Governance and Regional Inflation Persistence

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ERSA Back to Inflation - Conference. Pretoria, South Africa

May 8-9, 2025

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Introduction & Motivation

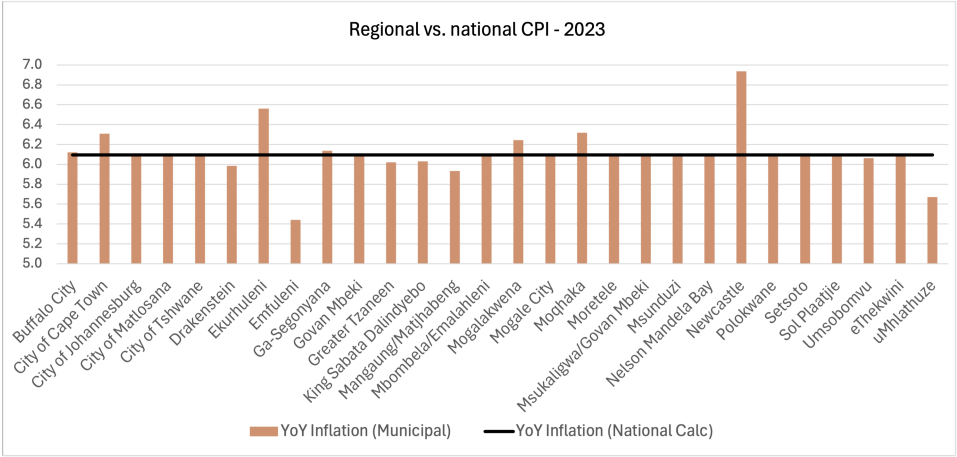

Figure: National vs. Municipal Inflation in 2023

Introduction & Motivation

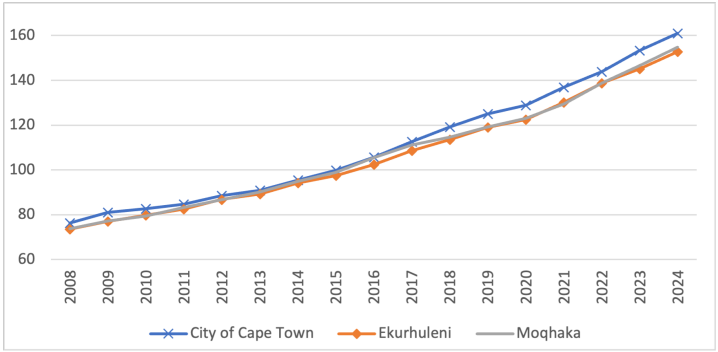

Figure: CPI trend comparison between 3 municipalities (2008–2023)

Introduction, Regional Disparities, and Governance

Why Study Inflation Persistence?

- Inflation persistence is critical for monetary policy → lower persistence implies a lower sacrifice ratio (Vaona & Ascari, 2012; Benigno & López-Salido, 2006).
- There is Aggregation bias, with inflation reflecting its most persistent components from sectors (Altissimo et al., 2006) & from regions (Vaona & Ascari, 2012).
- The global post-COVID inflation surge.

Why Regions Matter

- Regional markets and structures can drive inflation differentials (Blanchard & Katz, 1992; Choi & Matsubara, 2007).
- Retail market strength affects persistence: weaker markets = higher persistence (Vaona & Ascari, 2012; Yeşilyurt & Elhorst, 2014).
- In South Africa: major spatial heterogeneity – market access (Turok, 2011; Mudiriza & Lawrence, 2021; Mulumba et al., 2024).

Why Governance Matters

- Institutions lower transaction costs, increase economic activity (Williamson, 2000; North, 1992)
- Governance → mechanisms enabling laws and institutions to function effectively (Kaufmann et al., 2008; Langdon et al., 2016). → varies across regions- though same national framework → Implications for local inflation persistence (Haider et al., 2011).

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Objectives

- Construct CPI, inflation, inflation persistence across regions.
- Check for the the presence of regional differences in CPI, inflation, and inflation persistence
- Examine if governance & economic activity impact regional inflation persistence.

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Data - Prices & CPI in South Africa

- Price data - StatsSA $\rightarrow$ Monthly data from 31 different locations/municipalities (urban and rural (9) - collapsed to 27.
- **Governance:**
  - Sourced from Auditor-General of South Africa (AGSA).
  - Categories: Disclaimer, Adverse, Qualified, Unqualified (with/without findings). $\rightarrow$ categorised into 3: (Disclaimer, Adverse); Qualified; (Unqualified with findings, Unqualified without findings)
- **Economic Activity:**
  - Proxy: VIIRS Nighttime Lights (NTL) data.
  - Reflects regional economic activity, avoids cross regional movements effects
- **Market Structure (from Quantec):**
  - Unemployment, Infrastructure quality, competition.

Provincial and National CPI (2008-2023)

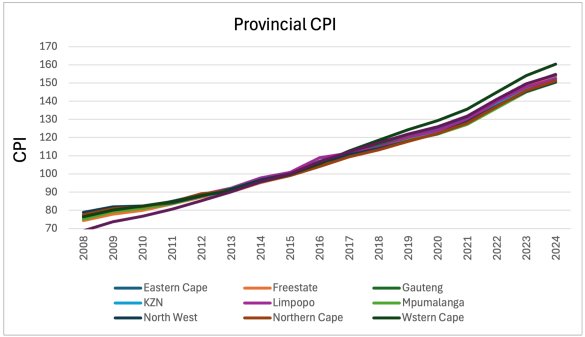


Figure: Provincial CPI

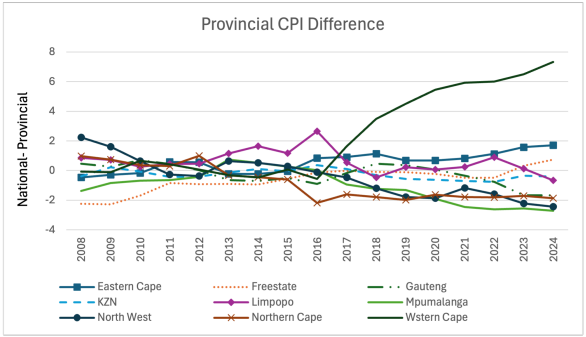


Figure: National vs. Province

Model: Computing Persistence

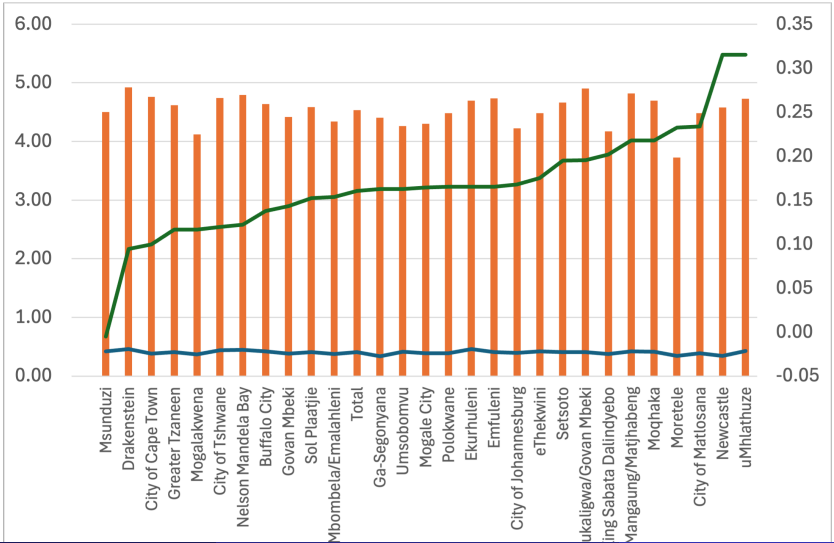
- **AR Process:**
  - Persistence computed using a univariate autoregressive (AR) model.
  - Seasonal effects accounted for with quarter dummies.
  - Optimal lag length determined by Schwarz Criterion (SC).
- **Model: Inflation Persistence:**

$$\pi_{it} = \alpha_i + \sum_{k=1}^{k_1} \beta_{ik} \pi_{i(t-k)} + \sum_{j=1}^{3} \gamma_{ij} m_{ijt} + u_{it} \tag{1}$$

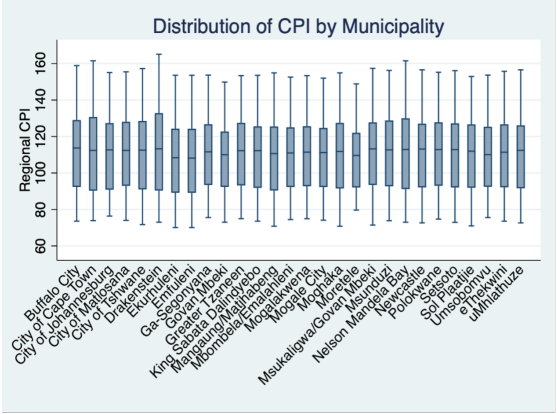
$$p_i = \sum_{k=1}^{k_1} \beta_{ik} \tag{2}$$

- **Two measures of persistence:**
  - **Single Persistence:** One value per municipality; assumes consistent inflation dynamics over time.
  - **Rolling Window Persistence:** Yearly persistence, allowing temporal variation across time.

Average Inflation & Inflation Persistence, (2008-2024)



CPI & Inflation Persistence



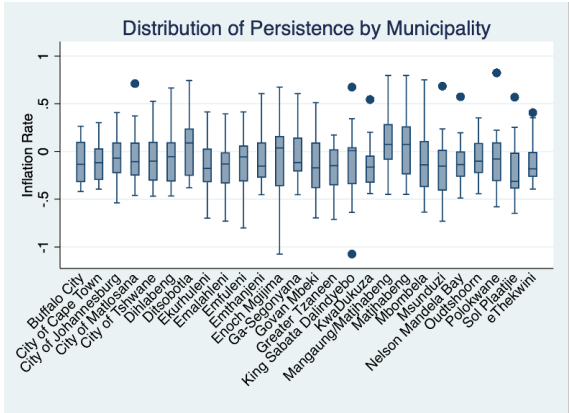


Figure: Municipal distribution of CPI, and Inflation persistence (2008-2023)

Inflation & Inflation Persistence, (2008-2024)

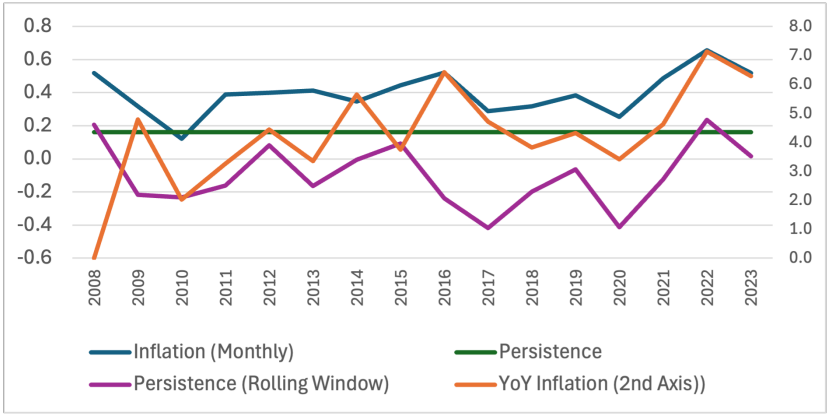


Figure: Monthly Inflation, Persistence & Year-on-Year Inflation

Model: Drivers of Persistence

- **Regression Model:**

$$p_{it} = \alpha + \beta_1 \text{gov}_{it} + \beta_2 \text{lights}_{it} + \beta_3 (\text{gov}_{it} \times \text{lights}_{it}) + \mathbf{Z}_{it}\boldsymbol{\gamma}(+\mu_i + \lambda_t) + \epsilon_{it} \qquad (3)$$

- **Where:**
  - p_{it}: Persistence (Rolling Window) in municipality i at time t.
  - gov_{it}: Audit score as a measure of governance.
  - lights_{it}: Nighttime lights as a proxy for economic activity.
  - $\text{gov}_{it} \times \text{lights}_{it}$: Interaction of governance and economic activity.
  - $\mathbf{Z}_{it}$: Vector of additional controls, including: Infrastructure, unemployment, & competition.
  - μ_i: Place fixed effects. λ_t: Month fixed effects. ϵ_{it}: Error term, clustered by place.

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Variables	(1) Inflation	(2) YoY Inflation	(3) Persistence	(4) Persistence Rolling
City of Cape Town	0.538**	0.003**	0.180**	-0.021**
	(0.000)	(0.000)	(0.000)	(0.000)
City of Johannesburg	-0.173**	-0.040**	-0.341**	0.005**
	(0.000)	(0.000)	(0.000)	(0.000)
City of Matlosana	-1.367**	-0.045**	-0.080**	0.055**
	(0.000)	(0.000)	(0.000)	(0.000)
City of Tshwane	-0.699**	0.008**	0.180**	0.005**
	(0.000)	(0.000)	(0.000)	(0.000)
Dihlabeng	-1.109**	-0.026**	0.103**	0.037**
	(0.000)	(0.000)	(0.000)	(0.000)
Ditsobotla	-2.113**	-0.091**	-0.835**	0.137**
	(0.000)	(0.000)	(0.000)	(0.000)
Ekurhuleni	-3.277**	-0.019**	0.225**	-0.022**
	(0.024)	(0.001)	(0.010)	(0.003)
Emalahleni	-1.473**	-0.057**	-0.225**	-0.075**
	(0.000)	(0.000)	(0.000)	(0.000)
Emfuleni	-1.671**	-0.038**	-0.187**	-0.005
	(0.024)	(0.001)	(0.010)	(0.003)
Emthanjeni	-1.938**	-0.033**	-0.215**	0.021**
	(0.017)	(0.001)	(0.009)	(0.003)
Enoch Mgijima	-1.436**	-0.034**	-0.062**	0.002
	(0.020)	(0.001)	(0.009)	(0.003)
Ga-Segonyana	-2.146**	-0.091**	-0.244**	0.049**
	(0.020)	(0.001)	(0.011)	(0.004)
Govan Mbeki	-2.980**	-0.049**	-0.146**	-0.045**
	(0.000)	(0.000)	(0.000)	(0.000)

Variables	(1) Inflation	(2) YoY Inflation	(3) Persistence	(4) Persistence Rolling
Greater Tzaneen	-1.194**	-0.042**	-0.165**	-0.083**
	(0.000)	(0.000)	(0.000)	(0.000)
King Sabata Dalindyebo	-1.148**	-0.063**	-0.086**	0.015**
	(0.021)	(0.001)	(0.010)	(0.004)
KwaDukuza	-1.275**	-0.020**	0.163**	-0.037**
	(0.000)	(0.000)	(0.000)	(0.000)
Mangaung/Matjhabeng	-2.570**	0.007**	0.285**	0.200**
	(0.011)	(0.001)	(0.014)	(0.003)
Matjhabeng	-2.435**	-0.038**	0.099**	0.152**
	(0.011)	(0.001)	(0.014)	(0.003)
Mbombela	-1.375**	-0.027**	0.343**	-0.005**
	(0.000)	(0.000)	(0.000)	(0.000)
Msunduzi	-0.448**	-0.042**	0.045**	-0.064**
	(0.000)	(0.000)	(0.000)	(0.000)
Nelson Mandela Bay	0.252**	0.012**	0.233**	-0.011**
	(0.000)	(0.000)	(0.000)	(0.000)
Oudtshoorn	1.256**	0.005**	0.445**	0.027**
	(0.000)	(0.000)	(0.000)	(0.000)
Polokwane	-0.860**	-0.047**	-0.081**	0.029**
	(0.000)	(0.000)	(0.000)	(0.000)
Sol Plaatjie	-2.229**	-0.025**	0.026**	-0.112**
	(0.000)	(0.000)	(0.000)	(0.000)
eThekwini	-0.930**	-0.014**	-0.079**	-0.010**
	(0.000)	(0.000)	(0.000)	(0.000)

Persistence Drivers

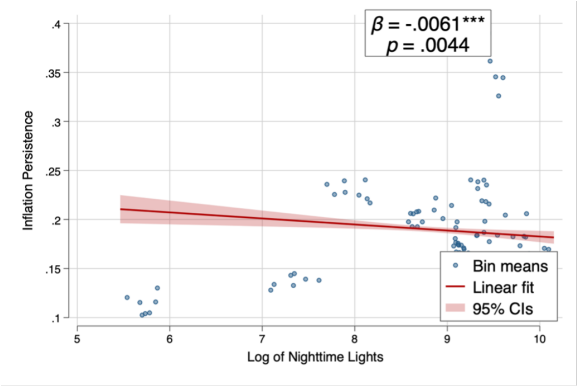


Figure: Inflation Persistence & Economic Activity

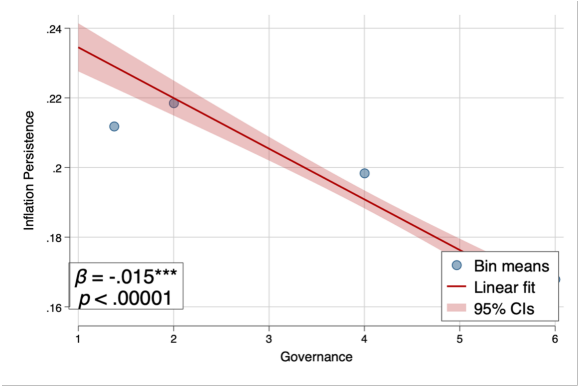


Figure: Inflation Persistence & Governance

Persistence Drivers

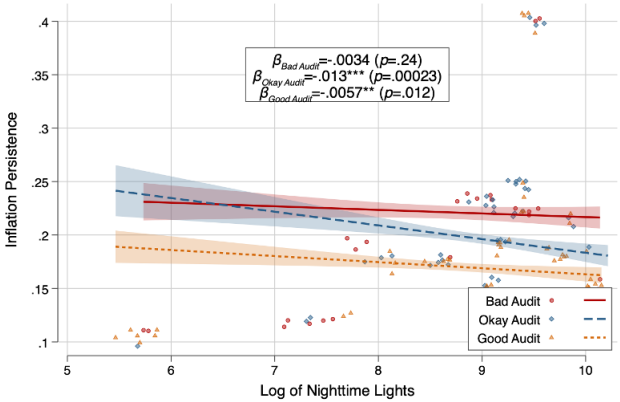


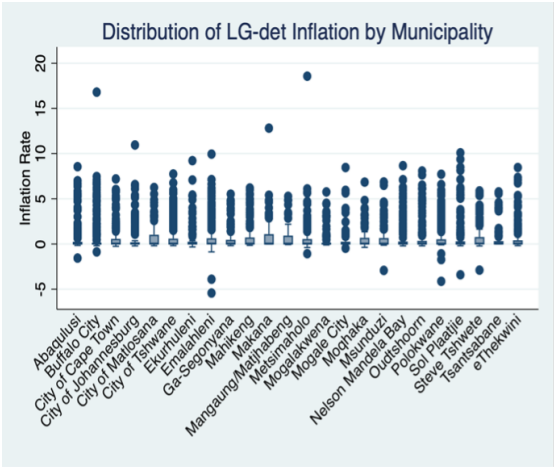
Figure: Inflation Persistence, Economic activity, & Governance

Rolling Window Persistence Drivers

Drivers of inflation persistence across regions

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) FE	(5) FE	(6) FE
	Persistence			Persistence Rolling Window		
Governance	-0.015**	0.010*	0.021*	-0.019*	0.036	0.115*
	(0.001)	(0.005)	(0.009)	(0.008)	(0.065)	(0.045)
Economic Activity		0.008**	0.007		-0.057	-0.066
		(0.003)	(0.005)		(0.081)	(0.116)
Governance × Economic Activity		-0.003**	-0.004**		-0.006	-0.010
		(0.001)	(0.001)		(0.007)	(0.006)
Infrastructure			0.010**			-0.042+
			(0.001)			(0.022)
YoY inflation			-0.003**			0.045+
			(0.001)			(0.022)
Constant	0.238**	0.160**	0.168**	-0.002	0.513	0.396
	(0.005)	(0.022)	(0.041)	(0.034)	(0.756)	(1.038)
Observations	3,848	3,584	2,084	3,848	3,584	2,084
R-squared	0.062	0.072	0.138	0.456	0.467	0.539

Distribution of Market vs. Municipal determined products - Inflation



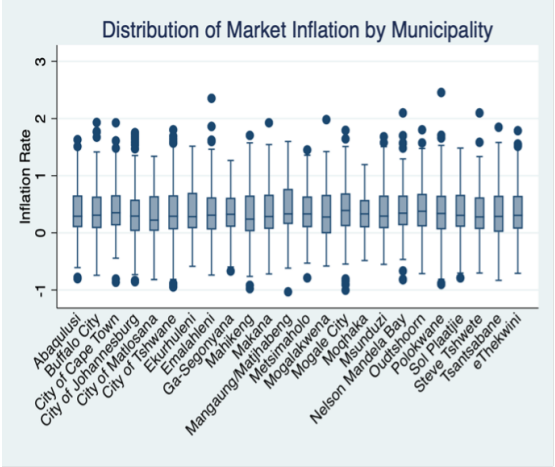
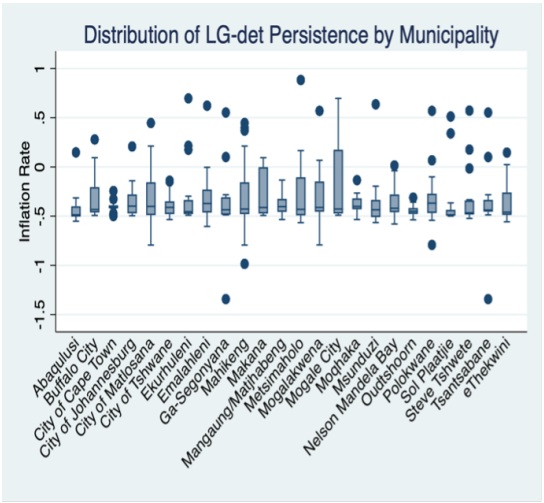


Figure: Comparing CPI, inflation and persistence for market and municipal determined prices

Distribution of Market vs. Municipal determined products - Persistence



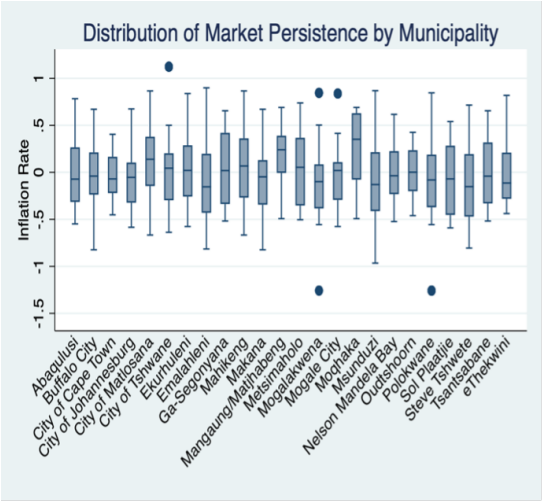


Figure: Comparing CPI, inflation and persistence for market and municipal determined prices

Municipal drivers of Regional Inflation Persistence

Drivers of inflation persistence across regions

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) FE	(5) FE	(6) FE
		Persistence			Persistence Rolling Window	
Governance	-0.018**	0.030**	0.031*	-0.017	-0.081	-0.514**
	(0.001)	(0.008)	(0.013)	(0.010)	(0.177)	(0.150)
Economic Activity		0.029**	-0.002		-0.055	-0.565**
		(0.004)	(0.007)		(0.064)	(0.193)
Governance × Economic Activity		-0.005**	-0.006**		0.007	0.058**
		(0.001)	(0.001)		(0.020)	(0.016)
Infrastructure			0.022**			-0.070+
			(0.001)			(0.040)
YoY inflation			-0.002			0.017
			(0.001)			(0.011)
Constant	0.362**	0.106**	0.297**	0.071	0.575	5.502*
	(0.006)	(0.032)	(0.060)	(0.043)	(0.571)	(1.976)
Observations	2,972	2,784	1,638	2,972	2,784	1,638
R-squared	0.058	0.069	0.187	0.522	0.531	0.162

Market drivers of Regional Inflation Persistence

Drivers of inflation persistence across regions

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) FE	(5) FE	(6) FE
	Persistence			Persistence Rolling Window		
Governance	-0.030**	-0.028**	-0.025	0.019	0.312+	0.418+
	(0.001)	(0.009)	(0.016)	(0.012)	(0.148)	(0.194)
Economic Activity		-0.016**	-0.016*		0.277+	0.220
		(0.004)	(0.008)		(0.141)	(0.247)
Governance × Economic Activity		0.001	0.001		-0.031+	-0.042+
		(0.001)	(0.002)		(0.016)	(0.020)
Infrastructure			-0.004**			0.011
			(0.001)			(0.024)
YoY inflation			-0.003**			0.009
			(0.001)			(0.007)
Constant	-0.163**	-0.055	-0.023	-0.433**	-3.028+	-2.666
	(0.006)	(0.042)	(0.077)	(0.052)	(1.346)	(2.457)
Observations	2,986	2,800	1,648	2,986	2,800	1,648
R-squared	0.162	0.191	0.205	0.307	0.343	0.402

Content

Conclusion

Key Findings

- **Regional Inflation Variations:** Substantial disparities in CPI, inflation, and inflation persistence across South African municipalities; poorer regions often face higher and more persistent inflation.
- **Governance Matters:** Stronger municipal governance, proxied by audit outcomes, reduces inflation persistence, especially in market-determined prices.
- **Economic Activity's Role:** High economic activity lowers inflation persistence—moreso when governance is strong.
- **Price Type Differences:** Municipal-determined prices exhibit higher persistence due to regulatory rigidity; while market-determined prices respond more to governance and economic vibrancy.
- **Temporal Dynamics:** Rolling window persistence shows that inflation evolves with governance and regional economic changes.

Thank you