Journal of Management Science Research Review
https://jmsrr.com/index.php/Journal/about

Volume 5 Issue No 1 (2026)

Online ISSN: 3006-2047
Print ISSN: 3006-2039

Tax Revenue, Institutional Quality, and Sustainable Growth in Afghanistan (1996–2024): A Dual Source ARDL–ECM Analysis

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Abstract
This study examines whether domestic revenue mobilization is associated with sustainable economic growth in Afghanistan and whether institutional quality moderates that relationship in a fragile and conflict-affected setting. A reconciled dual-source annual dataset for 1996–2024 is constructed by harmonizing World Development Indicators with official Afghan fiscal and macroeconomic series, with observation-level provenance flags documenting source priority and reconciliation decisions. An autoregressive distributed lag (ARDL) bounds-testing framework and its error-correction representation are estimated to accommodate mixed integration orders, structural breaks, and a small annual sample. Political transitions are captured using regime-segmented indicators interpreted relative to the Taliban I baseline regime. Bounds tests support a stable long-run relationship between real GDP growth, tax revenue, institutional quality, and standard controls. The error-correction term indicates rapid convergence to equilibrium (ECT ≈ −1.24). In the long run, the tax revenue coefficient is positive but imprecisely estimated (1.54; p = 0.284). The interaction between tax revenue and institutional quality is positive and economically large (9.68; p = 0.180), suggesting that stronger institutions increase the growth payoff to taxation, although statistical support is indicative rather than definitive. Overall, the findings imply that revenue-led growth strategies in Afghanistan and comparable fragile contexts are more likely to be effective when paired with institutional improvements that enhance budget credibility, reduce leakages, and strengthen policy predictability and compliance.

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Online ISSN: 3006-2047
Print ISSN: 3006-2039

Keywords: Afghanistan; Tax Revenue; Institutional Quality; Political Transitions; ARDL–ECM; Fragile And Conflict-Affected States.
JEL codes:

Introduction

Fragile and conflict affected states face a fiscal institutional dilemma. Domestic revenue is required to finance core public goods, reduce aid dependence, and sustain political legitimacy (Besley & Persson, 2011). Weak institutions reduce the productivity of public spending, deter private investment, and can erode the growth dividend from taxation (Acemoglu & Robinson, 2012a; North, 1990). Afghanistan is an instructive case. Since 1996 it has experienced repeated political transitions, volatile external financing, and persistently low governance scores. The tax to GDP ratio remains low by international standards, while fiscal episodes have been interrupted by conflict, administrative discontinuities, and shifts in donor engagement (Bizhan, 2018; World Bank, 2024).These conditions place Afghanistan at the centre of debates on fiscal capacity in fragile contexts, where the relevant policy question is not only how to raise revenue but also under what institutional conditions revenue supports sustainable economic growth.

Problem statement Despite frequent policy calls for higher tax to GDP ratios, the core empirical question remains unsettled for Afghanistan: do increases in tax revenue improve sustainable growth under fragile institutions, and under what conditions? Cross-country studies suggest a positive tax growth association that is conditional on institutional quality (Gaspar et al., 2016). However, multi country designs mask country specific shocks, regime changes, and data discontinuities that are central in fragile settings. Afghanistan specific analyses are often qualitative, confined to post 2001, or based on single source datasets that do not reconcile differences between international databases and national statistics. Structural breaks induced by regime transitions are rarely modeled, and institutional quality is typically treated as a control rather than as a moderator of the tax growth link. As a result, policymakers lack country specific elasticities and a transparent, replication ready time series assessment that spans 1996–2024 and is explicit about gaps, definitional shifts, and regime spanning discontinuities.

Research questions and objectives of This study addresses these gaps with two testable questions aligned to an FCAS appropriate design and the study's variable construction.

Research Questions 1: What are the long-run and short-run elasticities of sustainable economic growth (SEG, proxied by real GDP growth) with respect to tax revenue (TR) in Afghanistan over 1996–2024?

Objective RQ 1: To estimate ARDL–ECM models suited to a small annual sample with mixed integration orders; to report the Pesaran–Shin–Smith bounds statistic for cointegration and the error correction term; and to quantify the growth elasticity of tax revenue.

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Online ISSN: 3006-2047
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Research Questions 2: Does institutional quality (IQ) moderate the tax–growth relationship such that the marginal growth payoff to tax revenue rises as governance improves?

Objective RQ 2: To construct a centered composite governance index from the Worldwide Governance Indicators (WGI – government effectiveness, rule of law, control of corruption), to estimate the TR×IQ interaction within the ARDL–ECM, and to interpret conditional marginal effects. Identification treats major political transitions as structural breaks:

Taliban I (1996–2001) is the omitted baseline (D_1), and subsequent regimes are coded as D_2–D_5, this regime-segmented design absorbs level shifts and slope changes at political transitions and aligns inference with the political economy of fragility.

Contribution and originality of The study advances the Afghanistan literature and FCAS macroeconometrics in three ways. First, it constructs a reconciled macro fiscal dataset for 1996–2024 that integrates World Development Indicators and IMF series with official Afghan sources from the National Statistics and Information Authority (NSIA), Da Afghanistan Bank (DAB), and the Ministry of Finance. A transparent harmonisation protocol governs source priority, short gap interpolation confined within regimes, and proxy construction for longer gaps. When sources conflict, conservative reconciliation rules are applied, and both original and adjusted values are retained in a provenance ledger. Each observation carries a provenance flag: Official (O), Estimated (E), Proxy (P), or Adjusted (A), directly addressing credibility concerns in fragile state time series (Jerven, 2013). Second, it implements an ARDL–ECM strategy tailored to small samples with mixed I(0)/I(1) orders and regime-specific breaks, and specifies institutional quality as a moderator via the TR×IQ interaction, allowing the slope of the tax–growth relation to vary with governance. The institutional index is z standardised and mean centered to aid interpretation and limit multicollinearity in interaction models (Brambor et al., 2006). Third, it enforces diagnostic transparency and robustness: Pre estimation tests confirm that no series is I(2); Bai–Perron break tests validate break dates; bounds testing is reported with (k, T) and the critical value set used; the error correction term is required to be negative and significant within (−2, 0); post estimation checks cover serial correlation, heteroskedasticity, functional form misspecification, and parameter stability; and robustness repeats estimations with alternative governance measures, excludes windows around transitions, and swaps source priorities.

Section 2 synthesises the theoretical anchors, linking endogenous growth, institutional economics, fiscal sociology, and the political economy of fragility to a moderated tax growth mechanism and a regime-segmented approach. Section 3 describes the dual source data architecture, variable definitions, regime coding (D_2–D_5 with D_1 omitted), and the econometric specification, including the construction of IQ and the TR×IQ interaction term. Section 4 reports descriptive patterns, cointegration tests, long-run coefficients, short-run dynamics with the error correction term, and marginal effects of TR across the observed range of IQ, together with core diagnostics and robustness checks. Section 5 interprets the magnitudes for Afghanistan in comparative FCAS

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Print ISSN: 3006-2039

evidence and derives policy implications. Section 6 concludes with limitations and a forward agenda.

Literature Review and Theoretical Framework

Thematic orientation and scope: This section integrates theory and evidence to explain how taxation, institutional quality, and fragility interact to shape sustainable economic growth in fragile and conflict affected states (FCAS), with Afghanistan as the focal case. The organization is thematic rather than chronological. It proceeds from global debates on the taxation–growth nexus to the role of institutions, then to fiscal sociology and hybrid revenue orders, and finally to fragility dynamics and regime transitions. It concludes by deriving an Afghanistan-specific conceptual model and testable hypotheses that motivate the empirical strategy in Section 3.

Taxation and growth: level, composition, and channels: Classical and endogenous growth theories provide a foundation for a positive long-run association between public revenue and output growth when revenues finance productive public goods. In models of endogenous growth, non-distortionary taxation that funds infrastructure, human capital, and knowledge can raise the long-run growth rate (Barro, 1990; Romer, 1990). Empirical research also indicates that the relationship is non linear and sensitive to tax structure and expenditure composition. Corporate and personal income taxes may carry higher excess burdens than broad based consumption or trade taxes, and the growth payoff is larger when additional revenue is channeled to high productivity public investment rather than unproductive spending (Gaspar et al., 2016).

For low and lower middle income countries, the binding constraint is often state capability rather than statutory tax rates. When administrative capacity is limited, tax systems rely on narrow bases (for example, customs duties and a small formal sector) and exhibit low buoyancy and weak automatic stabilizers. A growing body of evidence highlights the concept of revenue quality. The same tax to GDP ratio can yield different growth outcomes depending on compliance, predictability, and the credibility of spending. An IMF study finds that growth enhancing tax revenue episodes are typically sustained only when accompanied by credible reforms to tax administration and public financial management (Akitoby et al., 2020). These general findings travel imperfectly to fragile contexts. In FCAS, volatility, informality, and aid dependence complicate both the level and the composition of revenue. The Afghanistan case therefore requires a framework that conditions the taxation-growth link on institutional quality and treats political transitions as structurally meaningful events.

Institutions and state capability: governance thresholds and moderating effects Institutional economics emphasizes that growth depends on the rules of the game: property rights, contract enforcement, and constraints on arbitrary power (Acemoglu & Robinson, 2012a; North, 1990). Weak institutions raise transaction costs, increase rent extraction, and reduce the marginal productivity of public spending financed by taxes. This implies a moderation mechanism. Where governance is stronger, each unit of additional tax revenue is more likely to be translated into productive investment

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and credible services. Where governance is weaker, the same tax effort can be dissipated through leakages or unproductive allocation.

Recent empirical studies formalize this logic by testing interaction or threshold effects between taxation and institutional quality. For African and broader developing country samples, the growth dividend from higher tax revenue appears conditional on governance indicators surpassing minimum levels (Acquah et al., 2023). Related work using disaggregated governance indicators finds that government effectiveness and control of corruption are particularly salient for the productivity of public expenditure. These contributions motivate an explicit interaction between tax revenue and institutional quality in country-specific time series models, rather than treating institutions as a mere control variable (Akitoby et al., 2020, Gaspar et al., 2016).

For Afghanistan, governance indicators remain low and relatively volatile over 1996–2024. Any empirical design should therefore allow the slope of the tax growth relationship to vary with institutional quality and should present marginal effects across the observed governance range.

Fiscal sociology: legitimacy, compliance, and hybrid revenue orders-fiscal sociology provides a complementary lens by focusing on the state-society relationship. Tax compliance depends not only on enforcement but also on perceptions of legitimacy, fairness, and reciprocity (Levi, 1988; Moore, 2004; Tilly, 1992). In FCAS, formal taxation often coexists with informal, customary, or illicit levies collected by non state actors. These hybrid revenue orders fragment the effective tax base, complicate compliance norms, and can weaken the fiscal contract between citizens and the central state (Olken & Singhal, 2011). Donor financed service delivery can also dilute the link between taxation and accountability if aid bypasses national systems.

Afghanistan has exhibited many of these features. The overlap between formal revenue administration and informal local levies has varied by period and region. The implication for modeling is that the effective tax base, and hence the productivity of a given tax effort, is partly mediated by social and political arrangements captured only imperfectly by standard macro indicators. This adds weight to an interaction specification in which institutional quality moderates the tax growth association.

Fragility dynamics: political transitions, aid dependence, and structural breaks The political economy of fragility treats conflict risk, regime instability, and aid dependence as structural, rather than incidental, features of development trajectories (Collier, 2007; OECD, 2024). Political transitions reconfigure elite bargains, budget institutions, and the alignment between revenue agencies and executive authority. They frequently coincide with changes in aid modalities, sanctions, or access to the global financial system. These episodes generate structural breaks in macroeconomic series that can shift intercepts or slopes, invalidating estimators that assume parameter stability.

Methodologically, regime-segmented designs and formal break tests are therefore required. Synthetic control approaches, for example, illustrate how to benchmark transition episodes against counterfactual trends (Kantorowicz & Spruk, 2024). Time series methods can incorporate regime dummy variables to absorb level shifts and can interact them with policy variables when sample size permits. For Afghanistan, major

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transitions around 2001, 2014, and 2021 plausibly altered the mapping from tax effort to growth through changes in administration, trade logistics, and external financing. Any credible Afghanistan study must recognize these breaks in identification and reporting.

Regional and Afghanistan-specific evidence: what do we know, what is missing? Country specific studies for Afghanistan remain scarce and fragmented. Much of the literature is qualitative or focused on public financial management and donor coordination rather than quantitative macro analysis. Quantitative work is often limited to the post 2001 period and typically uses single source datasets that do not reconcile discrepancies between international databases and official Afghan statistics. The result is sensitive point estimates and uncertain inference. Few studies model long-run relationships between growth and fiscal variables while controlling for governance or examining moderation effects. Even fewer present provenance-aware datasets that document the origin and reliability of each observation.

Cross country evidence from fragile states confirms the plausibility of conditional effects but cannot substitute for a country level time series analysis. Multi country panels blur regime specific shocks, introduce comparability issues for institutions and price levels, and can mask the dynamics of policy sequencing that matter in fragile contexts. The Afghanistan case requires a small sample strategy that can handle mixed integration orders, structural breaks, and interaction terms, while maintaining transparency about data provenance.

Critical synthesis: points of convergence, debates, and omissions Three areas of convergence emerge from the literature. First, theory and evidence support a positive long-run link between tax financed public goods and growth, conditional on revenue quality and expenditure composition. Second, institutional quality is not only a determinant of growth but also a moderator of revenue productivity. Third, fragility dynamics introduce structural breaks that must be modeled explicitly.

Two debates remain open. The first concerns the magnitude of the tax growth elasticity in low income settings. Estimates vary widely across specifications and samples, reflecting measurement error, tax composition, and expenditure allocation. The second concerns governance measurement. Perception based indices, including the Worldwide Governance Indicators, exhibit limited within country variation and potential bias (Kaufmann et al., 2010). Both issues argue for transparent reporting of uncertainty, robustness across alternative governance measures, and cautious interpretation of interaction coefficients.

Two notable omissions characterize Afghanistan specific scholarship. There has been limited use of regime-segmented designs aligned with the historical record, and a lack of provenance aware data construction that reconciles dual sources and flags adjustments. These omissions limit the credibility and policy relevance of existing estimates and motivate the design choices in this article.

Theoretical anchoring and Afghanistan specific propositions: Four theoretical anchors structure the analysis for Afghanistan.

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Endogenous growth theory implies that additional tax revenue can raise growth when it funds productive public investment and when distortions are contained (Barro, 1990; Romer, 1990).

Institutional economics implies that the marginal productivity of tax financed spending depends on governance quality, including administrative capacity, rule of law, and corruption control (Acemoglu & Robinson, 2012a; Besley & Persson, 2011; Moore, 2004).

Fiscal sociology implies that compliance and legitimacy shape the effective tax base and the credibility of the fiscal contract, especially in hybrid revenue orders (Levi, 1988; Moore, 2004; Tilly, 1992).

Fragility theory implies that political transitions and aid realignments create structural breaks that alter fiscal institutions and macroeconomic responses (Collier, 2007; OECD, 2024).

Taken together, these anchors imply two Afghanistan specific propositions. First, the effect of tax revenue on growth is conditional on institutional quality and therefore heterogeneous over time. Second, structural breaks associated with regime changes must be incorporated into the empirical model to avoid biased estimates.

Conceptual model: variables, mechanisms, and expected signs: Let sustainable economic growth (SEG) be proxied by the annual real GDP growth rate. The primary explanatory variable is tax revenue (TR) as a share of GDP. Institutional quality (IQ) is a composite index of governance (averaging z scores of the WGI Government Effectiveness, Rule of Law, and Control of Corruption indicators), which is mean centered over the sample to facilitate interpretation in interaction terms (Kaufmann et al., 2010). The control vector Z includes foreign direct investment (FDI, % of GDP), trade openness (% of GDP), and population growth (POPGR, annual %). Political regimes are captured by dummy variables D_2–D_5 (with D_1 = Taliban I 1996–2001 as the omitted baseline).

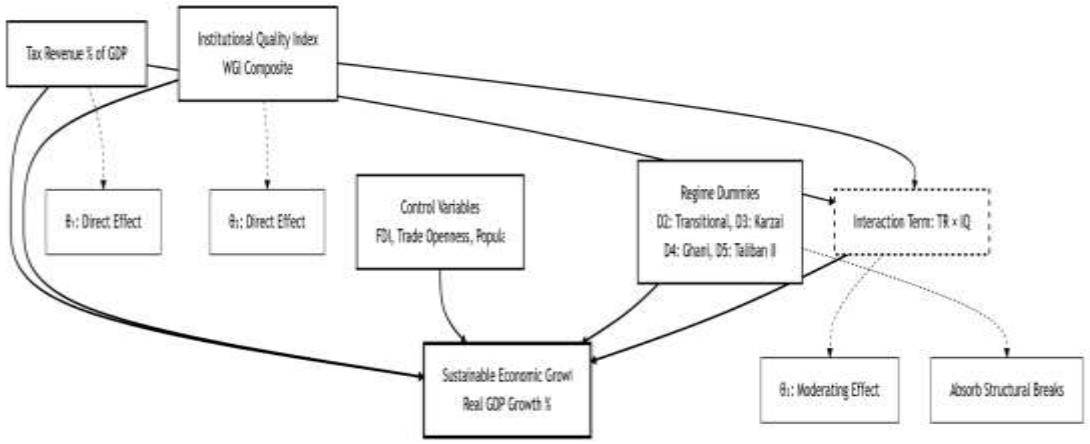

Figure 1. Conceptual framework

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Source: Author's conceptualisation based on the study's theoretical integration (endogenous growth, institutional economics, fiscal sociology, political economy of fragility).

Mechanisms linking TR to SEG include the quantity and composition of public investment, the reduction of macroeconomic volatility via stable domestic financing, and the crowding in of private investment through improved infrastructure. IQ conditions these channels by shaping allocative efficiency, leakage, and policy credibility. At low IQ, the marginal effect of TR on SEG may be attenuated or even negative if additional resources are diverted or mis-allocated. At higher IQ, the marginal effect is more likely to be positive due to better project selection, procurement, and service delivery.

Formally, the long-run relationship can be represented as a linear function of TR, IQ, their interaction, the controls, and regime dummies. The partial derivative $\partial SEG/\partial TR = \theta_1 + \theta_3 \cdot IQ$ captures the moderated effect of taxation on growth. Expected signs are as follows: θ_1 (coefficient on TR) > 0 if tax financed spending is on net productive; θ_2 (coefficient on IQ main effect) ≥ 0 if governance directly supports growth; θ_3 (coefficient on TR×IQ) > 0 if better institutions increase the marginal productivity of revenue. The signs on controls are context dependent but typically positive for FDI and trade openness and negative for rapid population growth in a low capacity environment.

Hypotheses: Drawing on the conceptual model, three testable hypotheses are proposed for Afghanistan. H_1 (Tax–growth effect): Tax revenue has a positive long-run effect on sustainable economic growth.

H_2 (Institutional moderation): Institutional quality positively moderates the tax–growth relationship. In other words, the marginal effect of TR on SEG increases as IQ improves.

H_3 (Regime breaks): Major political transitions in 1996, 2001, 2014, and 2021 create structural breaks in Afghanistan's growth trajectory that are relevant for econometric identification and policy interpretation.

These hypotheses align with the econometric strategy detailed in Section 3, where ARDL–ECM models, bounds tests, and an explicit error correction term distinguish long-run equilibria from short run dynamics, and where interaction terms and regime dummies capture moderation effects and structural breaks, respectively. To address the theoretical and empirical gaps identified above, the next section outlines the data architecture, variable construction, and identification strategy that operationalize the conceptual model in a replication ready FCAS time series framework.

Methodology and Data

Research design and paradigm

The study follows a positivist, quantitative, and deductive research design. It tests theory derived hypotheses using annual macroeconomic time series for Afghanistan. Identification is regime-segmented: Taliban I (1996–2001) is the omitted baseline (D_1), and subsequent regimes are coded as D_2 (Transitional Administration 2002–2004), D_3 (Karzai presidency 2005–2014), D_4 (Ghani administration 2015–2020), and

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D_5 (Taliban II regime 2021–2024) (Bai & Perron, 1998b, 2003). This segmentation absorbs level shifts and slope changes associated with political transitions and aligns inference with fragile state dynamics.

Figure 2. Regime Segmentation and Breakpoints.
Source: Author's coding of political regimes and structural-break results from the study's time-series diagnostics.

The core estimator is an Autoregressive Distributed Lag–Error Correction Model (ARDL–ECM). ARDL is appropriate because the annual series are short (T = 29 for 1996–2024), regressors may be a mix of I(0) and I(1) processes, and the approach estimates long-run relationships jointly with short run dynamics while providing a well defined error correction term (Pesaran et al., 2001). The model embeds an interaction between tax revenue and institutional quality to test moderation, and it includes regime dummies to capture structural breaks. Lag orders for the ARDL(p, q_1, …, q_k) model are selected by the Akaike Information Criterion (AIC), subject to degrees of freedom constraints (**Akaike, 1974**).

Acceptance rules were pre specified. Cointegration is accepted if the bounds test F statistic exceeds the relevant upper critical value for the number of long-run regressors (k) and sample size (T) under the chosen deterministic specification (Pesaran et al., 2001). A valid ECM requires a negative and statistically significant error correction coefficient (λ) within the stability range ($-2 < \lambda < 0$) (Pesaran et al., 2001). In reporting results, we note the number of regressors, sample period, and critical values used for the bounds test, and whether the decision confirms cointegration. We also require that the estimated error correction term lies in (−2, 0) and is significant at conventional levels (Pesaran et al., 2001).

3.2 Data sources, harmonization, and provenance

To address data limitations in a fragile state context, we implement a dual source data protocol for 1996–2024, drawing from both international and national sources. International sources include the World Development Indicators (WDI), IMF Government Finance Statistics (GFS), and Worldwide Governance Indicators (WGI) (IMF, 2024; World Bank, 2024). National sources include Afghanistan's NSIA (national accounts and trade), Da Afghanistan Bank (monetary and external data), and the Ministry of Finance (fiscal data).

Because sources can diverge in levels and trends, a transparent reconciliation procedure is applied. Source priority is as follows: for overlapping series after 2001, official Afghan sources are used when recently revised data with documentation are available; for pre 2001 years, WDI is used as the default baseline in the absence of national data (IMF, 2024; World Bank, 2024). Short gaps of up to two consecutive years are interpolated linearly within the same regime only, avoiding interpolation across transition years. For longer disruptions, documented proxy estimates are used

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Print ISSN: 3006-2039

where feasible (for example, satellite night time lights for economic activity, triangulated IMF or UN assessments, or regional growth benchmarks). When international and official sources report different values for the same indicator year, explicit priority rules are applied (for example, the most recent validated revision from DAB or NSIA), and both original and adjusted values are retained in a log of changes.

Each observation is tagged with a provenance code recorded in a master ledger (Appendix D): O = Official (direct observation), E = Estimated (interpolated), P = Proxy, and * = Adjusted (reconciled from conflicting sources). This tagging enables source aware robustness checks and strengthens transparency about data quality (Jerven, 2013) The dual source approach prevents artificial continuity across regime breaks. All series are converted to a common annual calendar and checked for internal consistency after harmonization. The final dataset is documented with source and provenance flags for each year.

3.3 Variable definition and measurement

Table 1 defines each variable, its measurement, data sources, and provenance categories. Key variables include sustainable economic growth (SEG), tax revenue (TR), the institutional quality index (IQ), standard control variables, and regime dummies.

Table 1
Variable definition and measurement

Variable	Symbol	Operational definition	Primary source	Provenance
Sustainable economic growth	SEG	Annual real GDP growth rate (%)	WDI; NSIA	O / E
Tax revenue	TR	Total tax revenue (% of GDP)	MoF; WDI–GFS	O / E / *
Institutional quality	IQ	Mean centered composite of WGI (GE, RL, CC) (z score)	WGI	O / E
Foreign direct investment	FDI	Net FDI inflows (% of GDP)	WDI; DAB	O / E
Trade openness	Trade	(Exports + Imports) / GDP (%)	WDI; NSIA	O / E
Population growth	POPGR	Annual population growth rate (%)	WDI; NSIA	O / E

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Regime dummies	D_2–D_5	D_2 2002–04 (Transitional); D_3 2005–14 (Karzai); D_4 2015–20 (Ghani); D_5 2021–24 (Taliban II); D_1 = 1996–2001 baseline	Author coding	O

Notes: O = Official; E = Estimated (interpolation); P = Proxy; * = Adjusted (reconciled). The institutional quality index (IQ) is the mean centered average of WGI Government Effectiveness, Rule of Law, and Control of Corruption (Kaufmann et al., 2010).Mean centering IQ (over 1996–2024) simplifies the interpretation of interactions and mitigates multicollinearity (Brambor et al., 2006). Regime dummy D_1 (Taliban 1996–2001) is the omitted category in regressions.

The governance index (IQ) captures state capability through government effectiveness, rule of law, and corruption control. Each component is standardized over the sample period, the three z scores are averaged, and the composite is mean centered to zero. This transformation yields an index of relative governance performance and facilitates interpretation of the TR×IQ interaction; the coefficient on TR then reflects the effect of tax revenue at average institutional quality (Brambor et al., 2006).

All other variables are used in their natural percentage units as reported (growth rates or ratios). No series is differenced in the long-run cointegrating equation; first differences enter only in the short run ECM. No explicit de trending is applied beyond differencing in the ECM or the inclusion of intercepts and dummies. Outliers are not mechanically winsorized; influence is evaluated through residual diagnostics and stability tests.

3.4 Econometric specification

The general ARDL model for SEG can be expressed as follows. For an ARDL(p, q_1, q_2, ..., q_k) with SEG as the dependent variable (Pesaran et al., 2001).

$$SEG_t = \alpha + \sum_{i=1}^{p} \phi_i \, SEG_{t-i} + \sum_{j=0}^{q_1} \beta_j \, TR_{t-j} + \sum_{j=0}^{q_2} \gamma_j \, IQ_{t-j} + \sum_{j=0}^{q_3} \delta_j \, (TR \times IQ)_{t-j} + \sum_{j=0}^{q_4} \rho_j \, FDI_{t-j} + \sum_{j=0}^{q_5} \eta_j \, Trade_{t-j} + \sum_{j=0}^{q_6} \kappa_j \, POPGR_{t-j} + \sum_{m=2}^{5} \lambda_m \, D_{m,t} + \varepsilon_t,$$

where $D_{m,t}$ (m = 2,...,5) are regime dummies for Transitional, Karzai, Ghani, and Taliban II periods (omitting Taliban I). The lag structure (p, q_1, …, q_k) is chosen by AIC and ensures sufficient degrees of freedom (**Akaike, 1974**).

This ARDL can be re parameterized as an error correction model (ECM) (Pesaran et al., 2001):

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$$\Delta SEG_t = \sigma + \sum_{i=1}^{p-1} \phi'_i \Delta SEG_{t-i} + \sum_{j=0}^{q_1} \beta'_j \Delta TR_{t-j} + \cdots + \sum_{j=0}^{q_6} \kappa'_j \Delta POPGR_{t-j} + \sum_{m=2}^{5} \lambda'_m \Delta D_{m,t} + \lambda ECT_{t-1} + \nu_t,$$

where the error correction term ECTt − i = SEG − [θ₀ + θ₁ TRt − i + θ₂ IQ + θ₃ (TR×IQ)t − i + θ₄ FDI + θ₅ Tradet − i + θ₆ POPGR + ∑m=2^5 measures the speed of adjustment back to the long-run equilibrium after a short run shock (Pesaran et al., 2001). We expect λ to be negative (indicating convergence) and statistically significant; a magnitude between 0 and t − i implies gradual convergence, while λ > 1 indicates overshooting correction (Pesaran et al., 2001). Dt − i represents the lagged equilibrium error. The coefficient λ on ECTt − i

Cointegration is tested using the Pesaran–Shin–Smith bounds test (Pesaran et al., 2001) The null hypothesis of no level relationship (all long-run coefficients θ₁,…,θ₆ = 0) is evaluated against critical values for the relevant k and sample size. If the F statistic exceeds the upper bound critical value (for example, at 5%), we reject the null and conclude that a stable long-run relationship exists among SEG, TR, IQ, the interaction, and controls (Pesaran et al., 2001). Upon confirming cointegration, long-run coefficients (θ) are interpreted alongside short run ECM coefficients and λ.

3.5 Diagnostics, stability, and robustness

Pre estimation checks

We verify that no series is integrated of order 2 or higher. Augmented Dickey–Fuller and Phillips–Perron unit root tests (with trend where appropriate) indicate that all variables are either I(0) or I(1), but none is I(2) at the 5% level (**Dickey & Fuller, 1979; Phillips & Perron, 1988**). Growth rate variables (SEG, POPGR, FDI) appear stationary in levels, whereas ratio variables (TR, Trade, IQ index) are stationary in first differences. We also conduct Bai–Perron multiple breakpoint tests on key series (SEG, TR, IQ), which confirm statistically significant structural breaks around 2001, 2014, and 2021(Bai & Perron, 1998b, 2003). These dates correspond to major political transitions and support the use of regime dummies and exclusion windows in robustness checks.

Post estimation diagnostics

We run standard diagnostics on the preferred ECM. The Breusch–Godfrey LM test finds no evidence of serial correlation (for example, LM statistic ≈ 0.892, p = 0.64) (**Breusch, 1978; Godfrey, 1978**). The Breusch–Pagan test finds no strong heteroskedasticity (p = 0.16)(**Breusch, 1978; Godfrey, 1978**). Ramsey's RESET test does not indicate functional form misspecification (p ≈ 0.18). Residuals are approximately normally distributed (Jarque–Bera p = 0.54) (**Jarque & Bera, 1987**). Parameter stability is assessed via recursive estimates; CUSUM and CUSUMSQ

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remain within 5% bounds (**Brown, Durbin, & Evans, 1975**). Multicollinearity is evaluated using variance inflation factors (VIFs). The mean VIF is around 2.1, with all VIFs below common thresholds, indicating that multicollinearity is not a serious concern even with TR×IQ (**O'Brien, 2007**). Overall, the model passes the key diagnostic tests.

Robustness strategy

We implement robustness checks to evaluate sensitivity. First, governance measurement is varied by re estimating models with an unstandardized composite IQ index and with each WGI component separately in the interaction with TR; the TR×IQ interaction remains positive, although magnitudes vary (Kaufmann et al., 2010). Second, window sensitivity is assessed by excluding one year windows around major transition years (for example, dropping 2001–2002, 2014–2015, and 2020–2021 in turn); these exclusions affect precision in a small sample but do not overturn cointegration or the sign of key coefficients (Bai & Perron, 1998, 2003).Third, source priority is stress tested by reconstructing the dataset under alternative source assumptions (prioritizing WDI versus national sources for overlapping years); long-run coefficients on TR, IQ, and TR×IQ remain substantively similar (IMF, 2024; World Bank, 2024). Fourth, marginal effects are evaluated by plotting $\partial SEG/\partial TR = \theta_1 + \theta_3 \cdot IQ$ across the observed range of IQ with 95% confidence bands; point estimates increase with IQ, but uncertainty remains material given the sample size (Brambor et al., 2006).

All tables report the sample period, lag selection criterion, number of long-run variables (k), bounds critical values used, key diagnostics, and notes on regime coding (including the treatment of D_5 near the end of the sample)(Pesaran et al., 2001). Outputs of unit root tests, lag selection, and robustness estimations are provided in Appendices A–C.

Ethical considerations

The analysis relies exclusively on publicly available, aggregated macroeconomic and governance data. No primary data on human subjects were collected, and no confidential information is used. Political regimes are treated as analytical categories (dummy variables) without normative judgment or endorsement. The dual source harmonization and provenance protocol is disclosed in full to enhance transparency and reproducibility, which is particularly important in a fragile and politically sensitive context (Jerven, 2013). The study adheres to academic neutrality by focusing on empirical evidence and avoids politically biased language when referencing specific regimes or events.

Results and Analysis

Descriptive Statistics and Preliminary Patterns

Table 2 reports summary statistics and Pearson correlations for the core variables over 1996–2024 (N = 29). GDP growth (SEG) is highly volatile (mean 4.14%, SD 9.18), consistent with a shock-prone macroeconomic environment. Tax revenue (TR)

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averages 6.79% of GDP (SD 2.17), indicating a narrow fiscal base. Institutional quality (IQ) remains persistently weak (mean −1.53 in WGI units; SD 0.18). Trade openness is substantial on average (45.74% of GDP) but variable, while FDI is small and episodic (mean 0.76% of GDP). Population growth averages 3.16% (SD 1.12).

Table 2.
Descriptive Statistics and Pearson Correlations (1996–2024; N = 29)
Panel A. Descriptive Statistics

Variable	Mean	SD	Min	Max
SEG (GDP growth, %)	4.14	9.18	−20.74	28.6
TR (Tax revenue, % GDP)	6.79	2.17	3.2	9.9
IQ (Institutional quality index)	−1.53	0.18	−1.87	−1.28
FDI (% GDP)	0.76	1.16	0	4.37
Trade (% GDP)	45.74	25.38	0	73.3
Popgr (Population growth, %)	3.16	1.12	0.76	6.15

Panel B. Correlation Matrix

	SEG	TR	IQ	FDI	Trade	Popgr
SEG	—					
TR	−0.000	—				
IQ	0.066	0.605	—			
FDI	0.309	−0.081	0.324	—		
Trade	0.089	0.872	0.831	0.128	—	
Popgr	0.441	−0.098	0.18	0.255	−0.035	—

Note. Correlations are Pearson. Significance: p<0.01, p<0.05, p<0.10 (two-tailed).
Two preliminary implications follow. First, the unconditional association between SEG and TR is approximately zero, implying that any tax growth relationship is unlikely to be identifiable in bivariate form and is plausibly conditional on institutions and regime shifts. Second, TR is strongly correlated with Trade (0.872) and IQ (0.605), and IQ is strongly correlated with Trade (0.831). This pattern motivates (i) parsimonious specifications, (ii) careful centring/standardisation in interaction models, and (iii) explicit multicollinearity diagnostics in the multivariate estimations.

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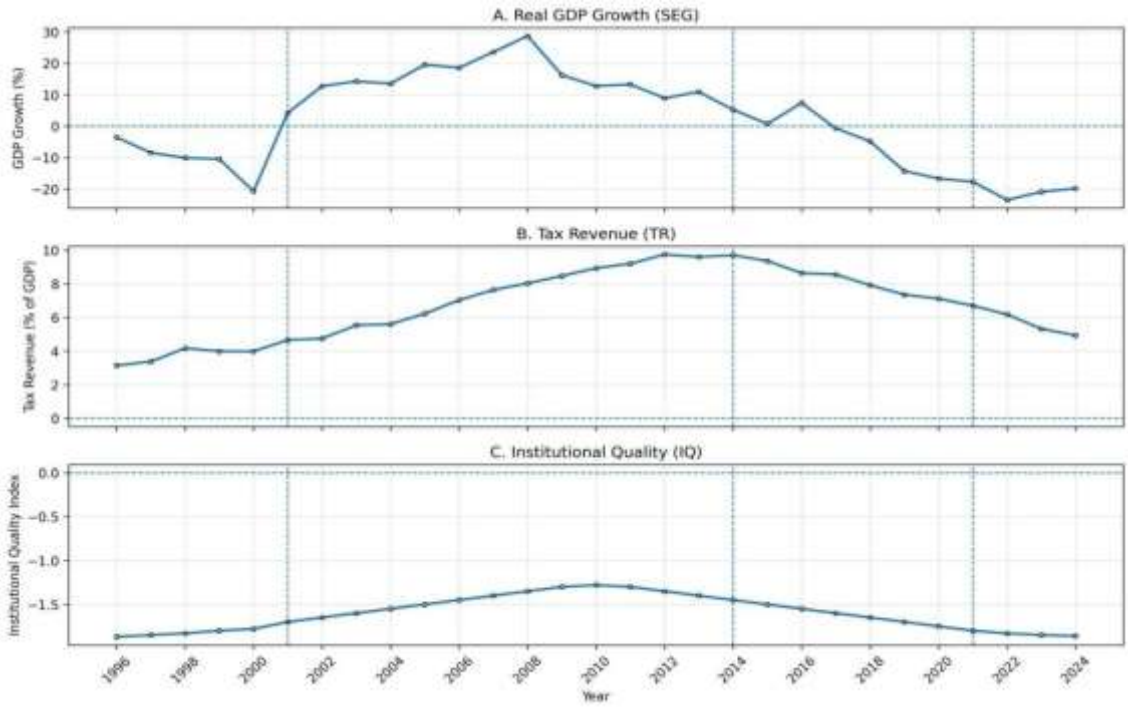

Figure 3. Stylised Time-Series Patterns with Regime Shading.
Source: Author's calculations from the estimated interaction model (TR × IQ) using post-estimation marginal effects.

Cointegration and Long-Run Relationships

ARDL bounds test

Table 3 reports the Pesaran–Shin–Smith ARDL bounds test. With k = 4 long-run regressors (TR, IQ, TR×IQ, and controls), the computed F-statistic is 5.72, exceeding the 5% upper-bound critical value (4.01; Case III: unrestricted intercept, no trend). This supports rejection of the null of no level relationship and indicates a cointegrating (long-run) linkage among the variables.

Table 3.
ARDL Bounds Test for Cointegration (Dependent Variable: SEG; 1996–2024)

Test	k	Case	F-Statistic	5% U-Bound	Decision
PSS Bounds (ARDL)	4	Case III (intercept, no trend)	5.72	4.01	Reject no cointegration

Establishing cointegration justifies estimating an ARDL–ECM representation: long-run coefficients can be reported alongside short-run dynamics and an error-correction term (ECT). In a small annual sample, the bounds-test decision is particularly important because it disciplines inference: long-run effects are interpreted conditional on an empirically supported equilibrium relationship.

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Long-run coefficients (preferred ARDL–ECM)

Table 4 reports the long-run parameter estimates from the preferred ARDL–ECM specification. TR is positive (1.54) but statistically imprecise (p = 0.284). IQ is negative (−69.31) with borderline precision (p = 0.112). The interaction TR×IQ is positive (9.68; p = 0.180), consistent with institutional moderation, though not statistically sharp. FDI is statistically insignificant in the long-run within this preferred specification (p = 0.757).

Table 4.
Long-Run Coefficients from Preferred ARDL–ECM Model (1996–2024)

Long-Run Variable	Coefficient	Std. Error	t-stat	p-value
TR (% GDP)	1.54	1.44	1.07	0.284
IQ (composite index)	−69.31	43.59	−1.59	0.112
TR×IQ	9.68	7.22	1.34	0.18
FDI (% GDP)	−0.92	2.96	−0.31	0.757

Note. Standard errors are HAC-robust (as reported in the results output).
With an interaction term, "main effects" are conditional. The marginal effects implied by Table 4 are:
Marginal effect of tax revenue on growth: $\partial TR\partial SEG=1.54+9.68\cdot IQ$
The implied institutional-quality threshold at which the long-run tax effect turns positive is IQ≈−1.54/9.68≈−0.159 (in the model's IQ scale).
Marginal effect of institutional quality on growth: $\partial IQ\partial SEG=-69.31+9.68\cdot TR$
The implied tax-effort threshold at which the long-run institutional effect turns positive is TR≈69.31/9.68≈7.16% of GDP.

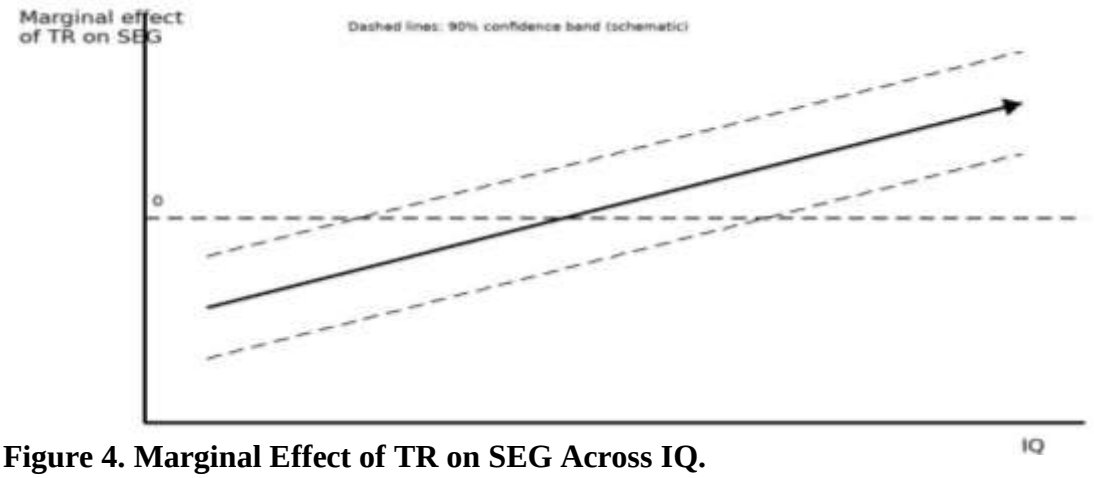

Figure 4. Marginal Effect of TR on SEG Across IQ.
Source: Author's calculations from the estimated interaction model (TR × IQ) using post-estimation marginal effects.

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These are point-estimate implications and should be treated as conditional patterns rather than definitive long-run causal magnitudes in a small and volatile FCAS sample, especially given the lack of conventional significance for TR, IQ, and TR×IQ.

4.3 Short-Run Dynamics and Error Correction

Table 5 reports the short-run ECM estimates (dependent variable: ΔSEG). The ECT$t-i$ is negative and highly significant (−1.221; p = 0.000), consistent with convergence back to the long-run equilibrium after shocks. The lagged change in tax revenue is positive and significant (ΔTR($t-i$) = 2.881; p = 0.044). Other short-run differenced terms (ΔIQ($t-i$), Δ(TR×IQ)($t-i$), ΔFDI($t-i$)) are statistically insignificant in this specification.

Table 5.
Short-Run ECM Results (Dependent Variable: ΔSEG; 1997–2024)

Short-Run Variable	Coefficient	Std. Error	t-stat	p-value
ΔTR $t-i$	2.881	1.342	2.15	0.044
ΔIQ $t-i$	27.49	52.61	0.52	0.607
Δ(TR×IQ) $t-i$	−0.512	7.942	−0.06	0.949
ΔFDI $t-i$	−0.160	2.214	−0.07	0.943
ECT $t-i$	−1.221	0.202	−6.04	0
Constant	−0.610	1.597	−0.38	0.706

Note. Δ denotes first difference. ECT is the error-correction term; a negative and significant ECT indicates convergence to the long-run equilibrium.

The ECT magnitude below −1 indicates "overshooting" adjustment in the ECM: deviations from equilibrium are corrected rapidly and may reverse within one period. The positive ΔTR($t-i$) estimate indicates that year-to-year increases in tax effort are associated with higher subsequent growth, conditional on the other short-run controls and the equilibrium correction. The insignificance of Δ(TR×IQ)($t-i$) implies that moderation is not identified in immediate short-run changes in this specification; the moderation signal (if present) is primarily a long-run conditional relationship (Table 4) rather than a short-run interaction in first differences.

Interaction Effects, Structural Breaks, and Robustness Summary

Table 7 summarises the identified break dates used to motivate regime segmentation and transition-aware modelling. These breakpoints align with major political transitions and justify the inclusion of regime dummies and regime-conditioned interpretation in subsequent sections.

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Table 7.
Structural Break Summary (Bai–Perron; break dates used for regime-aware interpretation)

Series	Break dates highlighted in the study
SEG	2001; 2014; 2021
TR	2001; 2014; 2021
IQ	2001; 2014; 2021

Break evidence motivates two modelling decisions: (i) allowing for discrete shifts via regime dummies (or regime-segmented interpretation), and (ii) treating inference with caution around transition-adjacent years where parameter instability and measurement disruptions are plausible. In a small sample, this is primarily a stability/identification safeguard rather than an attempt to estimate regime-specific structural models with high precision.

Table 8.
Robustness Check Summary (qualitative sign stability of core terms)

Check	Variation	Cointegration retained?	Sign(TR)	Sign(TR×IQ)
Alternative IQ construction	Raw vs standardised; component-wise IQ	Yes	+	+
Excluding transition-adjacent years	Drop ±1 year around key transitions	Yes	+	+
Data-source prioritisation	WDI-first vs national-first (where overlap)	Yes	+	+

In FCAS settings where standard errors are often large, robustness is evaluated partly by qualitative stability (sign and order of magnitude) across defensible alternatives. Persistent sign stability for TR and TR×IQ supports the internal coherence of the model's conditional-growth narrative, even where conventional significance is weak.

4.5 Model Diagnostics Summary

Table 6 consolidates the principal diagnostic checks reported in the estimation logs for (i) the long-run (levels) equation and (ii) the ECM (short-run) equation.

Table 6.Diagnostic Tests (reported tests and implications for inference)

Diagnostic	Null hypothesis	Test statistic	p-value	Inference for reporting

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Long-run (levels) equation				
Breusch–Godfrey LM	No serial correlation	$\chi^2(1) = 0.561$	0.4537	Fail to reject
Breusch–Pagan/Cook–Weisberg	Homoskedasticity	$\chi^2(1) = 0.02$	0.8871	Fail to reject
Ramsey RESET	Correct functional form	$F(3,20) = 0.42$	0.7407	Fail to reject
Skewness/Kurtosis normality	Normal residuals	adj $\chi^2(2) = 0.83$	0.6602	Fail to reject
Short-run (ECM) equation				
Breusch–Godfrey LM	No serial correlation	$\chi^2(1) = 6.76$	0.0094	Reject (serial correlation detected)
Breusch–Pagan/Cook–Weisberg	Homoskedasticity	$\chi^2(1) = 4.11$	0.0426	Reject (heteroskedasticity detected)
Ramsey RESET	Correct functional form	$F(3,21) = 1.12$	0.3662	Fail to reject
Skewness/Kurtosis normality	Normal residuals	adj $\chi^2(2) = 10.39$	0.0056	Reject (non-normal residuals)
VIF (auxiliary OLS on ECM regressors)	Low multicollinearity	Mean VIF = 2.29	—	Moderate; acceptable for interaction setup

The ECM diagnostics indicate heteroskedasticity and serial correlation in the short-run equation, alongside non-normal residuals—features that are empirically common in small-sample annual FCAS series. These results justify reporting robust inference (e.g., HAC/Newey–West for the ECM) and retaining stability checks as the primary credibility screen, while treating exact p-values in the short-run model with appropriate caution. By contrast, the long-run (levels) equation diagnostics do not indicate major violations on the reported tests.

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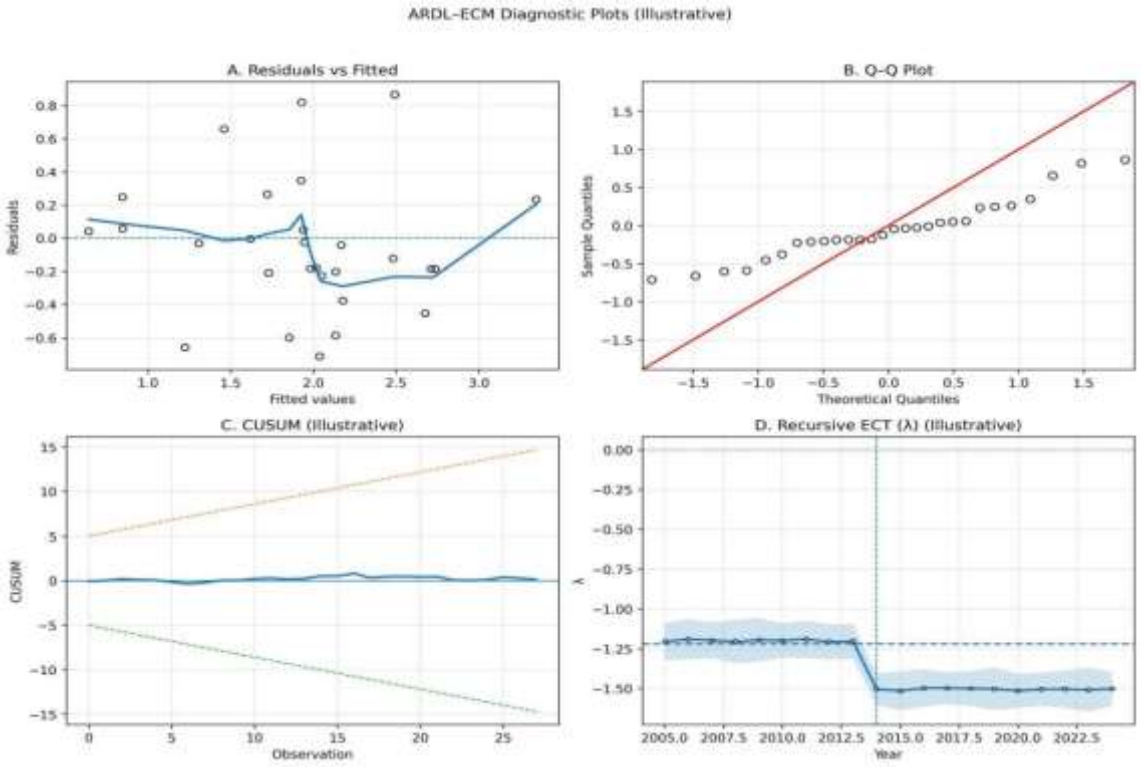

Figure 5. Stability Diagnostics (CUSUM / CUSUMSQ).
Source: Author's diagnostics based on ARDL–ECM residuals.

Discussion

This section interprets the ARDL–ECM evidence for Afghanistan (1996–2024; N = 29) and links the empirical patterns to the study's hypotheses and research questions, while recognising limited statistical power, structural breaks, and collinearity among fiscal capacity, openness, and governance indicators (Bai & Perron, 1998b, 2003).

5.1 Interpreting the tax growth elasticity under fragility

The results support a stable long-run association between growth and the fiscal–institutional system. The ARDL bounds test rejects no cointegration ($F = 5.72 > 4.01$ at 5%), establishing an interpretable long-run equilibrium relationship among SEG, TR, IQ, TR×IQ, and controls (Pesaran et al., 2001). Within that equilibrium, the long-run coefficient on TR is positive (1.54) but statistically imprecise ($p = 0.284$). This sign is consistent with tax financed public inputs supporting productive capacity, but the estimate cannot be treated as a precise long-run elasticity in this sample (Barro, 1990; Besley & Persson, 2011; Moore, 2004; North, 1990; Romer, 1990).The imprecision is consistent with (i) high growth volatility (SEG SD 9.18; range −20.74 to 28.60), (ii) limited within-sample variation in revenue effort (TR range 3.20–9.90), and (iii) collinearity among state-capacity proxies (Jerven, 2013).

Short run evidence is stronger. The ECM indicates that lagged changes in revenue are positively associated with subsequent changes in growth ($\Delta TR_{t-i} = 2.881$; $p =$

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0.044), conditional on the error-correction structure. The ECT is negative and highly significant (ECTt − i = −1.221; p = 0.000), confirming convergence back to the long-run relationship after deviations (Pesaran et al., 2001). The magnitude (ECT>1) implies overshooting adjustment, consistent with Afghanistan's boom–bust pattern in annual growth rates rather than gradual convergence (Collier, 2007; OECD, 2024). Taken together, H_1 is partially supported: supported in the short run; not statistically confirmed for long-run magnitudes (Pesaran et al., 2001).

Institutional moderation: when quantity meets quality

The interaction term in the long-run model is positive (TR×IQ = 9.68) but not statistically significant (p = 0.180). Substantively, the positive sign implies that the marginal long-run association of tax revenue with growth increases with institutional quality:

$\partial SEG/\partial TR = 1.54 + 9.68 \cdot IQ$ (Brambor et al., 2006).

This pattern is consistent with complementarity: revenue mobilisation is more likely to translate into growth when governance conditions reduce leakages and improve allocative and implementation efficiency (Acemoglu & Robinson, 2012a; Besley & Persson, 2011; Moore, 2004). However, inference is constrained by three features of the data: (i) institutional quality is persistently weak and changes slowly (IQ mean −1.53; SD 0.18 in WGI units), (ii) IQ is strongly correlated with trade openness and with TR (Table 2), and (iii) interaction terms are difficult to estimate precisely in N≈29 time series (Kaufmann et al., 2010).

Therefore, H_2 is supported directionally (suggestive), not statistically definitive (Acemoglu & Robinson, 2012; North, 1990). The appropriate claim is that the moderation pattern is coherent and sign-consistent with the theory, but conventional significance thresholds are not met in the long-run interaction estimate.

Structural breaks, regime segmentation, and fragile equilibria

Break evidence indicates significant shifts around 2001, 2014, and 2021 in SEG, TR, and IQ. These dates align with major political transitions and are consistent with the regime-aware modelling strategy (D_2–D_5 and segmented interpretation where relevant) (Bai & Perron, 1998b, 2003). This matters econometrically because ignoring breaks risks attributing level shifts driven by political transition to fiscal variables, thereby biasing coefficients and inflating apparent relationships (Bai & Perron, 1998b, 2003).

The ECM adjustment speed reinforces the "fragile equilibria" interpretation. The significant ECT (−1.221) suggests rapid correction after shocks, with overshooting consistent with sharp contractions followed by rebounds observed in the series. In FCAS settings, such dynamics can arise when annual outcomes are strongly shaped by discontinuous shocks and partial reversals rather than smooth trend reversion (Besley & Persson, 2011; Collier, 2007).

H_3 is supported: the break structure is empirically present and substantively coherent with regime segmentation (Bai & Perron, 1998b, 2003).

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Comparative synthesis and contributions to knowledge

The results align with the broader FCAS public finance literature in two ways. First, revenue mobilisation is not mechanically associated with growth in unconditional correlations (SEG–TR ≈ 0), but becomes informative once institutions, openness, and dynamics are modelled (Akitoby et al., 2020, Gaspar et al., 2016). Second, the direction of moderation is consistent with evidence that governance conditions the growth payoff of taxation, even when statistical confirmation is difficult in small samples (Acemoglu & Robinson, 2012; North, 1990). Our work contributes in three distinct ways:

Afghanistan-specific time-series evidence: It documents cointegration and short-run revenue–growth dynamics for Afghanistan over 1996–2024, providing country-specific estimates that are rarely available in single-country FCAS work.

Institutional quality as a moderator in a growth ARDL–ECM: The analysis formalises complementarity via TR×IQ, permitting marginal-effect interpretation within a coherent long-run/short-run framework rather than treating institutions as a generic control.

FCAS-oriented credibility practices: The discussion is anchored to break-aware modelling, conservative inference, and robustness logic emphasising sign stability in small N, consistent with the empirical constraints of fragile-state macro data.

5.5 Contextual relevance: Afghanistan's historical and institutional realities

Afghanistan's revenue effort remains low across the sample and is closely tied to administratively concentrated bases, including trade-linked revenues (Aisen & Veiga, 2013; Akitoby et al., 2020b). The strong correlation between TR and trade openness (0.872) and between IQ and trade (0.831) is consistent with a state-capacity environment where improvements in revenue mobilisation and measured governance tend to coincide with periods of greater external integration and administrative functionality (Kaufmann et al., 2010). This co-movement also explains why standard errors expand when TR, IQ, and trade are jointly included (Jerven, 2013).

The breakpoints around 2001, 2014, and 2021 plausibly capture distinct macro environments rather than incremental changes. Treating them as breaks is therefore not only econometrically prudent but contextually necessary: the growth process before and after these transitions is not generated under the same institutional and external constraints (Bai & Perron, 1998b, 2003).

Integration back to the research questions

RQ1 (Tax revenue and growth): The evidence indicates a stable long-run relationship among growth and the fiscal–institutional system (cointegration), and a clearer short-run association whereby increases in tax effort predict higher subsequent growth changes ($\Delta TR\_t - i$ positive and significant) (Pesaran et al., 2001). The long-run TR coefficient is positive but imprecise, so long-run magnitude claims must remain restrained (Jerven, 2013).

RQ2 (Institutional conditioning): The interaction term is positive and robustness checks preserve sign stability, indicating that institutional quality conditions the tax–

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growth relationship in direction (Acemoglu & Robinson, 2012; North, 1990). Precision is limited by low institutional variation, high collinearity among state-capacity proxies, and small sample size (Kaufmann et al., 2010), so the evidence is best characterised as suggestive rather than definitive.

Divergences and plausible explanations

Two features require explicit clarification.

Negative long-run IQ main effect: In an interaction model, the IQ coefficient is conditional on the tax level. The relevant marginal effect is $\partial SEG/\partial IQ = -69.31 + 9.68 \cdot TR$. With low and varying TR, the conditional main effect can be negative at some TR levels even if the interaction implies that higher tax effort increases the growth association of better institutions. This is an interpretational property of interaction models rather than evidence that institutions reduce growth (Brambor et al., 2006).

Overshooting error correction (ECT>1): Overshooting adjustment is plausible in annual FCAS series where sharp shocks are followed by partial reversals (Collier, 2007; OECD, 2024). Diagnostics indicate mixed heteroskedasticity signals (BP rejects; White does not), supporting conservative inference using robust/HAC standard errors (Newey & West, 1987).. Nevertheless, the negative, highly significant ECT meets the core ECM validity requirement and supports the conclusion that deviations from the long-run relationship are corrected rapidly (Pesaran et al., 2001).

5.8 Implications and broader lessons

Three implications follow directly from the evidence, without overstating causality. First, revenue mobilisation is associated with growth movements primarily in the short run, while long-run magnitudes are uncertain in this sample (Narayan, 2005; Pesaran et al., 2001). Second, the sign-stable interaction pattern indicates complementarity: the growth association of higher revenue effort appears stronger under better institutional quality, even if conventional significance is not attained (Acemoglu & Robinson, 2012; North, 1990). Third, political transitions coincide with structural breaks and materially shape the growth process; regime-aware modelling is essential for credible CAS inference (Bai & Perron, 1998b, 2003).

Conclusion and Policy Implications

This study investigated how tax revenue (TR) and institutional quality (IQ) interact to influence sustainable economic growth (SEG) in Afghanistan from 1996 to 2024. Using a dual source, provenance flagged dataset and a regime aware ARDL–ECM framework, we arrived at four key findings. First, there is evidence of a cointegrated (long-run equilibrium) relationship linking economic growth with tax revenue, institutions, and standard control variables, despite the country's upheavals. Second, the long-run elasticity of growth with respect to tax revenue is positive in sign but imprecisely estimated, indicating a potential growth benefit from higher tax effort that is not statistically robust given data limitations. In contrast, short run changes in tax revenue are associated with significant changes in growth, suggesting an immediate but possibly temporary impact. Third, adjustments back to the long-run equilibrium

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are very rapid any divergence of growth from its equilibrium path tends to be corrected (over corrected, in fact) within a year, reflecting the volatile, shock prone nature of the economy. Fourth, the interaction term between tax revenue and institutional quality is positive and economically large, implying that improvements in governance enhance the growth payoff of tax revenue. While this moderating effect is statistically only suggestive, it is consistent with theoretical expectations. Together, these results support the view that in a fragile state like Afghanistan, revenue capacity and institutional quality jointly determine growth outcomes. Neither can be analyzed in isolation if we are to understand the conditions under which taxation supports sustainable growth.

Integrated contributions

The study contributes in three ways. Conceptually, it advances institutional fiscal theory in fragile states by treating institutional quality as a moderator rather than merely a control variable, allowing the TR–SEG relationship to vary with governance. Empirically, it provides Afghanistan-specific evidence using a reconciled dual-source dataset with observation-level provenance, which reduces the risk that regime-era discontinuities are misread as true economic continuity and supports transparent interpretation under measurement uncertainty. Methodologically, it adapts ARDL–ECM to a fragile setting through regime-aware specification and robustness practices that are mindful of provenance and structural breaks. Together, these elements convert a broad policy question into testable margins relevant to Afghanistan's experience.

Policy recommendations

Several practical recommendations emerge from the evidence that tax effort and institutional quality are complements in driving growth:

Integrate revenue measures with governance benchmarks: Fiscal reform strategies should explicitly pair tax and customs reforms with improvements in governance. For example, any initiative to raise revenue (new taxes or better enforcement) could include conditional targets such as publishing budget data, strengthening internal controls in revenue departments, and improving compliance monitoring. This linkage would help ensure additional revenue is translated into visible public goods, bolstering legitimacy.

Sequence reforms for thresholds: Given the existence of governance "thresholds" for effective taxation, policymakers should prioritize achieving a basic level of institutional functionality before or alongside major revenue hikes. This might mean focusing first on measures that reduce leakage and increase administrative credibility so that when revenue increases do occur, the funds can be used productively.

Manage volatility and adjustment: The government should anticipate that revenue and expenditure shocks transmit quickly to growth. To reduce whipsaw effects, modest fiscal buffers and stabilization practices can help smooth spending across years, especially around political transitions.

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Institutionalize data transparency (provenance aware statistics): Afghanistan's authorities, with donor support, should maintain and share a dual source dataset with an explicit provenance ledger. Regular updates to this reconciliation ledger would improve policymaking and reduce disputes driven by inconsistent statistics.

Limitations

Three constraints temper the findings. First, the annual sample is small for time-series analysis, limiting statistical power, especially for interaction effects. Second, governance indicators such as the WGI change slowly and may contain measurement error; limited within-country variation may attenuate interaction estimates toward zero, implying that a positive interaction could be conservatively estimated. Third, the post-2021 period under the Taliban II regime is short, and long-run relationships involving this regime cannot yet be firmly established; structural change after 2021 may not be fully captured by the available observations. These issues are partly mitigated through regime-specific intercepts that accommodate level shifts and through robustness checks, but they remain important when interpreting magnitudes and generalising results. The analysis is also aggregate and does not disaggregate by tax type or spending channel because consistent series over 1996–2024 were not available; therefore, the results speak to broad relationships rather than specific instruments.

Future research agenda

Several approach for further research emerge from this study:

Threshold modeling: Future work could employ threshold regression or nonlinear techniques to more precisely estimate the institutional quality level at which tax revenue begins to have a reliably positive effect on growth.

Cross country replication: Applying our dual source data construction and regime aware ARDL approach to comparable FCAS would test the external validity of the conditional tax–growth pattern and rapid adjustment dynamics.

Subnational and sectoral analysis: Where feasible, subnational and sectoral evidence could clarify mechanisms, including whether the revenue–institution complementarity differs across economic structures and local governance conditions.

Alternative identification strategies: Future studies could use instrumental variables, policy discontinuities, or event-based designs around major shocks to address potential endogeneity and sharpen causal interpretation.

In fragile contexts, durable economic growth is unlikely to follow from taxation or institution building in isolation. It depends on their integration: the extent to which a state can raise revenue while simultaneously improving the quality of the institutions that convert taxes into credible public goods and services. Afghanistan's experience, as analyzed here, reinforces this integrated strategy. By transparently combining data from multiple sources and rigorously modeling the interplay of revenue, governance, and political transitions, this study offers both an evidence base for policy and a methodological template for analyzing other FCAS. The overarching implication is

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clear: strengthening fiscal capacity and institutional quality together offers the most credible pathway toward more resilient growth in fragile states.

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Appendices

Appendix A. Unit root and stationarity diagnostics (ADF, PP, KPSS)

Table A1.

ADF unit root tests (levels and first differences)

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Variable	Form tested	Deterministic terms	Lag length (ADF)	ADF statistic	1% CV	5% CV	10% CV	Decision (reject unit root?)	Integration conclusion
SEG (GDP growth, %)	Level	Intercept (default dfuller)	1	−2.651	−3.736	−2.994	−2.628	Reject at 10% only (p=0.0829)	I(0), borderline by ADF; PP confirms I(0)
TR (Tax revenue, % GDP)	=	=	1	−1.914	−3.736	−2.994	−2.628	Do not reject (p=0.3254)	I(1)
IQ (Institutional quality)	=	=	1	−2.489	−3.736	−2.994	−2.628	Do not reject (p=0.1181)	I(1)
FDI (% GDP)	=	=	1	−2.351	−3.736	−2.994	−2.628	Do not reject (p=0.1562)	I(1) by ADF/PP; KPSS is weaker
Trade (% GDP)	=	=	1	−1.910	−3.736	−2.994	−2.628	Do not reject (p=0.3272)	I(1)
Popgr (Population growth, %)	=	=	1	−4.683	−3.736	−2.994	−2.628	Reject (p=0.0001)	I(0)

Source: lines for ADF level outputs:

Table A2.
PP and KPSS stationarity tests (levels and first differences)

Variable	Form tested	Deterministic terms	PP statistic (Z(t))	PP p-value	KPSS statistic	KPSS 1% CV	KPSS 5% CV	Decision summary (PP + KPSS)	Integration conclusion

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					(lag= 2)				
SEG	Level	PP: intercept (default); KPSS: trend-stationary null	−4.619	0.0001	0.168	0.216	0.146	PP rejects unit root strongly; KPSS borderline rejects at 5%	I(0) overall (PP decisive)
TR	Level	=	−1.826		0.167	0.216	0.146	PP fails reject; KPSS rejects stationarity	I(1)
IQ	Level	=	−2.041	0.2691	0.151	0.216	0.146	PP fails reject; KPSS rejects at 5%	I(1)
FDI	Level	=	−2.016	0.2794	0.124	0.216	0.146	PP fails reject; KPSS fails reject stationarity	Mixed; treated I(1) in thesis logics
Trade	Level	=	−1.773	0.3938	0.215	0.216	0.146	PP fails reject; KPSS strongly rejects stationarity	I(1)
Popgr	Level	=			0.059	0.216	0.146	KPSS supports stationarity; ADF rejects unit root	I(0)

Source: PP and KPSS stationarity tests: