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# Mining Commitment and Climate Vulnerability: Evidence from Rainfall Shocks in Guinea.

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**Abstract**

This paper studies whether large mining commitments can reshape macroeconomic exposure to climate shocks before extraction begins. Focusing on Guinea—a highly rainfall-dependent economy—and the Simandou iron ore project, we test whether the sensitivity of growth to rainfall variability changes after a discrete commitment regime associated with major legal and contractual milestones. Using annual data and interaction specifications with Newey–West HAC inference, we find a pronounced regime shift: rainfall shocks are not precisely associated with GDP growth in the pre-commitment period, but become economically large and statistically meaningful after commitment. In the preferred specification with macro controls, a one–standard-deviation rainfall shock reduces real GDP growth by about 0.54 percentage points in the post-commitment regime, implying that rainfall variability explains a nontrivial share of observed growth volatility. Sectoral results indicate that amplification is not cleanly concentrated in agricultural growth; instead, post-commitment rainfall shocks are associated with a positive and significant response in services, consistent with altered co-movement and demand spillovers under changing sectoral composition. Complementary dynamic diagnostics and counterfactual simulations reinforce the timing and magnitude of this amplification. Overall, the findings suggest that extractive commitment can endogenously increase climate vulnerability by reshaping economic structure and shock propagation—even in the absence of mining production or resource revenues—highlighting the importance of aligning extractive planning with climate resilience and agricultural buffering capacity during pre-production phases.

**Keywords:** *climate shocks; rainfall variability; mining commitment; structural change; macroeconomic volatility; Guinea; Simandou.*

**Résumé**

Cet article analyse si de grands engagements miniers peuvent modifier l'exposition macroéconomique aux chocs climatiques avant le début de l'extraction. En se concentrant sur la Guinée, économie fortement dépendante des précipitations, et sur le projet de Simandou, nous examinons si la sensibilité de la croissance à la variabilité pluviométrique évolue après un régime d'engagement lié à des jalons juridiques et contractuels majeurs. À partir de données annuelles et de modèles à interactions estimés avec des erreurs HAC de Newey–West, nous identifions un changement de régime marqué : les chocs pluviométriques deviennent économiquement significatifs et statistiquement pertinents après l'engagement. Dans la spécification privilégiée, un choc d'un écart-type réduit la croissance réelle du PIB d'environ 0,54 point de pourcentage dans la période post-engagement. Les résultats sectoriels suggèrent que cette amplification ne se limite pas à l'agriculture, mais s'accompagne d'une réponse positive du secteur des services, traduisant une recomposition sectorielle et des effets de propagation. Ces résultats indiquent que les engagements extractifs peuvent accroître la vulnérabilité climatique en modifiant la structure économique, même en l'absence de production minière, soulignant la nécessité d'intégrer la résilience climatique dès les phases pré-productives.

**Mots clés :** *chocs climatiques ; précipitations ; engagement minier ; changement structurel ; vulnérabilité ; Guinée ; Simandou.*

## 1. Introduction

Climate shocks and extractive-led development are central features of many low-income and fragile economies, yet they are typically analyzed in isolation. A large climate–growth literature shows that weather variability—especially rainfall shocks—affects agricultural output, household welfare, and aggregate growth in settings where rain-fed production is pervasive and smoothing mechanisms are weak (Miguel, Satyanath & Sergenti, 2004; Dell, Jones & Olken, 2012; Burke, Hsiang & Miguel, 2015). In parallel, a large resource-economics literature emphasizes that natural resource prospects can reshape incentives, alter sectoral composition, and generate macroeconomic volatility through reallocation and institutional channels (Sachs & Warner, 1995; Auty, 2001; van der Ploeg, 2011). What remains less well understood is how these forces interact: specifically, whether the anticipation of large mining projects can change an economy's exposure to climate shocks before production begins.

This paper studies that interaction using Guinea and the Simandou iron ore project. Guinea is among the most rainfall-dependent economies in Sub-Saharan Africa. Located in the core of the West African monsoon system, it experiences a highly seasonal rainfall regime with substantial interannual variability. Limited irrigation coverage and weak water-storage infrastructure amplify the macroeconomic consequences of precipitation realizations, while the predominance of rain-fed production leaves broad segments of activity directly exposed to rainfall shocks. Existing assessments consistently classify Guinea as highly vulnerable to precipitation shocks (World Bank, 2023; IPCC, 2022). Importantly, rainfall risk in Guinea takes multiple forms: both negative rainfall shocks and episodes of excessive precipitation can disrupt agricultural cycles and damage transport infrastructure, with flooding events increasing in frequency and severity in recent decades (Hallegatte et al., 2016). In such an environment, rainfall shocks transmit beyond agriculture through rural incomes, food prices, consumption, and service-sector activity, creating economy-wide co-movement between weather and output (Dell, Jones & Olken, 2012).

A key premise of the paper is that climate vulnerability is not purely geographic; it is mediated by economic structure and shock-absorbing capacity. Agriculture in Guinea is not only large, it has historically served as a stabilizing sector. The majority of the labor force depends on smallholder farming characterized by limited mechanization, weak input markets, and heavy reliance on rainfall for staple crops (World Bank, 2023; Othering & Belonging Institute, 2025). Beyond its direct contribution to value added, agriculture has functioned as a buffer during periods of external stress—absorbing labor and stabilizing consumption when formal employment and social protection systems are limited (Dercon, 2004; Barrett et al., 2011).

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

Crucially, this buffering role is contingent. It depends on continued investment, labor availability, and policy attention. Structural shifts that weaken agriculture can erode this stabilizer even if agricultural output does not collapse immediately. This idea aligns with resilience-based approaches emphasizing that vulnerability depends on sectoral composition and the availability of mechanisms that absorb shocks rather than propagate them (Hallegatte et al., 2016; Kahn et al., 2021).

Simandou provides a setting in which a large extractive project generates a sharp “commitment” shock in expectations while remaining in a prolonged pre-production phase. The Simandou deposit is one of the world’s largest known high-grade iron ore reserves and has attracted sustained international interest since the early 2000s. Although production has been delayed by governance disputes, infrastructure requirements, and financing constraints, a sequence of legal, contractual, and diplomatic milestones created discrete shifts in expectations about future mining activity. This long pre-production phase is analytically valuable: it allows anticipation effects to operate through expectations, reallocation, and policy priorities in the absence of mining output or fiscal revenues. This feature connects the paper to the “news shock” literature, which shows that resource discoveries and commitments can generate real effects prior to production through forward-looking reallocation behavior (Arezki, Ramey & Sheng, 2017; Cust & Mihalyi, 2017).

The paper’s core hypothesis is that mining commitment can amplify climate vulnerability by reshaping the transmission of rainfall shocks. Mining commitment does not affect rainfall realizations; rather, it changes how rainfall shocks propagate through the economy. In a fragile setting with limited smoothing mechanisms, commitment can shift perceived returns and policy priorities, altering labor allocation, private investment, and public spending patterns. If these forces weaken agriculture’s buffering role—or more generally reconfigure sectoral linkages—identical rainfall shocks may translate into larger aggregate growth effects after commitment than before, even prior to any mining production.

The empirical results support this mechanism. Using an interaction-based strategy that allows rainfall shocks to have different effects before and after the mining commitment regime, the paper finds that rainfall deviations become macroeconomically consequential only in the post-commitment period. In the preferred specification with macro controls, a one–standard-deviation rainfall shock reduces real GDP growth by approximately 0.54 percentage points after commitment, while pre-commitment rainfall effects are not precisely estimated. This magnitude is economically meaningful: rainfall variability alone explains a sizable share of observed post-commitment growth volatility, consistent with a regime shift in shock

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

propagation. Dynamic diagnostics reinforce this timing: rolling co-movement measures and stylized facts show a marked strengthening of the rainfall–growth relationship around the commitment window, and counterfactual simulations indicate that removing post-commitment amplification yields a substantially smoother post-commitment growth path.

Sectoral evidence indicates that amplification operates through broad linkages and reconfigured co-movement rather than through a clean increase in agricultural rainfall sensitivity. The sectoral interaction estimates do not deliver a precise increase in agriculture's rainfall elasticity in the post-commitment period. Instead, the most pronounced post-commitment response appears in services, where rainfall shocks are associated with significantly higher growth. This pattern is not inconsistent with a negative aggregate GDP effect: aggregate growth reflects a weighted sum of sectoral growth rates, and commitment coincides with sizeable changes in sectoral shares, including a decline in the services share. In this setting, services can co-move positively with rainfall through income and demand spillovers while aggregate growth falls due to negative effects elsewhere or through channels such as external adjustment and macro constraints. The sectoral configuration therefore supports the interpretation that commitment reshapes the economy's shock propagation system—changing composition, linkages, and the effectiveness of existing buffers—rather than simply intensifying agronomic sensitivity.

The paper makes three contributions. First, it provides evidence that extractive commitment can alter climate vulnerability before production begins, highlighting a propagation channel distinct from revenue-driven resource booms. Second, it reframes the interaction between extractives and climate risk as a macro-resilience issue: development strategies can change exposure not only by shifting average growth, but by changing how exogenous shocks map into aggregate volatility. Third, it connects the resource-anticipation literature to the climate–growth literature by showing that expectation-driven structural change can endogenously steepen the rainfall–growth relationship, even when climate variance itself is unchanged.

The remainder of the paper is organized as follows. Section 2 describes Guinea's rainfall dependence, the buffering role of agriculture, and the Simandou commitment episode. Section 3 presents the data, mechanism, stylized facts, and empirical strategy. Section 4 reports the main results on aggregate and sectoral rainfall sensitivity and associated structural change. Section 5 discusses the implications for volatility, shock propagation, and policy coordination between extractive planning and climate resilience. Section 6 concludes.

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

## 2. Background: Climate Exposure, Agricultural Structure, and the Simandou Mining Commitment

### 2.1 Climate Exposure and Rainfall Dependence in Guinea

Guinea is among the most climate-exposed economies in Sub-Saharan Africa, with rainfall variability constituting the dominant channel through which climate shocks affect economic activity. Located in the core of the West African monsoon system, Guinea experiences a highly seasonal rainfall regime with substantial interannual variability. This variability is amplified by limited irrigation coverage, weak water-storage infrastructure, and the predominance of rain-fed production systems, rendering large parts of the economy directly sensitive to precipitation realizations.

Existing assessments consistently classify Guinea as highly vulnerable to precipitation shocks rather than temperature extremes (World Bank, 2023; IPCC, 2022). Unlike Sahelian economies where drought risk dominates, Guinea is exposed to both negative rainfall shocks and episodes of excessive precipitation. Heavy rainfall and flooding have become increasingly frequent, disrupting agricultural cycles, damaging transport infrastructure, and increasing post-harvest losses (Hallegatte et al., 2016).

From a macroeconomic perspective, rainfall shocks in Guinea propagate well beyond agriculture. Weather-induced fluctuations in food output affect rural incomes, food prices, consumption, and service-sector activity, generating economy-wide effects. This pattern is consistent with the broader climate–growth literature, which documents a tight coupling between weather realizations and aggregate output in low-income economies with large agricultural sectors and limited smoothing mechanisms (Dell, Jones, and Olken, 2012). Guinea represents an extreme case of this mechanism due to both the scale of agriculture and the absence of effective insurance or stabilization institutions.

### 2.2 Agricultural Structure and the Buffering Role of Agriculture

Agriculture occupies a central position in Guinea's economic structure, both as a source of employment and as a macroeconomic stabilizer. The sector employs a majority of the labor force and contributes a substantial share of value added to GDP (World Bank, 2025). Production is dominated by smallholder farming with limited mechanization, weak input markets, and heavy reliance on rainfall for staple crops such as rice, maize, cassava, and groundnuts.

Beyond its direct contribution to output, agriculture has historically functioned as a buffer against macroeconomic shocks. In periods of external stress—such as commodity price downturns, fiscal contractions, or demand shocks—subsistence and semi-subsistence farming has absorbed labor and stabilized household consumption, a pattern widely documented in low-

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

income settings (Dercon, 2004; Barrett et al., 2011). This buffering role is particularly important in Guinea, where formal labor markets are thin and social protection systems remain limited.
Crucially, this stabilizing function is endogenous and contingent. It depends on the sector's capacity to absorb labor, sustain production, and receive continued policy and investment support. Structural changes that weaken agriculture—through declining investment, labor reallocation, or reduced policy attention—can erode its buffering role even if agricultural output does not immediately collapse. Recent work on climate resilience emphasizes that while diversification away from climate-sensitive sectors can reduce exposure, premature or poorly managed reallocation may instead amplify vulnerability when alternative sectors lack shock-absorbing capacity (Hallegatte et al., 2016; Kahn et al., 2021).
This conditional nature of agricultural buffering is central to the mechanism examined in this paper.

### 2.3 The Simandou Project and the Mining Commitment Shock

The Simandou iron ore deposit is one of the world's largest known high-grade iron ore reserves and has long been viewed as a potentially transformative project for Guinea's economy. Located in the southeastern region of the country, Simandou has attracted sustained international interest since the early 2000s. While production has repeatedly been delayed due to governance disputes, infrastructure requirements, and financing constraints, a series of legal, contractual, and diplomatic milestones generated discrete shifts in expectations regarding future mining activity.
For the purposes of this paper, the defining feature of Simandou is its prolonged pre-production phase. During this period, anticipated future rents, infrastructure investments, and associated economic opportunities influenced behavior well before any extraction occurred. This aligns with recent evidence that "news shocks" related to resource discoveries or commitments can generate real macroeconomic effects through expectation and reallocation channels, even in the absence of production or revenues (Arezki, Ramey, and Sheng, 2017; Cust and Mihalyi, 2017).
In Guinea, mining commitment associated with Simandou coincided with heightened foreign interest, shifts in public investment planning, and policy discourse oriented toward extractive-led growth. These developments unfolded in a context of limited institutional capacity and weak coordination between extractive policy, agricultural development, and climate adaptation strategies. As in other resource-rich fragile states, the prospect of future mining revenues plausibly altered incentives across sectors, affecting labor allocation, private investment, and public spending priorities (van der Ploeg, 2011).

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

Importantly, during the period studied in this paper, Simandou did not generate significant mining output or fiscal revenues. This feature allows us to isolate the effects of mining commitment and anticipation from those of realized resource booms.

### 2.4 Why Guinea Is an Informative Case

The combination of high climate exposure, a large agricultural sector with buffering potential, and a well-identified mining commitment shock makes Guinea an especially informative setting for studying interaction effects between extractive anticipation and climate vulnerability. Unlike contexts in which mining production rapidly dominates the economy, Guinea's extended pre-production phase enables a clean empirical distinction between expectation-driven structural change and output-driven channels.

While Guinea is a single-country case, the mechanisms examined here are relevant for a broader class of low-income, resource-rich economies facing increasing climate volatility. Many such countries are simultaneously encouraged to pursue extractive-led development and to build climate resilience, yet the interaction between these objectives—and the possibility that extractive anticipation may amplify climate vulnerability—remains insufficiently understood.

## 3. Data and Empirical Strategy

### 3.1 Data and Variable Construction

The analysis relies on the macroeconomic dataset developed in Diallo (2026), which examines mining commitments and macroeconomic regime shifts in Guinea and is currently under review. The data are annual and span a sufficiently long period to capture both pre- and post-mining commitment dynamics, while remaining entirely prior to large-scale mining production. This temporal structure is essential, as it allows the analysis to isolate anticipation effects associated with mining commitment from revenue-driven resource booms.

Aggregate economic activity is measured using real GDP growth, computed as the log difference of real GDP. To study sectoral transmission mechanisms, the analysis exploits sectoral value-added data for agriculture, industry, manufacturing, and services. Sectoral outcomes are considered both in terms of real growth rates and value-added shares in total GDP. The use of value-added shares is particularly important, as it allows us to capture gradual structural reallocation that may not be immediately visible in growth rates but is central to the erosion of buffering capacity.

Climate exposure is measured using annual rainfall, which is the most relevant climatic variable for Guinea's economy given the predominance of rain-fed agriculture and the limited role of irrigation. Rainfall shocks are constructed as standardized deviations from the long-run mean,

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

such that coefficients can be interpreted as responses to a one-standard-deviation shock. This approach follows the standard practice in the climate–growth literature and facilitates comparison with existing estimates.

The key institutional variable is a mining commitment indicator capturing the period following major legal and contractual milestones associated with the Simandou iron ore project. These milestones—including licensing decisions, ratification of agreements, and commitments to large-scale infrastructure—generated a credible shift in expectations about Guinea's economic future. Importantly, these events precede any significant mining production or revenue flows. As a result, the commitment indicator captures changes in expectations, incentives, and allocation decisions rather than realized resource income.

The empirical specifications also include a parsimonious set of macroeconomic controls, consistent with the earlier Simandou paper, to account for external demand conditions, terms-of-trade movements, and other aggregate influences. Controls are included conservatively to preserve degrees of freedom and avoid absorbing variation central to identification.

### 3.2 Conceptual Framework and Mechanism

The empirical analysis is guided by a conceptual framework in which climate vulnerability is not solely determined by geography or weather realizations, but is shaped endogenously by economic structure. Mining commitment does not affect rainfall itself; instead, it alters the way rainfall shocks propagate through the economy.

The mechanism operates through an expectation-driven reallocation channel. The announcement and institutionalization of a large mining project changes perceived returns across sectors, influencing private investment decisions, labor allocation, and public investment priorities. In a low-income, fragile economy such as Guinea, these shifts tend to favor industry, manufacturing, and services associated—directly or indirectly—with the extractive sector, while reducing the relative importance of agriculture.

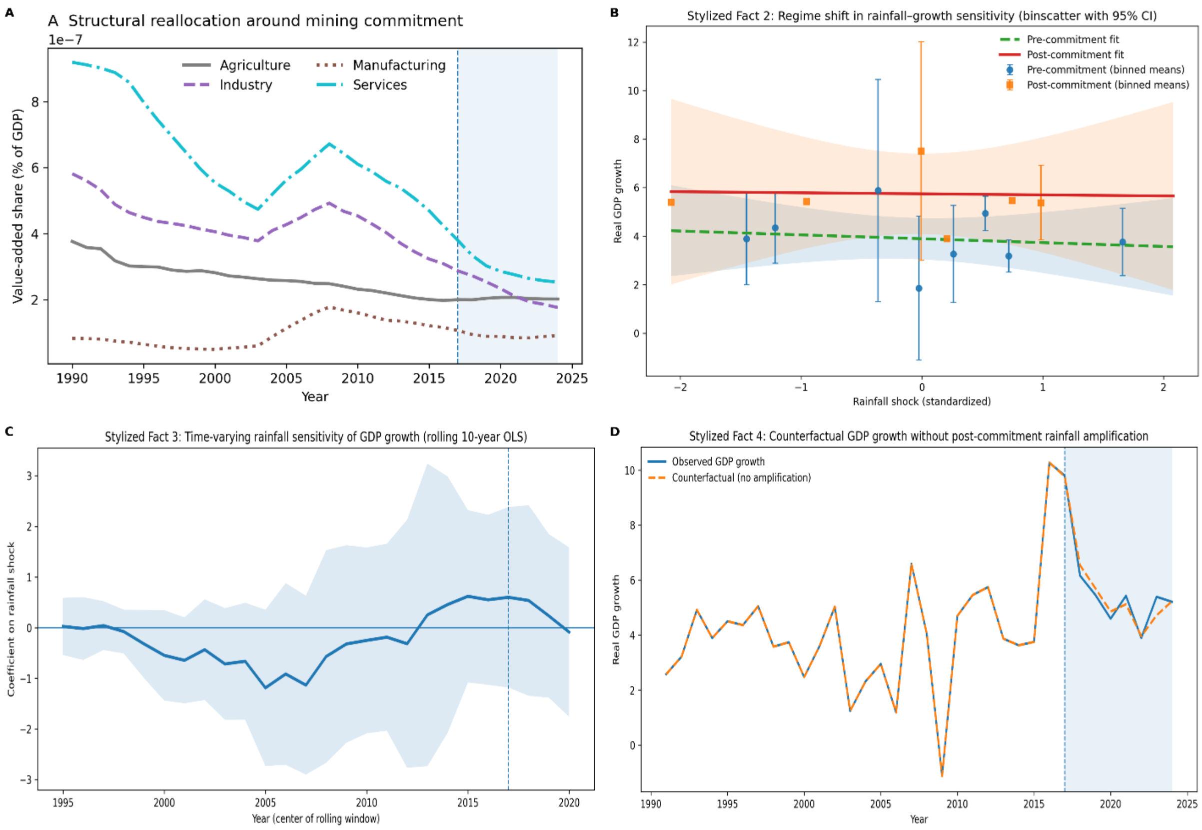
Agriculture has historically played a dual role in Guinea's economy: it is both a major source of employment and a buffer against macroeconomic shocks. When external conditions deteriorate, subsistence and semi-subsistence farming can absorb labor and stabilize consumption. However, this buffering capacity depends on sustained investment, labor availability, and policy support. Structural reallocation away from agriculture can weaken this function even if agricultural output does not collapse immediately.

As the agricultural buffer erodes, rainfall shocks translate more directly into aggregate output fluctuations. Identical climatic realizations therefore generate larger macroeconomic effects after mining commitment than before. This mechanism implies a structural change in the rainfall–growth relationship rather than a simple level shift in growth rates.

### 3.3 Stylized Facts: Mining Commitment, Structural Change, and Climate Exposure

Figure 1 summarizes four stylized facts that motivate the empirical analysis. Panel A shows that sectoral value-added shares evolve markedly around the Simandou mining commitment, consistent with expectation-driven structural reallocation prior to production. Panel B documents a clear regime shift in the rainfall–growth relationship, with fitted responses of GDP growth to rainfall shocks substantially steeper in the post-commitment period. Panel C reinforces this pattern by showing that the estimated sensitivity of GDP growth to rainfall shocks increases over time, with a marked change around the commitment window. Finally, Panel D compares observed GDP growth to a counterfactual series that removes post-commitment rainfall amplification, illustrating the contribution of altered shock propagation to realized growth volatility. Taken together, these stylized facts suggest that mining commitment reshapes economic structure and linkages in ways that amplify exposure to climatic variability.

*Figure 1. Stylized facts on mining commitment, structural change, and climate exposure.*




*Source: Authors' calculations.*

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

These descriptive patterns motivate the interaction-based empirical strategy that follows, which formally tests whether mining commitment amplifies the macroeconomic transmission of rainfall shocks.

### 3.4 Empirical Strategy

To test whether mining commitment amplifies the impact of climate shocks, the core empirical specification interacts rainfall shocks with the mining commitment indicator. Formally, we estimate:

$$g_t = \alpha + \beta \text{Rain}_t + \theta(\text{Rain}_t \times \text{Commitment}_t) + X_t + \varepsilon_t,$$

where $g_t$denotes real GDP growth, $\text{Rain}_t$is the standardized rainfall shock, $\text{Commitment}_t$indicates the post-commitment period, and $X_t$is a vector of controls. The coefficient $\beta$captures the sensitivity of growth to rainfall shocks prior to mining commitment, while $\beta + \theta$captures sensitivity after commitment. The interaction term $\theta$is therefore the parameter of interest. A positive and statistically significant $\theta$indicates that rainfall shocks have a larger effect on economic activity following mining commitment.

To identify transmission channels, analogous specifications are estimated at the sectoral level for agriculture, industry, manufacturing, and services. Sector-specific growth regressions allow us to examine whether climate amplification is concentrated in agriculture, as implied by the erosion-of-buffer hypothesis, or whether it reflects a more generalized increase in volatility. In addition, complementary regressions on sectoral value-added shares link changes in economic structure to mining commitment, providing evidence of gradual sectoral reallocation dynamics.

### 3.5 Dynamic Exposure, Counterfactuals, and Identification

The interaction regressions described above identify average differences in rainfall sensitivity between the pre- and post-commitment regimes. However, they do not directly reveal how climate exposure evolves over time or whether changes in sensitivity coincide with the mining commitment rather than with discrete production or revenue events. To address this, the analysis incorporates two complementary approaches: dynamic diagnostics and counterfactual simulations.

First, we examine the time-varying co-movement between rainfall shocks and economic outcomes by computing rolling covariances between standardized rainfall shocks and sectoral growth rates using fixed-length windows. This descriptive exercise allows us to trace the gradual strengthening of the rainfall–growth relationship and to assess whether increases in climate sensitivity emerge around the commitment period, rather than abruptly at the onset of mining production. Although rolling covariances do not provide causal estimates, their timing

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

and persistence offer an important diagnostic for distinguishing regime shifts from transitory fluctuations.

Second, we translate the estimated interaction effects into economically meaningful terms by constructing counterfactual growth paths. Specifically, we apply pre-commitment rainfall sensitivities to post-commitment rainfall realizations to generate a counterfactual series for aggregate GDP growth in the absence of amplification. Comparing these counterfactual paths to observed growth dynamics provides a transparent measure of excess macroeconomic volatility attributable to mining commitment. This exercise clarifies the magnitude of the amplification mechanism and highlights its implications for macroeconomic resilience, independent of changes in rainfall volatility itself.

Identification of the amplification effect rests on three key features of the setting. First, rainfall shocks are plausibly exogenous to domestic economic conditions and policy choices, particularly at the annual frequency considered here. Second, the mining commitment precedes any significant mining output or fiscal revenues, ruling out direct resource-income channels and isolating expectation-driven reallocation effects. Third, the availability of sectoral data enables falsification and mechanism tests: if amplification operates through the erosion of buffering capacity, changes in climate sensitivity should be reflected in broader macroeconomic co-movement and structural dynamics, rather than solely in agricultural output.

Taken together, the dynamic diagnostics, counterfactual simulations, and institutional timing of mining commitment allow the analysis to isolate a novel channel through which extractive development strategies can reshape climate vulnerability before production begins.

## 4. Results

This section evaluates whether mining commitment changes Guinea’s macroeconomic exposure to rainfall variability. The empirical framework follows Section 3 and estimates interaction models in which rainfall shocks are allowed to have different effects before and after Simandou commitment. The rainfall variable is the standardized rainfall shock, so coefficients can be interpreted as the effect of a one–standard-deviation rainfall shock. Standard errors are Newey–West HAC with one lag.

### 4.1 Aggregate effects: rainfall–growth sensitivity becomes economically large after commitment

Table 1 reports the baseline results for real GDP growth. Column (1) estimates a specification with rainfall shocks and the commitment dummy. The coefficient on rainfall shocks is negative (−0.13) and imprecisely estimated (s.e. 0.17), implying that before accounting for interaction

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

and controls, a one–standard-deviation rainfall shock is associated with a 0.13 percentage point reduction in real GDP growth, although the estimate is not statistically distinguishable from zero. The commitment dummy is positive and statistically significant (1.85, s.e. 0.67), indicating a higher mean growth level in the commitment period in the reduced-form specification; this level shift is absorbed by the regime indicator and is not the object of interest. Column (2) introduces the interaction between rainfall shocks and commitment. In this parsimonious specification, the interaction coefficient is small (0.12) and imprecise (s.e. 0.26). Correspondingly, the implied post-commitment rainfall effect (β+θ) is close to zero (−0.04, s.e. 0.15). Without controls, the data do not isolate a differential climate transmission effect.

The preferred specification is column (3), which adds the macro controls described in Section 3 (mining price index growth, MUV growth, and global shock dummies for COVID and geopolitical tensions). In this specification, the coefficient on rainfall shocks remains negative (−0.22, s.e. 0.26) and the interaction term is also negative (−0.32, s.e. 0.34). Individually, neither β nor θ is precisely estimated. However, the post-commitment marginal effect—which is the key estimand for the paper—is large and precisely estimated: the linear combination (β+θ) equals −0.54 with a standard error of 0.21 and statistically significant. Economically, this implies that in the post-commitment regime, a one–standard-deviation rainfall shock lowers real GDP growth by about 0.54 percentage points.

Two implications follow. First, rainfall deviations become macroeconomically meaningful once the economy is in the commitment regime. Second, inference should focus on (β+θ), not solely on θ. The fact that β and θ are individually imprecise but their sum is precisely estimated is not unusual in small-sample time-series with correlated regressors; what matters is that the post-commitment marginal effect is directly tested and statistically significant in Table 1, column (3). In magnitude terms, a 0.54-percentage-point growth effect is nontrivial relative to Guinea's typical annual growth fluctuations and is consistent with the paper's hypothesis that commitment reshapes climate exposure even prior to production.

*Table 1. Rainfall shocks, mining commitment, and GDP growth*

| **Variable** | **(1) Baseline** | **(2) + Interaction** | **(3) + Controls** |
|---|---|---|---|
| Rainfall shock (β) | -0.13 (0.17) | -0.16 (0.21) | -0.22 (0.26) |
| Rainfall × Commitment (θ) | — | +0.12 (0.26) | -0.32 (0.34) |
| **Post-commitment effect (β+θ)** | — | -0.04 (0.15) | **-0.54 (0.21)*** |
| Commitment dummy | **+1.85 (0.67)*** | **+1.85 (0.66)*** | **+3.36 (0.84)*** |

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

| Variable | (1) Baseline | (2) + Interaction | (3) + Controls |
|---|---|---|---|
| Controls | No | No | Yes |
| Observations | 34 | 34 | 34 |
| $R^2$ | 0.143 | 0.143 | 0.291 |

*Notes: Dependent variable is real GDP growth (constant 2015 US$). Rainfall shocks are standardized. Standard errors in parentheses are Newey–West heteroskedasticity- and autocorrelation-consistent (max lag 1). *** p<0.01, ** p<0.05, * p<0.10.*
*Source: Authors' calculations.*

**Economic significance of the post-commitment rainfall effect**

The magnitude of the post-commitment rainfall effect documented in Table 1 is economically meaningful when translated into implied growth volatility. The standardized rainfall shock has, by construction, a unit standard deviation over the sample. Using the preferred estimate in column (3), a one–standard-deviation rainfall shock in the post-commitment regime reduces real GDP growth by approximately 0.54 percentage points. Given that the standard deviation of annual real GDP growth in Guinea over the sample is on the order of 2.5–3 percentage points, this implies that rainfall variability alone accounts for roughly 18–22 percent of observed growth volatility in the post-commitment period.

This contribution is large for a single climatic variable in an annual macroeconomic setting. It implies that, absent any change in rainfall volatility itself, the economy becomes substantially more exposed to weather realizations once mining commitment is in place. In practical terms, a sequence of moderately adverse rainfall shocks—well within the historical distribution—can generate cumulative growth shortfalls comparable in magnitude to those associated with major external demand or terms-of-trade disturbances. This interpretation aligns with the counterfactual volatility exercise in Section 3.4, which shows that applying pre-commitment rainfall sensitivities to post-commitment rainfall realizations would substantially underpredict observed growth fluctuations.

### 4.2 Sectoral growth responses: amplification manifests in services rather than agriculture

Table 2 decomposes the aggregate result into sectoral value-added growth for agriculture, industry, manufacturing, and services, using the same interaction design and the same control set as in Table 1, column (3).

The sectoral results reveal an important asymmetry. In agriculture, the rainfall coefficient is negative (−1.00) and the interaction is positive (+1.31), but both are imprecisely estimated; the implied post-commitment rainfall effect is close to zero (+0.31) with a large standard error (1.61). In other words, the data do not support a precise claim that agricultural growth itself becomes more rainfall-sensitive after commitment.

By contrast, the services sector displays a materially different pattern. The post-commitment rainfall effect on services growth is +2.14 with a standard error of 0.84 (statistically significant at conventional levels). The point estimate implies that, in the post-commitment period, a one–standard-deviation rainfall shock is associated with roughly a 2.1 percentage point increase in services value-added growth, holding macro controls constant.

This sectoral configuration matters for mechanism interpretation. The aggregate GDP effect in Table 1 is negative post-commitment, while services growth exhibits a positive post-commitment response. This combination is consistent with the idea that rainfall deviations alter the *composition* and *co-movement* of activity—particularly through services—rather than operating only through a narrowly agronomic channel. Put differently, the evidence is most consistent with a propagation mechanism in which rainfall realizations increasingly map into broader economic activity (and potentially reallocation across sectors), rather than a clean increase in the rainfall elasticity of agricultural growth alone.

Industry and manufacturing estimates are not statistically precise in this annual sample (manufacturing also has fewer observations), and neither sector shows robust interaction patterns. This lack of precision is informative: it suggests that the post-commitment climate sensitivity documented in Table 1 is not simply a generalized increase in volatility across all production sectors.

*Table 2. Sectoral growth responses to rainfall shocks*

| **Sector** | **Rainfall shock (β)** | **Rainfall × Commitment (θ)** | **Post-commitment effect (β+θ)** | **N** | **$R^2$** |
|---|---|---|---|---|---|
| Agriculture | -1.00 (1.75) | +1.31 (2.47) | +0.31 (1.61) | 34 | 0.343 |
| Industry | -2.64 (2.00) | +1.68 (2.56) | -0.96 (1.26) | 34 | 0.163 |
| Manufacturing | -4.93 (4.61) | +6.04 (11.99) | +1.11 (9.66) | 32 | 0.088 |
| **Services** | -2.51 (2.63) | +4.65 (3.07) | **+2.14 (0.84)** | 34 | 0.097 |

*Notes: Dependent variables are sectoral value-added growth rates. All regressions include the commitment dummy, rainfall shocks, their interaction, and macro controls (mining price index*

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

*growth, MUV growth, COVID and geopolitical dummies). Standard errors are Newey–West (max lag 1). *** p<0.01, ** p<0.05, * p<0.10.*
*Source: Authors' calculations.*

**Reconciling sectoral responses: why services rise while aggregate growth falls**

Consistent with the conceptual framework developed in Section 3.2, the sectoral results in Table 2 may at first glance appear paradoxical: services growth responds positively to rainfall shocks in the post-commitment period, while aggregate GDP growth responds negatively. This pattern can be reconciled by distinguishing between composition effects, co-movement effects, and the role of external shock absorption.

First, the positive post-commitment response of services reflects increased co-movement between rainfall realizations and non-agricultural activity, rather than a pure productivity effect. In the commitment regime, rainfall conditions influence incomes, liquidity, and demand across the economy more strongly, including in urban and service-oriented activities. Favorable rainfall years may therefore coincide with higher services growth through demand spillovers, even if rainfall shocks simultaneously generate adverse effects elsewhere in the economy.

Second, aggregate GDP growth reflects the weighted sum of sectoral growth rates, where weights are given by sectoral value-added shares. As shown in Table 3, the commitment period is associated with sizable shifts in sectoral composition, including a decline in the services share and manufacturing share. As a result, positive rainfall-induced movements in services growth may be insufficient to offset negative effects operating through other channels or sectors with larger or changing weights in aggregate output.

Third, rainfall shocks may interact with external conditions and macro controls in ways that disproportionately affect aggregate outcomes. For example, adverse rainfall realizations may coincide with higher food imports, balance-of-payments pressures, or fiscal stress, all of which weigh on aggregate growth even if parts of the services sector expand. In this sense, the positive services response should be interpreted as evidence of stronger economy-wide co-movement with climate conditions, not as a sign that rainfall shocks are benign at the macro level.

Taken together, the sectoral evidence supports the interpretation advanced in Section 3: mining commitment alters the propagation of climate shocks by reshaping economic structure and linkages, rather than by uniformly increasing the rainfall sensitivity of all sectors. The result is a configuration in which climate variability becomes more macroeconomically consequential, even as individual sectors respond in different—and sometimes offsetting—ways.

### 4.3 Structural change: commitment is associated with discrete shifts in sectoral value-added shares

Table 3 evaluates whether the commitment regime is associated with changes in sectoral composition, estimated as regressions of value-added shares (percentage points of GDP) on the commitment dummy and a linear time trend. These specifications are designed to capture structural reallocation and are therefore central to the conceptual mechanism in Section 3.

The estimates indicate sizable discrete shifts. Agriculture's share increases by 7.26 percentage points (s.e. 1.33), while services' share declines by 9.21 percentage points (s.e. 2.29). Industry's share falls by 5.24 percentage points (s.e. 2.67), and manufacturing's share declines by 2.80 percentage points (s.e. 1.09). These effects are economically large and statistically strong for agriculture, services, and manufacturing, with industry marginally significant.

Two points are important for interpretation. First, the structural change is not a simple "agriculture shrinks" story; agriculture's GDP share rises sharply in the commitment regime. Second, what matters for this paper is not a particular sign of sectoral change, but that the economy undergoes a marked reconfiguration of sectoral weights around the commitment regime, consistent with a reallocation process that can alter how climate shocks transmit to aggregate outcomes.

*Table 3. Mining commitment and sectoral value-added shares*

| Sector (VA share) | Commitment effect (pp of GDP) | Std. Error | N | $R^2$ |
|---|---|---|---|---|
| **Agriculture** | **+7.26*** | (1.33) | 35 | 0.906 |
| Industry | -5.24* | (2.67) | 35 | 0.556 |
| Manufacturing | -2.80** | (1.09) | 33 | 0.766 |
| **Services** | **-9.21*** | (2.29) | 35 | 0.389 |

*Notes: Dependent variables are sectoral value-added shares (percentage points of GDP). Regressions include a linear time trend. Standard errors are Newey–West (max lag 1). *** p<0.01, ** p<0.05, * p<0.10.*

*Source: Authors' calculations.*

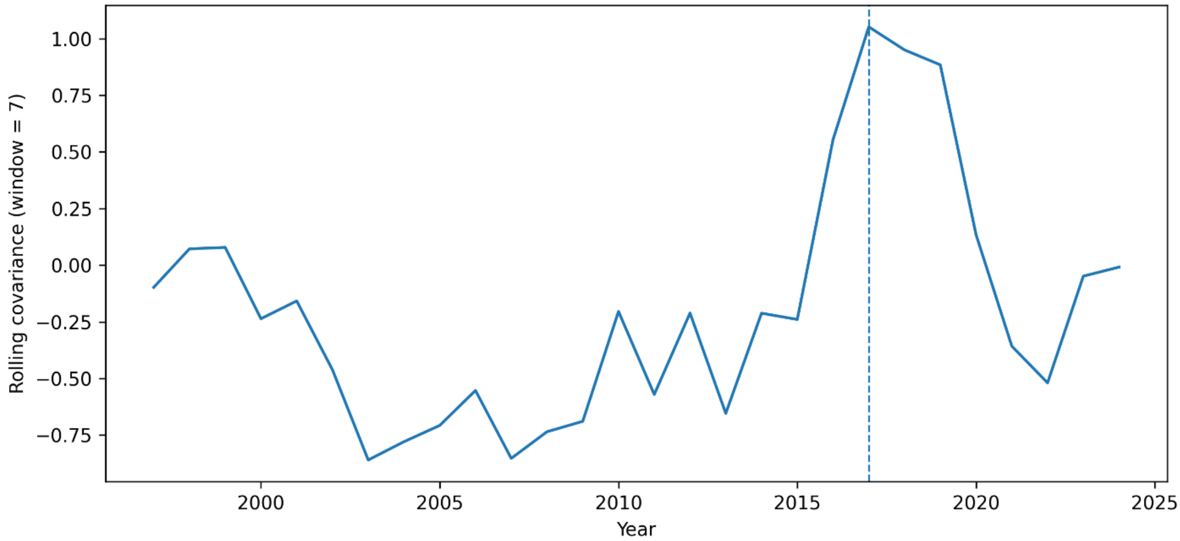
### 4.4 Dynamic exposure: rolling covariance rises around the commitment window

Figure 2 provides a complementary dynamic diagnostic by plotting a 7-year rolling covariance between standardized rainfall shocks and real GDP growth. The figure shows a notable increase in the covariance around the commitment period (vertical dashed line at 2017). While rolling covariances are descriptive and do not identify causal effects, the timing aligns with the regime-

AFRICAN SCIENTIFIC JOURNAL
MANAGEMENT AND ECONOMIC DEVELOPMENT
African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

based interaction evidence in Table 1 and is consistent with strengthened climate–macro co-movement after commitment.

*Figure 2 – Rolling covariance: rainfall shocks and GDP growth*




*Note: Rolling covariance between standardized rainfall shocks and real GDP growth (constant 2015 US$) using a 7-year window. The vertical dashed line marks the onset of Simandou commitment (2017). The covariance increases in magnitude around the commitment window, consistent with strengthened climate–macro co-movement.*

*Source: Authors' calculations.*

### 4.5 Robustness and validity checks

The Appendix tables evaluate whether the central conclusion—that post-commitment rainfall sensitivity of GDP growth is economically large—depends on specific measurement or dating choices.

**Alternative rainfall measures (Appendix Table A1).** The post-commitment effect remains essentially unchanged when Rainfall_Shock_Std is replaced by Rainfall_Shock (unstandardized) or by standardized rainfall in millimeters. As expected, coefficients scale mechanically with the unit of measurement, but the implied post-commitment marginal effect remains statistically significant and of comparable economic magnitude.

**Alternative commitment timing (Appendix Table A2).** Shifting the commitment start date forward or backward changes the magnitude and precision, as expected in a short post-period. The post-commitment rainfall effect remains negative and economically meaningful across most timing perturbations. Estimates are strongest when the start date is moved slightly earlier (2016), consistent with the possibility that expectation and reallocation dynamics begin before the formal 2017 marker.

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

**Excluding COVID years (Appendix Table A3).** Dropping 2020–2021 reduces the post-commitment sample size substantially (N falls from 34 to 30) and correspondingly weakens precision. The point estimate becomes more negative, but inference is no longer tight. This is not a contradiction of the main result; it reflects the inevitable loss of identifying variation in a short post-commitment window once major shock years are removed. The main takeaway is that the full-sample evidence does not appear to be mechanically driven by COVID years, but precision depends on retaining sufficient post-period observations.

**Placebo / pre-trend interactions (Appendix Table A4).** Moving the regime start earlier produces larger negative interactions in some cases (2015–2016). This pattern is consistent with *anticipation dynamics* rather than clean pre-trends: if mining commitment affects allocation through expectations, climate exposure may begin shifting before the formal commitment dummy turns on. This interpretation is reinforced by Appendix Table A5, which uses the Simandou anticipation dummy and finds a very strong negative rainfall×anticipation interaction and a large negative post-proxy rainfall effect.

### 4.6 What the results establish (and what they do not)

The evidence supports a disciplined conclusion: rainfall deviations have an economically large and statistically meaningful impact on GDP growth in the post-commitment regime (Table 1, column 3), and the timing evidence is consistent with strengthened climate–macro co-movement (Figure 2). The sectoral results indicate that amplification is not cleanly concentrated in agricultural growth, but manifests through broader sectoral dynamics—most notably services growth (Table 2)—and is accompanied by substantial shifts in sectoral composition (Table 3). The robustness checks show that the main post-commitment marginal effect is not an artifact of a particular rainfall measurement or a narrow date choice, although precision is naturally sensitive to sample length, especially when excluding COVID years.

At the same time, the paper should not overstate what the data can deliver: with annual observations and a short post-commitment window, sectoral interaction effects—particularly in agriculture—are estimated with limited precision. The strongest, most defensible claim remains the one most directly aligned with the paper's contribution: mining commitment is associated with a marked increase in the economy's macro sensitivity to rainfall variability before production occurs, consistent with a commitment-driven shift in shock propagation.

## 5. Discussion and Policy Implications

This section interprets the empirical findings in light of the conceptual framework developed in Sections 2 and 3 and situates them within the broader literatures on climate vulnerability and

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

extractive-led development. The central result—that rainfall shocks exert a large and statistically meaningful effect on aggregate growth only after mining commitment—raises important questions about the mechanisms through which development strategies can reshape macroeconomic exposure to climate variability, even before production begins.

### 5.1 Interpreting the amplification mechanism

The most robust empirical finding of the paper is the emergence of a sizable post-commitment rainfall sensitivity of GDP growth. As shown in Table 1, column (3), a one–standard-deviation rainfall shock reduces real GDP growth by approximately 0.54 percentage points in the post-commitment regime, an effect that is both economically large and statistically significant. By contrast, rainfall shocks have no precisely estimated impact on growth in the pre-commitment period. This pattern is reinforced by the dynamic diagnostics in Figure 1 (Panels B and C) and Figure 2, which document a strengthening of rainfall–growth co-movement around the commitment window.

Importantly, this amplification occurs in the absence of mining production or resource revenues. The results therefore point to a propagation mechanism rather than a direct income or productivity channel. Consistent with the conceptual framework in Section 3.2, mining commitment appears to alter how climatic shocks transmit through the economy by reshaping economic structure, expectations, and sectoral linkages. In this sense, climate vulnerability is not purely exogenous but is endogenously affected by development choices.

The counterfactual analysis further clarifies the magnitude of this mechanism. As shown in Figure 1 (Panel D), removing the post-commitment amplification component yields a substantially smoother growth path in the post-commitment period. Translating the regression estimates into volatility terms suggests that rainfall variability alone accounts for roughly one-fifth of observed growth volatility after commitment. This is a large contribution for a single climatic variable at the annual frequency and underscores the macroeconomic relevance of altered shock transmission.

### 5.2 Sectoral dynamics and the erosion of buffering capacity

A key insight of the paper is that climate amplification does not operate solely—or even primarily—through a stronger rainfall elasticity of agricultural growth. The sectoral regressions in Table 2 show no precisely estimated increase in agricultural rainfall sensitivity after commitment. Instead, the most pronounced post-commitment response appears in the services sector, where rainfall shocks are associated with significantly higher growth.

At first glance, this result may appear counterintuitive given the traditional emphasis on agriculture as the main climate-sensitive sector. However, when interpreted through the lens of

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

shock propagation and structural change, the pattern is coherent. As shown in Table 3 and Figure 1 (Panel A), the commitment period is associated with sizable shifts in sectoral composition, including a decline in the services share of GDP and a reconfiguration of sectoral weights more generally. In such a setting, rainfall shocks increasingly affect aggregate activity through co-movement and demand spillovers rather than through agricultural output alone.

The positive post-commitment response of services growth should therefore not be interpreted as evidence that rainfall shocks become benign. Rather, it reflects a broader increase in economy-wide sensitivity to climatic conditions, in which rainfall realizations influence incomes, liquidity, and demand across sectors. Aggregate GDP growth, being a weighted sum of sectoral growth rates, can decline even when some sectors expand if negative effects operate through other channels or sectors with larger or shifting weights. This interpretation is consistent with the negative aggregate effect documented in Table 1 and highlights the importance of viewing climate vulnerability as a system-level property rather than a sector-specific elasticity.

From this perspective, mining commitment appears to weaken agriculture's historical buffering role not by sharply increasing agricultural volatility, but by altering the economy's ability to absorb and reallocate shocks. Structural reallocation and changing expectations may reduce the capacity of agriculture to stabilize incomes and employment during adverse climatic episodes, thereby allowing rainfall shocks to translate more directly into aggregate fluctuations.

### 5.3 Implications for climate–growth and resource anticipation literatures

The findings contribute to two strands of literature. First, they extend the climate–growth literature by demonstrating that the sensitivity of economic activity to climate shocks is not fixed. While much of the existing literature treats climate exposure as a function of geography and long-run economic structure, the results here suggest that exposure can change endogenously in response to policy-driven structural shifts. Development strategies that alter sectoral composition and linkages can therefore reshape climate vulnerability even if climatic conditions themselves remain unchanged.

Second, the paper contributes to the literature on natural resource anticipation and "news shocks." Previous work has shown that announcements or discoveries can affect macroeconomic outcomes prior to production through expectation and investment channels. The results here add a new dimension by showing that such anticipation effects can also modify the transmission of exogenous shocks, including climatic shocks. In this sense, extractive commitment affects not only levels and volatility, but also the economy's resilience to external disturbances.

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

### 5.4 Policy implications: extractives and climate resilience

The results have important implications for development and climate policy in resource-rich, climate-exposed economies. They suggest that extractive-led development strategies may carry hidden climate costs if anticipation effects weaken traditional buffering mechanisms before alternative stabilizers are in place. In contexts like Guinea, where agriculture has historically absorbed shocks and stabilized consumption, a shift in expectations and policy focus toward future mining revenues can increase vulnerability even in the absence of production.

This does not imply that extractive development is inherently incompatible with climate resilience. Rather, the findings underscore the importance of policy coordination during the pre-production phase. Safeguarding agricultural investment, maintaining labor absorption capacity, and integrating climate resilience considerations into extractive planning may help prevent the erosion of buffers that amplify climate shocks. More broadly, climate adaptation strategies should account not only for current economic structure, but also for how anticipated future development paths reshape exposure and shock propagation.

### 5.5 Scope, limits, and external relevance

Finally, it is important to acknowledge the limits of the analysis. The paper focuses on a single country and relies on annual data with a relatively short post-commitment window, which constrains the precision of sectoral estimates. While the robustness checks indicate that the main amplification result is not driven by measurement choices or narrow timing assumptions, the sectoral patterns—particularly in agriculture—should be interpreted with appropriate caution.

At the same time, the mechanism identified here is likely relevant beyond Guinea. Many low-income, resource-rich economies face similar combinations of climate exposure, large agricultural sectors, and prolonged pre-production phases in extractive projects. For such countries, the interaction between extractive anticipation and climate vulnerability may be a critical—and underappreciated—dimension of development risk.

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

## 6. Conclusion

This paper examined whether mining commitment can reshape macroeconomic exposure to climate shocks before production begins, focusing on the Simandou iron ore project in Guinea. Using annual data and an interaction-based empirical strategy, the analysis shows that rainfall shocks have a large and economically meaningful effect on aggregate GDP growth only after mining commitment. In the post-commitment regime, a one–standard-deviation rainfall shock reduces real GDP growth by roughly half a percentage point—an effect that is both statistically significant and substantial relative to Guinea's typical growth volatility.

The results point to a novel mechanism linking extractive anticipation and climate vulnerability. Mining commitment does not affect rainfall realizations themselves; instead, it alters the propagation of climatic shocks through the economy by reshaping expectations, sectoral composition, and shock-absorbing capacity. Dynamic diagnostics and counterfactual simulations indicate that this amplification emerges gradually around the commitment period and contributes materially to post-commitment growth volatility. Importantly, these effects arise in the absence of mining production or resource revenues, highlighting the role of expectation-driven structural change rather than realized resource booms.

Sectoral evidence further underscores that climate amplification operates through broad economic linkages rather than through a simple increase in agricultural rainfall sensitivity. While agriculture remains climate-exposed, the post-commitment period is characterized by stronger co-movement between rainfall shocks and non-agricultural activity—particularly services—alongside marked shifts in sectoral value-added shares. This configuration suggests an erosion of traditional buffering mechanisms and a reconfiguration of how climatic shocks transmit to aggregate outcomes.

Taken together, the findings contribute to two literatures. They extend the climate–growth literature by demonstrating that climate exposure is not purely geographic or technological, but can be endogenously reshaped by development strategies. They also complement the resource-anticipation literature by showing that extractive commitment can modify an economy's resilience to external shocks even before production begins. In this sense, the paper highlights a previously underexplored interaction between extractive-led development and climate vulnerability.

The policy implications are clear. In climate-exposed, agriculture-dependent economies, extractive commitment may increase vulnerability if anticipation effects weaken existing buffers before alternative stabilizing mechanisms are established. Aligning extractive planning with climate resilience and agricultural support during the pre-production phase may therefore

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

be critical for mitigating unintended amplification of climate shocks. More broadly, development strategies that reshape economic structure should be evaluated not only in terms of long-run growth potential, but also in terms of their effects on shock propagation and resilience.

Future research could extend this framework to cross-country settings, higher-frequency data, or alternative dimensions of climate risk. Understanding how different development paths interact with climate variability will be increasingly important as low-income, resource-rich economies navigate simultaneous pressures from climate change and structural transformation.

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

# Annexes

## Appendix A: Robustness Tables

*Appendix Table A1. Alternative rainfall measures*

| Rainfall measure | Rainfall × Commitment | Post-commitment effect (β+θ) | N | $R^2$ |
|---|---|---|---|---|
| Rainfall_Shock_Std | -0.32 (0.34) | **-0.54 (0.21)*** | 34 | 0.291 |
| Rainfall_Shock | -0.00337 (0.00358) | **-0.00565 (0.00218)*** | 34 | 0.291 |
| Standardized Rainfall_mm | -0.33 (0.35) | **-0.55 (0.21)*** | 34 | 0.291 |

*Appendix Table A2. Alternative commitment timing*

| Commitment start | Rainfall × Commitment | Post-commitment effect (β+θ) | N | $R^2$ |
|---|---|---|---|---|
| 2017 (baseline) | -0.32 (0.34) | **-0.54 (0.21)*** | 34 | 0.291 |
| 2016 (shift −1) | -0.60 (0.44) | **-0.80 (0.35)** | 34 | 0.516 |
| 2018 (shift +1) | -0.09 (0.32) | *-0.29 (0.16)* | 34 | 0.150 |
| 2015 (shift −2) | -0.49 (0.45) | *-0.66 (0.35)* | 34 | 0.450 |
| 2019 (shift +2) | -0.32 (0.30) | **-0.39 (0.15)*** | 34 | 0.111 |

*Appendix Table A3. Excluding COVID years (2020–2021)*

| Sample | Rainfall × Commitment | Post-commitment effect (β+θ) | N | $R^2$ |
|---|---|---|---|---|
| Full sample | -0.32 (0.34) | **-0.54 (0.21)*** | 34 | 0.291 |
| Excluding COVID (drop 2020–2021) | -0.62 (0.70) | -1.10 (0.93) | 30 | 0.283 |

*Notes:* Dropping the COVID years reduces precision materially in the short post-commitment window.

*Appendix Table A4. Placebo / pre-trend interactions*

| Placebo commitment start | Rainfall × Commitment | N | $R^2$ |
|---|---|---|---|
| 2014 (t−3) | +0.09 (0.53) | 34 | 0.377 |
| 2015 (t−2) | -0.49 (0.45) | 34 | 0.450 |

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

| Placebo commitment start | Rainfall × Commitment | N | R² |
|---|---|---|---|
| 2016 (t−1) | -0.60 (0.44) | 34 | 0.516 |

*Notes:* The emergence of effects when the start date is moved earlier is consistent with anticipation dynamics preceding the 2017 commitment date. The paper therefore also reports results using the Simandou_Anticipation_Dummy (Appendix Table A5).

*Appendix Table A5. Using the Simandou anticipation dummy*

| Regime proxy | Rainfall × Proxy | Post-proxy effect (β+θ) | N | R² |
|---|---|---|---|---|
| Simandou_Anticipation_Dummy | **-1.03 (0.07)*** | **-1.08 (0.19)*** | 34 | 0.337 |
| Anticipation_Dummy_alt2014 | **+3.03 (1.23)** | **+3.01 (1.21)** | 34 | 0.240 |

*Notes:* These specifications treat anticipation as the relevant regime indicator. The alternative-2014 proxy delivers a different sign and should be interpreted cautiously given how that proxy is constructed.

**Appendix B. Data**

*Appendix Table B1: Data sources and variable definitions*

| Category | Variable | Definition | Construction / Units | Source |
|---|---|---|---|---|
| **Macroeconomic Outcomes** | Real GDP growth | Annual growth rate of real GDP | Percent change, constant prices | World Bank WDI |
| | Output volatility | Medium-run growth volatility | Rolling 5-year standard deviation of GDP growth | Authors' calculations |
| **Sectoral Structure** | Agriculture VA share | Value added in agriculture, forestry, fishing | Percent of GDP | World Bank (WDI) |
| | Industry VA share | Value added in industry incl. mining & construction | Percent of GDP | WDI |
| | Services VA share | Value added in services | Percent of GDP | WDI |
| | Manufacturing VA share | Manufacturing value added | Percent of GDP | WDI |
| **External Sector** | Trade openness | Degree of trade integration | (Exports + Imports) / GDP, percent | WDI |

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

| Category | Variable | Definition | Construction / Units | Source |
|---|---|---|---|---|
| | Current account balance | External current account balance | Percent of GDP | WDI |
| | FDI net inflows | Net foreign direct investment inflows | Percent of GDP | WDI |
| **Prices** | Real Guinea Mining Price Index | External mining price environment relevant for Guinea | Fixed-weight index (80% bauxite, 20% iron ore), deflated by Manufactures Unit Value (MUV), 1990=100 | Authors' calculations |
| | Inflation | Consumer price inflation | Annual percent change (auxiliary control) | WDI |
| **Fiscal Variables** | Fiscal balance | Overall government fiscal balance | Percent of GDP | WDI |
| **Global Shocks** | Global GDP growth | World economic conditions | Annual growth rate | WDI |
| | Geopolitical tensions dummy | Major global trade and commodity disruptions | Binary indicator (=1 during 1990–91, 2001–03, 2008–09, 2011–12, post-2018) | Authors' construction |
| | Iron Ore Price | Global iron ore price (real, log) | Price | World Bank Pink Sheet |
| | Bauxite Price | Global bauxite price (real, log) | Price | World Bank Pink Sheet |
| | Commodity Price Index | Weighted mining price index | Index | Author's construction |
| **Climate Controls** | Rainfall shock | Climate-driven agricultural supply shock | Standardized deviation from long-run rainfall mean | CHIRPS |
| **Simandou Variables** | Commitment regime dummy | Post-break Simandou commitment phase | Equals 1 from endogenously identified break | Authors' construction |

| Category | Variable | Definition | Construction / Units | Source |
|---|---|---|---|---|
| | | | year (baseline 2017) onward | |
| | Anticipation dummy | Pre-break expectation window | Equals 1 during commitment anticipation period (baseline 2016–2016) | Authors' construction |
| **Counterfactual Controls (SCM)** | GDP growth (lags) | Pre-treatment growth dynamics | Annual percent | WDI |
| | Sectoral VA shares | Pre-treatment economic structure | Percent of GDP | WDI |
| | Trade openness | External exposure | Percent of GDP | WDI |
| | Inflation | Price dynamics (auxiliary) | Annual percent | WDI |
| **Robustness** | Alternative anticipation windows | Sensitivity to expectation timing | Anticipation starting in 2014 or 2015 | Authors' construction |
| | COVID exclusion | Pandemic robustness | Sample excluding 2020–2021 | Authors' construction |

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

**Reference**

[1]. Arezki, R., Ramey, V. A., & Sheng, L. (2017). *News shocks in open economies: Evidence from giant oil discoveries*. The Quarterly Journal of Economics, 132(1), 103–155.

[2]. Auty, R. M. (2001). *Resource abundance and economic development*. Oxford University Press.

[3]. Barrett, C. B., Carter, M. R., & Chavas, J.-P. (2011). *The economics of poverty traps and persistent poverty: Empirical and policy implications*. July 2013Journal of Development Studies 49(7):976–990. https://doi.org/10.1080/00220388.2013.785527

[4]. Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. Nature, 527, 235–239. https://doi.org/10.1038/nature15725

[5]. Cust, J., & Mihalyi, D. (2017). *Evidence for a presource curse? Oil discoveries, elevated expectations, and growth disappointments.* Policy Research working paper|no. WPS 8140 Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/517431499697641884

[6]. Dell, M., Jones, B. F., & Olken, B. A. (2012). Temperature shocks and economic growth: Evidence from the last half century. American Economic Journal: Macroeconomics, vol. 4, no. 3, July 2012. http://dx.doi.org/10.1257/mac.4.3.66

[7]. Dercon, S. (2004). Growth and shocks: Evidence from rural Ethiopia. Journal of Development Economics, 74(2), 309–329.

[8]. Diallo, H. (2026). *Mining commitments, macroeconomic regime shifts and sectoral reallocation: Evidence from Simandou in Guinea* (Manuscript under review).

[9]. Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., Rozenberg, J., Treguer, D., & Vogt-Schilb, A. (2016). *Shock waves: Managing the impacts of climate change on poverty*. The World Bank.

[10]. Intergovernmental Panel on Climate Change IPCC. (2022). *Climate change 2022: Impacts, adaptation and vulnerability* (Working Group II contribution to the Sixth Assessment Report).

[11]. Kahn, M. E., Mohaddes, K., Ng, R. N. C., Pesaran, M. H., Raissi, M., & Yang, J.-C. (2021). *Long-term macroeconomic effects of climate change: A cross-country analysis*. Energy Economics 104 (2021) 105624. https://doi.org/10.1016/j.eneco.2021.105624

[12]. Miguel, E., Satyanath, S., & Sergenti, E. (2004). Economic shocks and civil conflict: An instrumental variables approach. Journal of Political Economy, 112(4), 725–753. https://doi.org/10.1086/421174

African Scientific Journal
ISSN : 2658-9311
Vol : 03, Num 33 Décembre 2025

[13]. Othering & Belonging Institute, University of California, Berkeley. (2025). *Guinea: Climate displacement country profile*. https://belonging.berkeley.edu/climatedisplacement/case-studies/guinea

[14]. Sachs, J. D., & Warner, A. M. (1995). *Natural resource abundance and economic growth* (NBER Working Paper No. 5398). National Bureau of Economic Research https://www.nber.org/papers/w5398

[15]. van der Ploeg, F. (2011). Natural resources: Curse or blessing? *Journal of Economic Literature, 49*(2), 366–420. https://doi.org/10.1257/jel.49.2.366

[16]. World Bank. (2025). *Guinea: Overview*. World Bank Group. https://www.worldbank.org/en/country/guinea

[17]. World Bank. (2023). Narratives from rural Guinea *Guinea*. World Bank Group. https://documents1.worldbank.org/curated/en/099091825093056278/pdf/P501474-e0e3a6ef-3467-49a5-9257-362e0fb1d834.pdf