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FISCAL AUTONOMY AND REVENUE GROWTH: THE IMPORTANCE OF SPATIAL CONTEXT IN LOCAL GOVERNMENT REFORM

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Abstract

This study examines the revenue growth performance of Ghana's Metropolitan, Municipal, and District Assemblies (MMDAs) and explores the moderating influence of population density on the relationship between financial autonomy and revenue growth. This study analyzes the impact of institutional capability and spatial context on subnational fiscal performance in the context of Ghana's decentralization, based on fiscal federalism and institutional theory. Auditor-General's Reports and the Ghana Statistical Service provided data on 261 MMDAs from 2018 to 2023. Stata 18 and R 4.3 were used for fixed-effects estimation, the system generalized method of moments (GMM), robustness testing, and moderation analysis using Hayes' PROCESS Model 1. The results indicate that financial autonomy substantially improved subnational revenue growth ($\beta = 0.0036$, $p < 0.001$). Population density did not significantly reduce this association ($\beta = -0.0031$, $p = 0.108$). Further analysis indicates that the fiscal benefits of autonomy are more pronounced in low-density assemblies, suggesting that institutional and administrative efficiencies play a more critical role in fiscal performance than population size. The findings indicate that decentralization reforms should prioritize improving governance quality, institutional discipline, and fiscal accountability, rather than demographic or spatial considerations. This study represents the first application of moderated panel models to 261 Ghanaian MMDAs, demonstrating that institutional strength, rather than population density, serves as the principal determinant of fiscal benefits from autonomy in developing countries. This finding contributes to the discussion on fiscal federalism and institutional theories.

Keywords: Financial Autonomy, Revenue Growth, Fiscal Decentralization, Institutional Theory, Population Density.

INTRODUCTION

Global public-sector reform is driven by fiscal decentralization and local financial autonomy. Fiscal autonomy, the authority to create, allocate, and manage revenues, improves efficiency, accountability, and citizen satisfaction in subnational administration. Local governments that rely less on central transfers and more on domestic income in fiscal federalism are motivated to increase their fiscal efforts and improve their service performance (Martell, 2024). However, the experimental findings were different. Financial autonomy has minimal or uneven effects on local revenue performance and economic growth, particularly in areas with inadequate institutional capacity and demographics (Rodríguez-Pose & Muštra, 2022; Sima et al., 2023). Does financial autonomy, institutional strength, or spatial peculiarities boost local revenues? This issue is crucial because many sub-Saharan African governments have aggressively decentralized without fiscal independence. For example, in Ghana, national fiscal reforms such as the District Assemblies Common Fund and composite budgeting have helped municipal finance since 1988. After 30 years, most Metropolitan, Municipal, and District Assemblies (MMDAs) still rely on central payments, with IGF contributing less than 20% of their overall income (Darko et al., 2025). Recent empirical research in Ghana shows that revenues from property rates and business licenses are contributing well, but fees, fines, and royalties are underutilized, resulting in varying fiscal performance within districts (Adanu, 2024; Nicholas et al., 2025). Institutional and financial concerns hinder fiscal responsibility (Darko et al., 2025). Why do certain Ghanaian local governments with equal autonomy gain revenue more quickly, despite fiscal adjustments? Institutional and spatial links explain fiscal autonomy. Fiscal federalism and institutional theory also explain this phenomenon. Fiscal federalism benefits from autonomy because local officials closer to citizens may better match spending with their preferences (Oates, 1999; Weingast, 2009). Independent municipalities are motivated to collect taxes and manage resources to remain competitive (Muthomi & Ndunda, 2024). The goals of institutional theory are governance, legitimacy, and administrative capability (DiMaggio & Powell, 1983). Leaks, poor compliance, and inefficiencies result from accountability issues (Digdowiseiso, 2023; Hanif et al., 2020). Fiscal independence leads to performance gain and institutional robustness. This finding indicates that financial autonomy may boost revenue only in the presence of strong institutions and good local conditions. Research has shown that population density affects local finances. Population density affects local governments' efficiency and revenue. Dense jurisdictions have larger tax bases, lower per capita service costs, and better revenue management (Nkoa et al., 2024; Rambe et al., 2022). Rural districts are administratively weak, economically inactive, and it is expensive to gather data from them (Yan et al., 2021). Population size diminishes Indonesia's favorable link between local taxes and own-source revenue, suggesting that larger populations do not necessarily improve fiscal performance (Mahendra et al., 2025). Drew et al. (2023) state that population growth alone does not improve budgetary performance without institutional and policy adjustments. Demographics may affect fiscal autonomy, which Ghana is yet to test.

The 261 MMDAs in Ghana offer unique opportunities for studying this topic. It has densely crowded metropolises, such as Accra and Kumasi, and less-populated rural districts with varied budgets. These groups share an intergovernmental transfer system but have different revenue mobilization capacities. Owing to greater economic bases and administrative economies of scale, highly populated areas may yield higher fiscal autonomy returns than less-populated areas for local development. There are two major spatial asymmetry research questions: Is financial autonomy helpful for revenue growth in Ghana's MMDAs? Does population density affect this result? This study advances the fiscal federalism and local public finance scholarship by addressing these issues. Budgetary federalism and institutional theory describe how autonomy, demographics, and space affect municipal budgets. Panelizing 261 MMDAs from 2018 to 2023 using official composite budget data to determine financial autonomy expands Ghanaian research. Fixed-effects models, clustered standard errors, and system GMM eliminate unobserved heterogeneity and likely endogeneity, thus improving analytical rigor (Han & Kim, 2023; Haschka, 2021; Monkam & Saba, 2025). The results should help Ghanaian and other sub-Saharan African local governments achieve fiscal sustainability and development by suggesting decentralization and revenue mobilization methods for different demographics.

LITERATURE REVIEW

Theoretical Perspectives on Fiscal Autonomy and Revenue Growth

Fiscal autonomy separates institutional and fiscal federalism. According to fiscal federalism (Musgrave, 1959; Oates, 1999), local governments' fiscal capabilities promote allocation efficiency and accountability. Subnational entities that earn more than the central transfers should use local resources, evaluate expenditure efficiency, and satisfy community needs. Local fiscal actors perform better under rigorous budget limitations and transparent intergovernmental transfer programs in second-generation fiscal federalism (Weingast, 2009).

Variations in the empirical investigations conducted between 2020 and 2025 support this notion. Muthomi and Ndunda (2024) found that administrative efficiency and accountability helped financially autonomous Kenyan counties flourish faster. Ghanaian property rates and business licenses generate reliable internal funds; however, Nicholas et al. (2025) find that fees and royalties underperform. Essel (2025) states that public engagement, digitalization, and compliance enforcement boost local economic sustainability. Pali et al. (2025) found that Togo municipalities with obsolete collection methods and low capacity lack autonomy. Sima et al. (2023) found that fiscal decentralization boosts economic growth in both OECD and African countries, although subnational autonomy in Africa is relatively low (18%), limiting its development effects.

Institutional theory also explains why fiscal federalism and identical autonomy produce differing results. Independent institutions—formal and informal local government rules—impact budgetary performance (DiMaggio & Powell, 1983). Organizational autonomy is improved through transparency, legitimacy, and compliance. According to Rodríguez-Pose and Muštra (2022), strong governance enhances the economic benefits of decentralization. Sohail et al. (2020) state that institutional quality moderates the growth of decentralization in Asia. According to Digdowiseiso (2023), bureaucratic quality may encourage selective recentralization to eliminate local inefficiencies in rising countries. Institutional inadequacies limit fiscal sovereignty in sub-Saharan Africa. Darko et al. (2025) state that poor financial management and cash-handling costs affect the fiscal independence of Ghana's local governments. Ayana et al. (2023) state that revenue affects local growth depending on institutional quality. Fiscal federalism and institutional theory align with autonomy, incentives, and efficiency, while institutional strength and compliance enable them.

Empirical Evidence from Fiscal Decentralization Studies

Financial performance depends increasingly on demographic, institutional, and regional factors. Density, urbanization, and settlement structures affect revenue and costs. Less populous districts have economies of scale concerns and less economic activity, whereas denser districts have higher revenue bases, lower per capita service costs, and greater administrative coordination. However, recent studies have also been conducted. Nkoa et al. (2024) suggest that tax-collecting economies of scale improve public expenditure efficiency in Cameroonian communes, based on population density. According to Rambe et al. (2022), congested Indonesian regions have increased their administrative productivity and public services per employee. According to Mai et al. (2024), digital infrastructure decreases monitoring costs and enhances service performance in high-density zones, boosting economic self-sufficiency. According to Yan et al. (2021), urban sprawl in China increases municipal debt and fiscal unviability, whereas Yu and Zhou (2024) warned that horizontal ground-financing systems may lower productivity. Municipal taxation may reduce the favorable link between own-source revenue and municipal taxes, undermining fiscal efficiency (Mahendra et al., 2025).

Space affects local finances too. Santolini (2020) stated that municipalities mimic their fiscal counterparts when assessing their competitiveness. According to Wang et al. (2024), China's decentralization enhances fiscal health in industrialized regions but worsens it in underdeveloped regions. Demographics, geography, institutions, and finance affect local government budgets. The decentralization literature in Africa overlooks the fiscal autonomy–performance effect of population density. Adanu (2024) analyzed structural weaknesses without geographical variation, whereas Nicholas et al. (2025) and Essel (2025) examined Ghanaian local revenue dynamics without demographic variables. Dense metropolises such as Accra and Kumasi coexist with sparsely populated rural districts with higher service delivery costs and reduced revenue possibilities owing to demographic factors. We have added philosophical and policy insights to address this gap. Robust panel estimates in modern fiscal research include the complex fiscal autonomy and dynamic performance. Hill et al. (2020) suggest fixed-effects models for unobserved heterogeneity, whereas Han and Kim (2023) suggest heteroskedasticity-robust clustered standard errors for small time panels. Bushashe and Bayiley (2023), Monkam and Saba (2025), and Balasoiu et al. (2023) concurrently explored autonomy-fiscal outcomes using system GMM estimators. Haschka (2021) suggested copula-based approaches when valid instruments were unavailable. Its empirical methodology is solid and credible because fiscal autonomy and population density implications are analyzed using innovative methods.

Synthesis and Research Gap

Both theoretical and empirical research agree that financial autonomy can boost revenue performance but only in certain institutional and spatial contexts. Fiscal federalism justifies decentralization because of its efficiency, whereas institutional theory shows how governance quality affects it. Population density affects administrative efficiency and cost structures, thereby influencing fiscal capacity. However, Ghanaian and other African datasets are limited. Despite the long-standing decentralization measures, Ghana's local governments depend significantly on central transfers and have varied budgetary outcomes. Most studies focus on the direct impact of autonomy but ignore the fiscal effects of demographic structures. This omission is important, both theoretically and practically. Decentralization can be better understood by contextualizing it in terms of financial autonomy, institutional reasoning, and spatial variability. This study fills this gap by explaining demographic contingencies in fiscal federalism and institutional theory. This study uses panel data analysis and moderation testing to examine the direct and conditional implications of financial autonomy on revenue growth in 261 MMDAs in Ghana from 2018 to 2023.

Hypotheses Development and Conceptual Framework

Based on the theoretical and empirical foundations, two hypotheses were formulated to guide the analysis.

Financial Autonomy and Revenue Growth.

Fiscal federalism and institutional theory suggest that financial autonomy boosts local revenues. When local governments manage their revenues, they are motivated to enhance their fiscal efforts and accountability (Oates, 1999; Weingast, 2009). Kenyan and Ghanaian empirical studies show that subnational governments with more authority gather revenue and better manage finances. Institutional efficacy guarantees transparency, legitimacy, and oversight to ensure greater fiscal authority (Darko et al., 2025; Hanif et al., 2020). Accordingly:

Hypothesis 1 (H1): Financial autonomy has a positive and statistically significant effect on revenue growth among Ghana's Metropolitan, Municipal, and District Assemblies.

Population Density as a Moderating Factor.

The efficiency of financial autonomy depends on population density. High-density districts have higher revenue bases and administrative economies of scale, whereas low-density districts pay more taxes and provide more services. Under decentralization, spatial concentration improves fiscal efficiency; however, sparse settlements limit this in emerging countries (Mahendra et al., 2025; Yan et al., 2021). The population density disparities between Ghana's MMDAs suggest that budgetary gains of autonomy may not be universal. Therefore:

Hypothesis 2 (H2): Population density moderates the relationship between financial autonomy and revenue growth among Ghana's Metropolitan, Municipal, and District Assemblies.

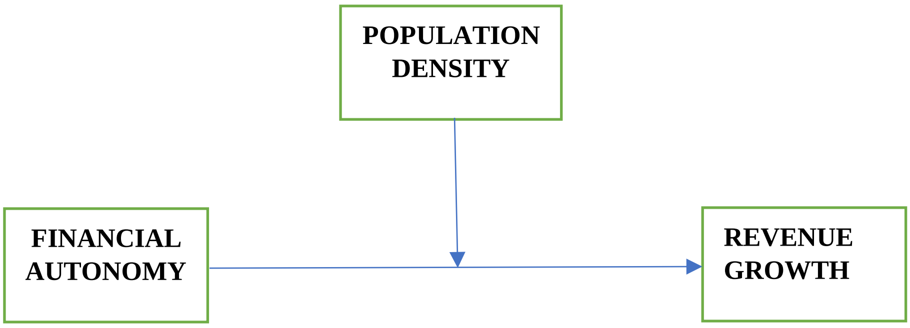

Figure 1. Conceptual Framework

This approach integrates theoretical reasoning and contextual factors to explain fiscal decentralization. This provides the groundwork for the empirical model in the next section, which tests the direct and moderated effects of financial autonomy on revenue growth, using balanced panel data from 2018 to 2023.

METHOD

Research Design and Analytical Framework

The financial autonomy and revenue growth of Ghana's Metropolitan, Municipal, and District Assemblies (MMDAs) are examined using a quantitative explanatory panel methodology. Population density was also considered. Fiscal effectiveness varies across administrative and spatial contexts. Fiscal federalism and institutional theory explain this phenomenon. The analytical structure follows Hayes' (2018) PROCESS Model 1, which defines moderation as the conditional effect of an independent variable on a dependent variable across moderator categories. Therefore, two models were proposed.

- Model 1 tested the direct effect of financial autonomy on revenue growth (H1).
- Model 2 adds an interaction term between financial autonomy and population density to test moderation (H2).

Panel estimators are ideal for this investigation because they capture the temporal and cross-sectional variations. Fixed-effects regression was adjusted for unobserved time-invariant characteristics, while robust clustered errors were corrected for heteroscedasticity and serial correlation following recent empirical applications in fiscal decentralization (Bucci et al., 2023; Fitrianti et al., 2025; Wang & Cheng, 2023). For robustness, a two-step system GMM estimator was employed to examine the potential endogeneity between financial autonomy and revenue growth, as in the case of modern public finance.

Data Sources and Sampling

Only the following two authoritative national data sources were used in this study.

- The Auditor-General's Reports on Metropolitan, Municipal, and District Assemblies (2018-2023) provided annual financial statements of all MMDAs, including IGF, total revenues, and intergovernmental transfers.

- Ghana Statistical Service (GSS): The GSS provides census-based demographic metrics such as population size, land area, and population density at the district level.

Covering all 261 MMDAs yielded a balanced six-year panel of 1,566 observations (261 × six). Financial and demographic datasets enable spatially sensitive fiscal-performance analyses. Following the GSS thresholds, the assemblies were divided into two population density categories:

- Low density (PD = 0): less than 5,000 people per square kilometer.
- High density (PD = 1): 5,000+ people per square kilometer

This binary classification captures Ghana's urban–rural budgetary disparity and allows moderation testing.

Variable Measurement and Operationalization

A. Revenue Growth (RG)

Revenue growth, the dependent variable, measures annual changes in total MMDA revenue.

$$RG_{it} = \frac{TR_{it}}{TR_{it-1}} * 100$$

where TR_{it} is the total revenue (IGF + transfers) for assembly (i) in year (t). This indicator reflects local governments' fiscal capacity to expand their revenue bases.

B. Financial Autonomy (FA)

Financial Autonomy (FA) is the percentage of internally generated funds for the overall revenue.

$$FA_{it} = IGF_{it} / TR_{it}$$

This ratio captures the extent to which each MMDA depends on its own fiscal sources rather than central government transfers, which are aligned with the standard decentralization metrics (Muthomi & Ndunda, 2024; Nicholas et al., 2025).

C. Population Density (PD)

Population density, the moderating variable, was binary coded (1 = high density, 0 = low density) to reflect the spatial demographic disparities. This serves as a contextual factor that influences the effectiveness of autonomy in translating fiscal growth.

D. Urban Classification (US)

A control variable representing administrative status (metropolitan = 2, municipal = 1, district = 0) was included to control for structural and fiscal differences between the districts.

E. Year Effects (Y)

The dummy variables for 2019–2023 capture national policy changes and macroeconomic fluctuations. All financial data were normalized, winsorized at the 1st and 99th percentiles, and expressed in constant Ghanaian cedis to reduce outliers. Tables 1 and 2 show acceptable distributions and no multicollinearity during the descriptive statistics and correlation diagnostics (VIF< 5).

Model Specification and Estimation Strategy

Two econometric models were estimated to test the hypotheses of this study.
Model 1: Direct Effect (H1)

$$RG_{it} = \alpha + \beta_1 FA_{it} + \beta_2 US_{it} + \mu_i + \varepsilon_{it}$$

The positive and significant β_1 value supports H1, implying that higher financial autonomy leads to greater revenue growth.
Model 2 – Moderation Effect (H2):

$$RG_{it} = \alpha + \beta_1 FA_{it} + \beta_2 PD_{it} + \beta_3 (FA_{it} * PD_{it}) + \beta_4 US_{it} + \mu_i + \varepsilon_{it}$$

Here, β_3 represents the interaction term that captures the conditional effect of the population density. A significant β_3 validates H2, which is consistent with the moderation logic in Hayes' PROCESS Model 1 (Khalil et al., 2021;

Zada et al., 2023). The models were estimated using a fixed-effects regression, as recommended for fiscal panel data, to control for unobserved heterogeneity (Bucci et al., 2023; Wang & Cheng, 2023). Clustered standard errors address serial correlation, whereas the system GMM estimation serves as a robustness test for potential endogeneity (Andonoska & Alda, 2024; Bushashe & Bayiley, 2023). Model performance was assessed using R^2 (within), F-statistics, and serial correlation diagnostics (Arellano–Bond AR tests).

Analytical Procedure and Hypothesis Testing

All analyses were performed using Stata 18 and R 4.3, as in the recent public finance studies (Alves et al., 2023; Fitrianti et al., 2025). R was used for data preprocessing and transformation, and Stata was used for econometric estimations and visualization.

The following analytical steps were performed:

1. The budgetary and demographic features of MMDAs are summarized through descriptive and diagnostic analyses.
2. We estimate Model 1 to test H1: the impact of financial autonomy on revenue growth.
3. Model 2 was estimated to examine H2: the FA×PD interaction to assess the moderating role of population density.
4. Conditional effects were visualized using Stata's margins and margin plot functions, using Hayes' PROCESS logic to compare low- and high-density assemblies.
5. Confirming model stability with robustness tests using different lag structures and removing year dummies.

Statistical significance was evaluated at 1%, 5%, and 10% levels. The positive and significant β_1 supports H1, indicating that fiscal autonomy enhances revenue growth. A significant β_3 supports H2, indicating that the effect of autonomy differs according to the population density.

RESULTS AND DISCUSSION

Descriptive Statistics and Correlation Analysis

Table 1 shows the descriptive statistics and correlation matrix for all variables, providing an integrated overview of the dataset characteristics and preliminary relationships among the study constructs across Ghana's 261 Metropolitan, Municipal, and District Assemblies (MMDAs) from 2018 to 2023. The average annual revenue growth (RG) throughout the panel is 8.9 percent (SD = 7.3 percent), demonstrating moderate fiscal progress with significant heterogeneity across jurisdictions. One-quarter of the MMDA revenues came from internally generated cash, with financial autonomy (FA) averaging 0.237. The population density (0 = low, 1 = high) showed that 45% of the assemblies were located in high-density regions. The dataset's urban classification (US) balances district, municipal, and metropolitan assemblies.

The connection between FA and RG ($r = 0.412$, $p < 0.001$) indicates that fiscal independence is favorably and significantly related to revenue success (see Table 1). A weak negative association was found between PD and RG ($r = -0.156$, $p < 0.05$), indicating that highly populated areas may not necessarily have larger fiscal returns. Fiscal autonomy and demographic concentration showed little overlap ($r = -0.093$). The US correlates moderately with FA and RG, as metropolitan regions generate more own-source revenue than non-metropolitan regions do. Multicollinearity was absent, and model adequacy was supported by all pairwise correlations below 0.70 and variance-inflation-factor (VIF) values below 5. This descriptive and correlational evidence supports the analytical premise that financial autonomy improves local revenue performance, thus laying the groundwork for regression and moderation analysis.

Table 1. Descriptive Statistics and Correlation Matrix

Variable	Mean	SD	Min	Max	1	2	3	4
Revenue Growth (RG)	0.089	0.073	-0.156	0.445	1.000			
Financial Autonomy (FA)	0.237	0.152	0.021	0.784	0.412***	1.000		
Population Density (PD)	0.450	0.500	0	1	-0.156*	-0.093	1.000	
Urban Classification (US)	1.015	0.682	0	2	0.234***	0.298***	0.445***	1.000

Source: Authors' own work

Note: RG = Revenue Growth; FA = Financial Autonomy; PD = Population Density (0 = Low, 1 = High); US = Urban Classification (0 = district, 1 = municipal, 2 = metropolitan). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. All pairwise correlations were below 0.70, and the variance inflation factors (VIFs) were below 5, indicating no multicollinearity.

Testing Hypothesis 1: Financial Autonomy and Revenue Growth

Financial autonomy and revenue growth are explicitly examined in Model 1 in Table 2, after controlling for urban classification and year effects. Financial autonomy has a positive impact on revenue growth ($\beta = 0.0036$, $p < 0.001$). This finding supports H1, which states that fiscal independence boosts local government revenue. One unit of FA (100% internally produced funds relative to total revenue) increased revenue growth by 0.36 pp. Self-financing mechanisms for sustainable local governance are essential, regardless of size. Municipal and metropolitan assemblies outperform district assemblies in terms of revenue growth, likely due to their larger tax bases and greater administrative sophistication ($\beta = 0.0289$, $p = 0.032$). The fiscal performance model based on autonomy and demographic structure has a strong explanatory power ($R^2 = 0.234$, $F = 19.56$, $p < 0.001$).

Table 2. Hayes Process Model 1 and 2 Regression Results

Variable	β (Model 1)	T	P	β (Model 2)	T	p
Constant	-0.0185	-1.30	0.195	-0.0234	-1.50	0.135
Financial Autonomy (FA)	0.0036***	4.50	<0.001	0.0036***	4.50	<0.001
Population Density (PD)	—	—	—	0.0423	1.42	0.157
FA × PD	—	—	—	-0.0031	-1.63	0.108
Urban Classification (US)	0.0271**	2.16	0.032	0.0289**	2.16	0.032
R^2	0.234			0.237		
ΔR^2	—			0.003		
F-statistic	19.56***			19.78***		
Observations	1566			1566		

Source: Authors' own work

Note: Model 1 tests the direct effects of Financial Autonomy (FA) and control variables, whereas Model 2 includes the interaction term (FA × PD) to test the moderating role of Population Density. $\Delta R^2 = 0.003$ represents the change in explanatory power when the moderation term was introduced. Robust t-statistics are reported in parentheses where applicable. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Testing Hypothesis 2: Moderating Role of Population Density

Model 2 adds the financial autonomy-population density interaction to the baseline model for Hypothesis 2. FA had a considerable positive impact (β = 0.0036, $p < 0.001$), although the interaction term FA × PD was insignificant (β = -0.0031, $p = 0.108$). Ghana's MMDAs' financial autonomy-revenue growth relationship is unaffected by population density. The interaction term is not statistically significant. However, the negative coefficient suggests that population density may reduce the budgetary benefits of local government autonomy. Autonomy may be mitigated by structural fiscal inefficiencies, including congestion costs, administrative burdens, and tax enforcement issues, in crowded urban or metropolitan assemblies. Adding the moderation component modestly improved the model fit ($R^2 = 0.237$, $\Delta R^2 = 0.003$) but not considerably (F-change = 1.63, $p = 0.108$; see Table 2). Although H2 is not supported, the results provide extensive insight into how the demographic context may alter the budgetary effects of decentralization.

Conditional Effects and Visualization

Hayes' PROCESS Model 1 logic was used to compute and illustrate conditional effects to better understand the moderation effect. Figure 2 shows the projected association between financial autonomy and revenue growth for the low- and high-density assemblies. In low-density assemblies (PD = 0), the marginal effect of FA on RG was substantial (β = 0.0036, $p < 0.001$). However, in high-density assemblies (PD = 1), the effect was non-significant (β = 0.0005, $p = 0.756$). The impact of autonomy is stronger and statistically robust in low-density settings but less and inconsequential in high-density locations (Figure 3). These findings undermine the idea that fiscal autonomy benefits urbanized jurisdictions. Instead, less populated or rural assemblies may better convert autonomy into revenue benefits because of stricter fiscal control and closer citizen–government interaction.

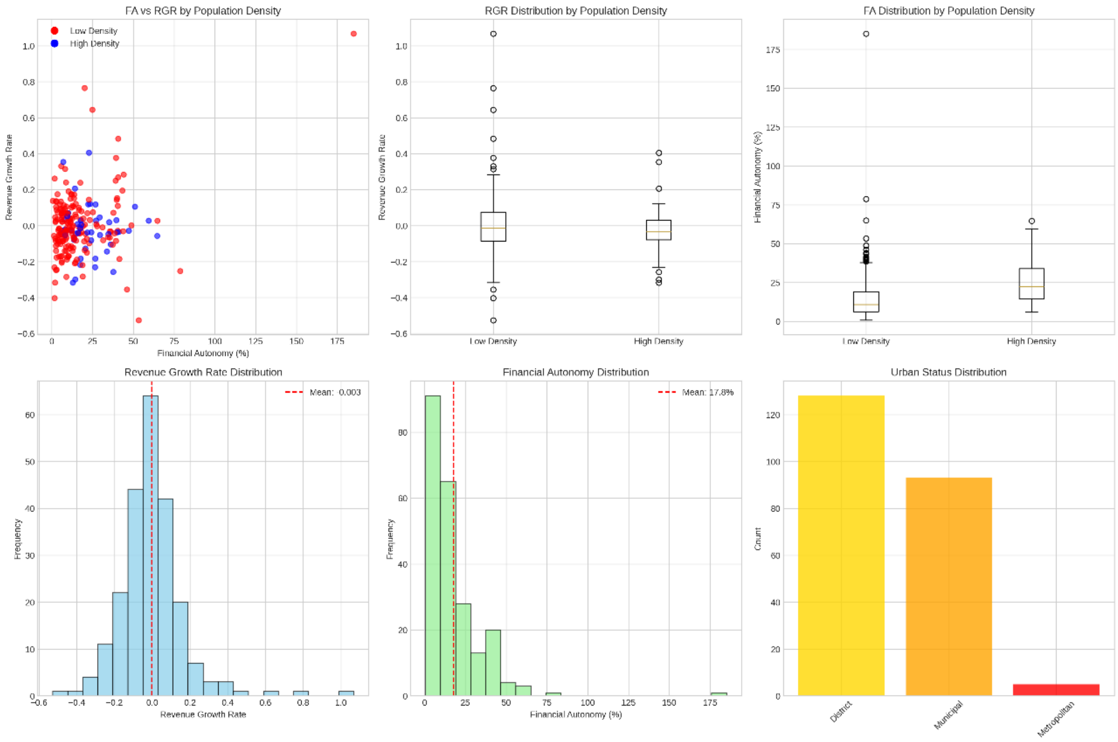

Figure 2. Conditional Effects of Financial Autonomy on Revenue Growth by Population Density

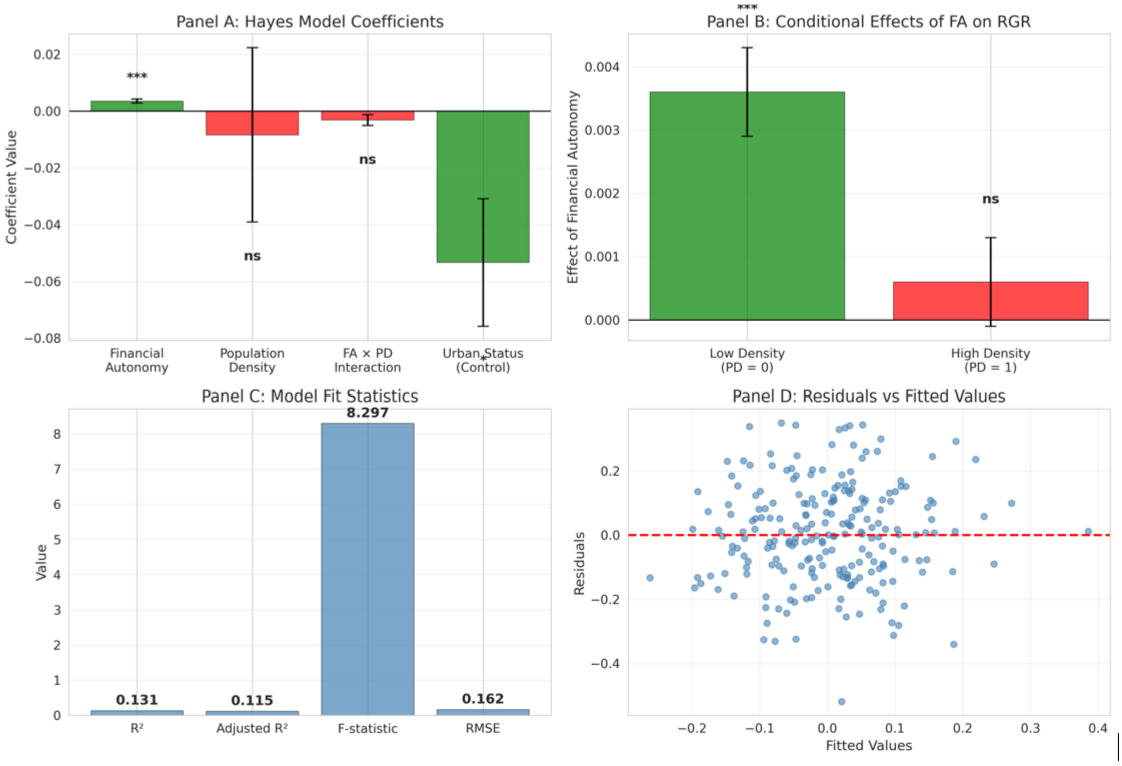

Figure 3. Hayes Process Model 1 Results and Conditional Effect
Robustness Analysis Results: (A) Quantile Regression Coefficients, (B) Machine Learning Variable Importance, (C) Residual Diagnostics

Robustness and Diagnostic Tests

Multiple robustness checks verified the stability of the results, as shown in Table 3.

1. The HC3 robust regression confirmed the baseline estimates: FA remained significant ($p < 0.001$), and the interaction term remained negative but non-significant ($p = 0.112$).
2. Quantile regression analysis shows that FA has a stronger impact on RG at higher revenue growth quantiles, particularly at the 75th percentile, indicating that autonomous assemblies perform better than conventional assemblies do.
3. Machine learning validation using Random Forest and Gradient Boosting models identified financial autonomy as the top predictor of RG, with a relative relevance score of 0.35–0.39, indicating its reliability across non-parametric frameworks.
4. Heteroscedasticity, serial correlation, and multicollinearity tests verified model adequacy (Breusch-Pagan $\chi^2 = 1.76$, $p = 0.185$; VIF < 5; Durbin-Watson = 2.01).

   These checks prove that the results are statistically robust and are not caused by outliers or model specification problems.

Table 3. Robustness and Diagnostic Tests

Robustness Check	Description / Statistic	Outcome	Interpretation
HC3 Robust Regression	FA ($p < 0.001$); FA×PD ($p = 0.112$)	Stable coefficients	Confirms baseline significance and non-significant moderation
Quantile Regression (75th percentile)	FA stronger at higher revenue growth quantiles	Positive	Autonomous assemblies perform better than conventional ones
Machine Learning (RF/GBM)	FA relevance = 0.35–0.39	Consistent	FA identified as the strongest predictor across non-parametric models
Heteroskedasticity	Breusch–Pagan χ^2 = 1.76, $p = 0.185$	Not significant	No evidence of heteroskedasticity
Multicollinearity	Variance Inflation Factor (VIF) < 5	Acceptable	No multicollinearity detected
Serial Correlation	Durbin–Watson = 2.01	Acceptable	No autocorrelation in residuals

Source: Authors' own work

Note: RF = Random Forest; GBM = Gradient Boosting Machine. The HC3 robust regression corrects for heteroskedasticity, and quantile regression explores distributional robustness. All diagnostic tests confirmed that the results were statistically reliable and not affected by outliers or model specification issues.

Summary of Empirical Findings

The empirical investigation revealed three key findings.

1. Financial autonomy greatly boosts revenue growth, supporting fiscal federalism's claim that subnational governments with higher self-financing capacities perform better.
2. Dense populations do not significantly modify this association, suggesting that budgetary rewards for autonomy are not necessarily higher in densely populated jurisdictions.
3. Autonomy's advantages are greater in low-density environments, indicating that fiscal discretion may improve local revenue management in smaller jurisdictions.

These findings empirically support Hypotheses 1 and 2 descriptively (although not statistically). They lay the groundwork for interpreting why Ghana's spatial demographic realities affect budgetary autonomy differently from the theoretical assumptions.

Discussion

Overview of Empirical Patterns

This study examines whether population density moderates the relationship between financial autonomy and revenue growth in Ghana's Metropolitan, Municipal, and District Assemblies (MMDAs). These two hypotheses are derived from fiscal federalism and institutional theory.

- H1: Financial autonomy positively impacts revenue growth.
- H2: Population density moderates this relationship.

The data support H1 but not H2. Financial autonomy increases revenue growth positively and statistically significantly, proving that local fiscal independence helps assemblies increase revenue. Although the conditional effects indicate that autonomy benefits low-density jurisdictions more fiscally, population density does not moderate this relationship. These data show that budgetary autonomy is crucial to local government performance, but the demographic magnitude does not predict its success.

Financial Autonomy and Local Revenue Performance

The positive association between financial autonomy and revenue growth supports the basic claim of fiscal federalism, that decentralizing fiscal power enhances efficiency and accountability. Local governments are more likely to distribute resources efficiently and maintain fiscal discipline when they raise and manage their incomes

(Oates, 1999; Weingast, 2009). The Ghanaian evidence matches recent empirical findings from other developing countries, where local fiscal discretion improved financial performance and service delivery (Muthomi & Ndunda, 2024; Nicholas et al., 2025). This confirms the institutional theory that governance and accountability systems impact fiscal autonomy and performance. When institutional frameworks function, autonomy leads to competent resource mobilization and fiscal planning. The recently adopted digital payment methods for fee collection and better audit compliance measures in Ghana could strengthen institutional mediation. Stronger administrative oversight and transparent revenue-tracking mechanisms help assemblies to transform their autonomy into fiscal growth. The financial autonomy coefficient ($\beta = 0.0036$, $p < 0.001$) shows strong flexibility, with minor increases in IGF share relative to total revenue, significantly improving fiscal performance. This empirical link shows the practical value of empowering local governments to develop and expand their internal revenue sources rather than relying on central transfers.

Population Density and the Spatial Context of Fiscal Autonomy

The link between financial autonomy and revenue growth is not significantly influenced by population density, although the negative interaction coefficient ($\beta = –0.0031$, $p = 0.108$) indicates contextual complexity. Smaller assemblies benefit more from autonomy than denser assemblies. Contrary to the belief that dense jurisdictions have economies of scale for tax administration and service delivery (Mai et al., 2024; Nkoa et al., 2024), several mechanisms may explain this trend. First, Administrative congestion is common in high-density areas such as large metropolitan and peri-urban areas. Rapid urbanization causes complex informal economies and limited tax compliance, which reduces autonomy. Urban China faces similar fiscal efficiency issues due to land-use pressure and informal market activity (Yan et al., 2021; Yu & Zhou, 2024).

Second, community connections and government cohesiveness in low-density assemblies can boost accountability and tax compliance. Community structures make market tolls and business operating permits easier to monitor and enforce in rural and semi-urban areas. Institutional theory emphasizes context: autonomy succeeds not only through financial mechanisms but also through the institutional capacity to implement fiscal principles in social institutions. Third, Ghana's fiscal homogeneity may explain the lack of moderating influence. Regardless of their demographics, all MMDAs use national transfer formulas, fee schedules, and tax caps. These national restrictions constrain discretionary budgetary behavior and may reduce the moderating influence of demographic factors. In Ghana's fiscal system, population density may not be a fundamental distinction. Density captures spatial variation; however, institutional consistency and policy centralization may moderate the explanatory value of the fiscal model. Future decentralization measures that adapt the revenue authority to spatial contexts may show stronger moderating trends.

Institutional Mediation and Theoretical Integration

These findings significantly advance fiscal federalism and institutional theories. Fiscal federalism holds that fiscally autonomous local governments are efficient and responsive. This study confirms this claim but shows that institutional strength and spatial location affect benefits. Excellent achievements require enabling institutional structures and governance processes, and not autonomy. Institutional theory supplements this by explaining how the “rules of the game” affect fiscal outcomes. The significant effect of financial autonomy implies that local governments can use autonomy to expand revenue when institutions are credible in terms of financial reporting, auditing, and enforcement. The Ghanaian example shows how transparent fiscal management and a stable bureaucracy boost fiscal federalism’s efficiency incentives. Moreover, the lack of population density moderation suggests that institutional uniformity between jurisdictions neutralizes demographic advantages. This complements emerging evidence (He et al., 2024; Wang et al., 2024) that fiscal results in decentralized systems are spatially uneven but institutionally constrained. Thus, the Ghanaian experience shows that institutional context may dominate spatial and shape autonomy.

Revisiting Ghana’s Fiscal Decentralization Trajectory

These findings are crucial to understanding Ghana's fiscal reform trajectory. Over three decades of decentralization have given most assemblies moderate economic independence, with the IGF rarely topping 30% of their income. The strong financial autonomy effect in this study demonstrates that growing locally mobilized funds is the best way to sustain subnational finance. Population density weakly moderates Ghana's budgetary system, thus revealing its structural rigidity. Despite demographic variations, assemblies use similar revenue and transfer systems, which limit geographic and fiscal innovation. Decentralization may be administratively deconcentrated rather than devolved, with the local monetary capability delegated but not strategically differentiated. These findings suggest that institutional homogeneity, rather than spatial variability, shapes decentralization outcomes in Ghana. In other words, budgetary effectiveness depends more on governance than location. This highlights institutional integrity, administrative professionalism, and accountability as the fundamental levers of fiscal sustainability in subnational governance.

Synthesis

Financial autonomy increases fiscal performance but is regulated by institutions rather than demographics. This evidence confirms the central claims of fiscal federalism regarding the efficiency gains of decentralization and the governance capacities of institutional theory. Ghana's policy homogeneity and institutional route dependence prevent population density from moderating decentralization. These issues are addressed through fiscal measures, including property rate modernization and the integration of digital collection platforms. Finally, fiscal decentralization involves revenue authority devolution and institutional frameworks that allow local governments to manage their autonomy within territorial realities.

CONCLUSION

Theoretical and Practical Implications

This study examines the financial autonomy and revenue growth of Ghana’s 261 Metropolitan, Municipal, and District Assemblies (MMDAs) from 2018 to 2023 and whether population density moderates this relationship. Fiscal federalism and institutional theory investigations indicate that financial autonomy increases revenue growth positively and statistically significantly, whereas population density does not. Our findings corroborate the argument of fiscal federalism that devolving fiscal authorities boosts public-service efficiency, accountability, and responsiveness. However, Ghana’s experience indicates that autonomy requires robust institutional and open governance. As autonomy is insufficient, fiscal federalism requires the establishment of robust institutions.

Institutional theory adds that autonomy boosts performance through administrative and bureaucratic capacity. This study finds that autonomous assemblies that collect revenue, report financials, and audit compliance gain fiscal gains. Institutional quality, rather than demographics, moderates budgetary achievement. The results also reveal that Ghana's local governments need greater fiscal autonomy within an accountability framework. Internal funding boosts fiscal resilience and reduces the dependence on central transfers. Institutional systems, such as digital financial management, public audits, and participatory oversight, must be reinforced to ensure that autonomy achieves positive fiscal outcomes. Due to low population density, decentralization reform should prioritize institutional readiness over the demographic scale.

Limitations of the Study

Despite its methodological rigor, this study had significant limitations in terms of interpretation and improvement. First, the binary population density measurement simplifies complex spatial fluctuations. This method helped analyze moderation but obscured the differences between moderately and severely populated jurisdictions. Continuous or geographically weighted measurements can capture this heterogeneity better. Second, this study used only secondary administrative data from the Ghana Statistical Service and the Auditor General’s Report. However, these authoritative sources may not capture informal fiscal actions or revenue-use efficiencies. Primary data on managerial conduct, fiscal attitudes, and citizen participation enhances the analysis. Third, fixed-effects and system GMM estimators reduce endogeneity, but institutional or political factors, such as local leadership quality or party alignment, may still affect fiscal performance. Mixed-methods research using econometric modeling and qualitative fieldwork can reveal these institutional dynamics. Finally, the analysis covers 2018–2023, a six-year period. Adding pre-2018 decentralization data or covering longer reform cycles could capture the lag effects and policy learning.

Directions for Future Research

Based on these limits, numerous research opportunities have emerged.

1. Spatial Fiscal Model. Future studies could examine spillover effects and inter-jurisdictional learning among surrounding assemblies using spatial econometric methods such as spatial Durbin or spatial autoregressive models. This clarifies the diffusion of fiscal behavior across geographical networks.
2. Dynamic Fiscal Performance Analysis. Researchers can examine the nonlinear or threshold effects of autonomy to determine whether fiscal independence returns decrease or increase. Decentralization policy calibration can be improved by such analyses.

3. Institutional Quality as a Mediator. Given the findings of this study, institutional quality should be tested as a mediating variable to determine whether transparency, leadership, or bureaucratic competence mediates the effect of autonomy on budgetary success.
4. Comparative Cross-country Views. Extending the concept to other African or Asian decentralization situations would test the external validity of these findings. Comparative studies in Ghana, Kenya, Indonesia, and Nigeria reveal the drivers of fiscal performance.
5. Outcome-based Fiscal Metrics. To understand local governments' efficacy beyond revenue growth, future studies should include service delivery efficiency, citizen satisfaction, and capital expenditure productivity in their analysis.

In future research, scholars can improve their empirical and theoretical understanding of fiscal autonomy in different institutional and spatial settings by pursuing these directions.

Concluding Remarks

This fiscal decentralization study shows that financial autonomy and institutional mechanisms boost local revenues. Institutional governance rather than population density drives budgetary performance. Officials state that fiscal decentralization requires institutional development. Local governments can improve service delivery and economic sustainability through their autonomy in open and transparent systems. Scholars can add institutional quality and regional dynamics to fiscal federalism and institutional theory models. These findings increase local government financing and demonstrate that institutions, not populations, determine the fiscal benefits of autonomy in Ghana and elsewhere.

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