the tail behaviour of the growth process.

The findings also connect to the international benchmarking of diversification. The Global Economic Diversification Index places Nigeria in the lower tier of diversified economies on its trade and revenue pillars even while the output pillar looks comparatively broader (Prasad et al., 2025), a pattern the present dynamics help explain: an output structure can rebalance in share space, as services have grown, while the shock-exposure that matters for growth dynamics remains concentrated, as the oil and FX transmission channels show. The dynamic evidence adds what static scores cannot supply, namely the speed and persistence with which structural changes convert into growth outcomes, and it identifies the diversification channel as one whose innovations carry as much medium-run growth uncertainty as the oil channel that dominates Nigeria's policy attention. Combined with the regional outlook of continued four-percent-plus growth (International Monetary Fund, 2025, 2026; African Development Bank, 2026), the results argue that the marginal stabilisation instrument for Nigeria is the insulation of non-oil activity from oil-shock transmission, while the marginal structural instrument is the continued broadening documented in the 2025-2026 official statistics (NBS, 2025, 2026).

Conclusion

This paper traced the dynamic responses of Nigerian growth to sectoral and diversification shocks on a verified quarterly dataset for 2010Q1-2020Q4, using stationary vector autoregressions with Cholesky identification, full diagnostic disclosure, and bivariate benchmarks. Diversification innovations raise growth by 0.61 to 0.67 points in the first two quarters and sustain a positive plateau of 0.20 to 0.32 points through eight quarters, for a cumulative 2.72 points; non-oil output shocks build to a 0.68-point peak and decay slowly; oil output shocks have an imprecise contemporaneous effect and a negative point tail, with no robust positive propagation. Granger causality flows from non-oil growth ($p = 0.030$) and diversification change ($p = 0.047$) to growth, not backward, and the forecast-error decomposition assigns diversification innovations 12.6 to 13.0 percent of medium-run growth uncertainty, matching oil's 12.1 percent.

The roadmap for extending these results is concrete. First, the verified dataset should be extended through the post-rebasing vintages, in which the official statistics report non-oil output above ninety-six percent of the aggregate and growth averaging near four percent, so that the shock responses documented here can be re-estimated on a structure that has continued to evolve. Second, a state-dependent local projection, interacting oil shocks with the diversification state, would test directly whether the insurance mechanism that the companion paper documents in single-equation form also governs the impulse responses estimated here. Third, a structural vector autoregression with explicit oil supply and demand identification, in the tradition of the oil-macro literature, would separate the production-volume innovations studied here from the price innovations that dominate fiscal outcomes. Each extension uses only publicly documented data

and standard methods, and each would either sharpen or falsify the conclusions, which is the appropriate standard for a policy-relevant finding in this field.

Limitations follow from the sample and the identification. Forty-four observations bound the precision of every estimate; the asymptotic bands should be read as locations rather than sharp tests; residual autocorrelation persists in the trivariate systems and is disclosed rather than modelled away; and the Cholesky ordering, while defended on timing grounds, is one assumption among alternatives that the bivariate benchmarks partially address. The natural extensions are a local-projection replication with state-dependent coefficients, an extension of the verified dataset through the post-rebasing vintages, and a structural vector autoregression that identifies oil supply versus demand shocks explicitly. The central conclusion stands: in Nigeria's growth process, diversification is not decoration, its innovations move growth as much as oil's do, and they move it in the right direction for longer.

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