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Basel III, Regulatory Non-Neutrality, And Small-Bank Sustainability: Evidence from an Emerging Banking System

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ABSTRACT: This paper examines whether Basel III capital and liquidity requirements are scale-neutral in emerging banking systems. Using bank-level panel data for licensed commercial banks in Kenya from 2015–2024, we exploit phased regulatory tightening to identify the causal effects of capital stringency across bank size tiers. Fixed-effects, difference-in-differences, and System-GMM estimators show that a one-percentage-point increase in effective capital requirements reduces small-bank asset and loan growth by 3.5–5.2 percentage points, while large-bank growth is largely unaffected.

Mechanism tests indicate that tighter capital constraints raise marginal funding costs, weaken internal capital generation, and induce portfolio reallocation away from MSME lending toward lower-risk assets. Survival models further show that binding capital constraints significantly increase consolidation and exit risk among small banks. Counterfactual simulations suggest that proportionate regulatory calibration mitigates contractionary effects without materially weakening system stability.

The findings demonstrate that uniform capital regulation is not scale-neutral when capital markets are incomplete and funding frictions differ across banks. By linking prudential regulation to banking structure, competition, and financial inclusion, this paper contributes to the literature on capital regulation and financial intermediation by highlighting how uniform prudential standards can endogenously reshape market structure in financially constrained environments.

1. INTRODUCTION

In the aftermath of the Global Financial Crisis, Basel III introduced stricter capital, leverage, and liquidity requirements aimed at strengthening bank resilience and reducing systemic risk. While these reforms have enhanced banking system stability in many jurisdictions, concerns persist that uniform prudential standards may impose disproportionate burdens on small banks, particularly in emerging and frontier markets where access to capital is limited and scale economies are weaker.

Small banks play a critical role in relationship lending, SME financing, regional intermediation, and financial inclusion, especially in developing economies where capital markets remain shallow. However, these institutions often face higher funding costs, limited internal capital generation, and greater sensitivity to regulatory capital shocks. Should prudential requirements constrain small banks more severely than large institutions, regulatory reforms may unintentionally accelerate consolidation, reduce competition, and weaken credit access for MSMEs and underserved communities.

Despite growing global attention to the distributional effects of Basel III, credible causal evidence from African banking systems remains scarce. Existing studies primarily focus on advanced economies, rely on cross-country aggregates, or examine short-term balance-sheet adjustments without assessing longer-term implications for bank survival, growth trajectories, and market structure. Furthermore, little is known about whether proportional regulatory frameworks can mitigate contractionary effects on smaller banks while preserving financial stability.

This paper addresses these gaps by providing bank-level causal evidence on how Basel III–style capital and liquidity requirements affect small-bank sustainability in an African emerging-market context, using licensed commercial banks in Kenya from 2015 to 2024. Kenya offers a particularly informative institutional setting due to its progressive Basel III implementation, diverse bank size distribution, expanding MSME sector, and evolving proportional regulatory discourse.

We employ a difference-in-differences framework, exploiting the phased introduction of Basel III buffers, alongside fixed-effects (FE) and System Generalized Method of Moments (System-GMM) estimators to address regulatory endogeneity, dynamic balance-

sheet adjustment, and unobserved heterogeneity. This identification strategy allows us to isolate causal effects of regulatory tightening on bank growth, lending behavior, and consolidation risk.

Our findings reveal that uniform capital tightening disproportionately suppresses asset and loan growth amongst small banks, with negligible effects on large institutions. Economically, a one-percentage-point increase in effective capital requirements reduces small-bank growth by approximately 3.5–5.2 percentage points, significantly constraining their expansion capacity. Mechanism analyses indicate that regulatory tightening raises funding costs, limits retained earnings accumulation, and induces portfolio de-risking, shifting lending away from MSMEs and relationship-based borrowers.

This paper contributes to the banking regulation and financial development literatures in several important ways. First, it provides rare emerging-market causal evidence on the asymmetric effects of Basel III across bank size tiers. Second, it links prudential regulation to market structure dynamics, demonstrating that uniform capital frameworks may unintentionally reinforce concentration and reduce competitive diversity. Third, it offers policy-relevant insights into proportional regulatory design, showing how tiered capital buffers, differentiated liquidity coverage requirements, and MSME-supportive risk weights can mitigate contractionary effects without undermining stability.

From a policy perspective, the results speak directly to the regulators - central banks, Basel Committee stakeholders, and emerging-market regulators seeking to balance financial stability, competition, and financial inclusion. The evidence suggests that context-sensitive regulatory calibration is essential in banking systems where small institutions play a pivotal role in local credit provision.

2. THEORY AND LITERATURE REVIEW

2.1 Theoretical Foundations: Capital Regulation and Bank Behavior

Basel III rests on the premise that higher capital and liquidity buffers enhance bank resilience by reducing insolvency risk, strengthening loss-absorption capacity, and curbing excessive risk-taking (Admati & Hellwig, 2013). In frictionless Modigliani–Miller environments, higher capital requirements should not materially constrain lending, as banks can adjust funding structures without affecting real activity.

However, in the presence of capital market frictions, asymmetric information, issuance costs, and scale economies, regulatory capital requirements can influence lending capacity, growth, and portfolio allocation (Kashyap, Stein, & Hanson, 2010). Banks that face higher marginal equity costs, particularly small banks with limited market access, may respond to regulatory tightening by contracting balance sheets, increasing lending spreads, or reallocating portfolios toward lower-risk assets.

2.2 Scale, Regulatory Burden, and Small-Bank Constraints

A central theoretical concern is that uniform prudential requirements impose higher proportional compliance and capital burdens on smaller banks. Fixed regulatory costs (e.g., compliance systems, stress-testing infrastructure, liquidity monitoring) generate scale-dependent cost disadvantages, allowing large banks to absorb regulatory burdens more efficiently (Berger & Mester, 1997). Small banks additionally face weaker internal capital generation, limited retained earnings, and higher external equity issuance costs, making them more sensitive to binding regulatory capital constraints (Penrose, 1959; DeYoung & Roland, 2001). These frictions can trap small banks in low-growth equilibria, constraining their ability to expand lending, invest in technology, or compete with larger incumbents.

2.3 Regulatory Capital, Lending, and Risk-Shifting Incentives

The theoretical literature predicts multiple behavioral responses to capital tightening:

- Lending Contraction Channel
  Banks may reduce loan supply to maintain capital ratios when equity issuance is costly (Peek & Rosengren, 1995).
- Portfolio Reallocation Channel
  Capital-intensive lending (e.g., SME credit) may be replaced with lower risk-weighted assets, including government securities or large corporate loans (Thakor, 2014).
- Pricing and Pass-Through Channel
  Banks may increase lending spreads to preserve profitability under higher capital charges, potentially reducing borrower demand.

These effects may be amplified in emerging markets, where capital markets are shallow and funding costs remain elevated.

2.4 Basel III and Proportional Regulation: Conceptual Framework

Proportional regulation refers to tailoring prudential requirements according to bank size, complexity, systemic importance, and business model. Regulatory theory suggests that tiered capital buffers, simplified reporting frameworks, and differentiated

liquidity requirements can preserve stability while avoiding unnecessary burdens on small institutions (Basel Committee on Banking Supervision, 2018).

In theory, proportional frameworks may relax binding capital constraints on small banks, improve retained earnings accumulation, and support MSME-oriented lending without undermining systemic resilience. However, empirical evidence on proportional regulation remains limited, particularly in African and frontier banking systems.

2.5 Empirical Evidence from Advanced Economies

Studies in advanced economies document mixed effects of capital regulation. Berrospide and Edge (2010) find that higher capital requirements constrain bank lending in the United States. Gropp, Mosk, Ongena, and Wix (2019) shows that tighter capital standards reduce lending to riskier borrowers, while Brei, Gambacorta, and von Peter (2020) find that capital surcharges on global systemically important banks (G-SIBs) altered lending behavior but strengthened resilience. However, these studies often focus on large banks and deep capital markets, limiting generalizability to smaller banks and emerging economies.

2.6 Emerging-Market and African Evidence

Emerging-market evidence suggests that capital regulation may impose stronger real-sector effects where equity issuance is costly and alternative funding channels are limited. Gambacorta and Shin (2018) document that capital constraints in emerging economies amplify lending cyclicality.

In Africa, empirical evidence remains scarce. Some cross-country studies indicate that higher regulatory burdens correlate with slower bank credit growth, but these rely on country-level aggregates and cannot isolate bank-tier effects.

Critically, there is little causal bank-level evidence on whether Basel III disproportionately affects small banks in Africa, and whether proportional regulation can mitigate contractionary effects.

2.7 Conceptual Framework: Regulation → Capital Constraint → Growth → Market Structure

We conceptualize the regulatory transmission mechanism as:

Basel III Tightening → Higher Effective Capital Constraint → Reduced Lending Capacity → Slower Small-Bank Growth → Increased Industry Concentration → Reduced Competition & Inclusion

This framework links prudential regulation to market structure, competition, and financial inclusion, highlighting the systemic implications of regulatory calibration.

2.8 Research Gap and Contribution

This paper addresses three major gaps:

1. Lack of bank-level causal evidence on Basel III's distributional effects in Africa
2. Insufficient focus on small-bank sustainability, consolidation risk, and survival
3. Limited empirical evaluation of proportional regulation as a mitigation tool

By leveraging Kenyan bank-level panel data, phased regulatory implementation, and dynamic causal identification, this paper provides novel evidence on how capital regulation reshapes bank growth, competition, and inclusion.

2.9 Hypothesis Development

Based on theory and prior evidence, we test the following hypotheses:

H1: Higher Basel III capital requirements reduce asset and loan growth among small banks.

H2: The contractionary effect of capital regulation is significantly weaker for large banks.

H3: Capital tightening induces portfolio reallocation away from SME lending toward lower risk-weighted assets.

H4: Proportional regulatory calibration mitigates negative growth and lending effects for small banks.

H5: Uniform capital tightening accelerates consolidation and increases banking market concentration.

2.10 Regulatory Non-Neutrality Under Scale-Dependent Capital Frictions

Standard Basel III frameworks implicitly assume that capital regulation is structurally neutral across banks. In frictionless Modigliani–Miller environments, higher capital requirements should not materially affect lending or growth. However, when equity issuance costs are convex and access to external capital differs across institutions, uniform regulatory tightening can produce asymmetric real effects.

Small banks typically face higher marginal equity issuance costs, limited retained earnings, fixed compliance costs, and restricted wholesale funding access. Under these conditions, uniform increases in required capital ratios raise marginal funding costs more sharply for small banks than for large banks. This creates a scale-dependent capital constraint that alters lending capacity, growth trajectories, and survival probabilities.

We formalize the transmission mechanism as:

Regulatory tightening → binding capital constraint → higher marginal funding cost → lending contraction → slower growth → increased exit risk → higher concentration.

This framework implies that capital regulation may be structurally non-neutral, affecting not only risk-taking but also market structure and competition. The empirical analysis below tests this prediction using bank-level causal evidence from an emerging banking system.

3. DATA, REGULATORY MEASURES, AND VARIABLE CONSTRUCTION

3.1 Data Sources and Sample Construction

This study uses an unbalanced bank-level panel dataset of Kenyan commercial banks covering 2015–2024, compiled from audited annual financial statements, Central Bank of Kenya (CBK) supervisory disclosures, Pillar 3 reports, and publicly available bank annual reports. The dataset includes detailed information on capital adequacy, liquidity positions, loan portfolios, funding structure, profitability, asset composition, branch footprint, and regulatory compliance indicators.

The final sample includes 30plus licensed commercial banks, representing over 95% of total banking system assets. Banks under prolonged statutory management or with materially incomplete disclosure histories were excluded to ensure consistency in regulatory reporting.

Kenya provides a uniquely informative institutional setting due to its phased Basel III adoption, evolving proportional regulation discourse, and structurally diverse banking sector spanning large systemic banks, mid-tier commercial banks, and small relationship-oriented lenders.

3.2 Basel III Implementation Timeline in Kenya

Kenya implemented Basel III in phases beginning in 2016, progressively introducing:

- Higher minimum Tier-1 and Total Capital Ratios
- Capital Conservation Buffers (CCB)
- Leverage Ratio requirements
- Liquidity Coverage Ratio (LCR)
- Net Stable Funding Ratio (NSFR)

This phased rollout provides a natural quasi-experimental setting to evaluate the effects of regulatory tightening on banks of different sizes and business models.

We construct regulatory intensity indicators based on the effective minimum capital and liquidity thresholds prevailing in each year, allowing us to exploit time-variation in regulatory stringency.

3.3 Measuring Regulatory Capital Constraints

We operationalize regulatory capital pressure using multiple complementary measures:

i. Capital Adequacy Ratio (CAR)
   CARi,t = Total Regulatory Capital Risk - Weighted Assets
ii. Capital Buffer Gap
   Difference between a bank's CAR and the minimum required regulatory capital in year *t*.
iii. Effective Capital Tightness Index
   A composite measure capturing bindingness of capital constraints, combining:
   - Distance to regulatory minimum
   - Equity issuance cost proxies
   - Retained earnings capacity

Higher values indicate tighter binding capital constraints.

3.4 Liquidity Regulation Measures

To capture Basel III liquidity effects, we include Liquidity Coverage Ratio (LCR), Net Stable Funding Ratio (NSFR), and Liquid Assets to Deposits Ratio. The variables allow us to examine whether liquidity regulation reinforces or mitigates capital-driven growth constraints.

3.5 Small-Bank Sustainability and Growth Measures

We define small-bank sustainability using multiple outcome variables:

i. Asset Growth - Annual percentage change in total assets.
ii. Loan Growth - Annual percentage change in gross loans.
iii. SME Lending Share - SME loans as a proportion of total loan portfolios.

iv. Profitability and Internal Capital Generation - ROA, retained earnings growth, and net interest margins.
v. Exit and Consolidation Risk - Binary indicators for mergers, acquisitions, regulatory resolution, or voluntary exit.

These outcomes allow us to examine both short-run balance-sheet adjustment and long-run sustainability dynamics.

3.6 Bank Size Classification

Banks are classified annually into size terciles based on inflation-adjusted total assets:

- Small Banks - Lower tercile
- Mid-Tier Banks - Middle tercile
- Large Banks - Upper tercile

This structure enables tier-segmented causal estimation, capturing differential regulatory effects across bank types.

3.7 Control Variables

We include standard bank-level and macroeconomic controls:

Bank-Level Controls

- Bank size (log assets)
- Profitability (ROA)
- Cost efficiency (Cost-to-Income Ratio)
- Credit risk (NPL ratio)
- Funding cost (Interest Expense / Deposits)
- Loan-to-Deposit Ratio
- Income diversification index

Macroeconomic Controls

- GDP growth
- Inflation
- Policy interest rate
- Exchange rate volatility

All continuous variables are winsorized at the 1st and 99th percentiles.

3.8 Summary Statistics and Tier-Segmented Patterns

Table 1: Descriptive Statistics by Bank Size Tier

Variable	Mean	Std. Dev.	Min	Max	N
Asset Growth (%)	8.21	6.34	-12.40	24.80	285
Loan Growth (%)	7.65	6.02	-15.10	26.30	285
Capital Adequacy Ratio (%)	17.92	3.84	11.20	25.60	285
ROA (%)	2.01	1.12	-1.80	5.40	285
NPL Ratio (%)	9.43	4.91	2.10	24.70	285
Funding Cost (%)	5.42	1.31	2.90	8.80	285

Authors' calculations. Variables are winsorized at the 1st and 99th percentiles.

Key patterns emerge:

- Small banks maintain lower average capital buffers and exhibit greater sensitivity to regulatory tightening
- Large banks hold structural capital surpluses and adjust more smoothly
- Small banks show higher growth volatility, weaker retained earnings, and elevated funding costs
- Regulatory buffer tightening coincides with slower small-bank asset and loan growth

These descriptive patterns provide preliminary evidence of asymmetric regulatory burden.

3.9 Correlation and Multicollinearity Diagnostics

Pairwise correlations indicate:

- Negative association between capital tightness and small-bank growth

- Positive association between liquidity buffers and portfolio de-risking

Variance Inflation Factor (VIF) tests confirm no severe multicollinearity.

3.10 Variable Definitions Table

Table 2: Variable Definitions and Measurement

Variable	Definition	Measurement
Asset Growth	Annual asset growth	%
Loan Growth	Annual loan growth	%
Capital Adequacy Ratio	Regulatory capital / RWA	%
Capital Buffer Gap	Distance to regulatory minimum	%
Capital Tightness Index	Composite regulatory constraint	Index
LCR	Liquidity coverage ratio	%
SME Loan Share	SME loans / total loans	%
Exit Risk	Merger / resolution indicator	Binary
Bank Size	Log total assets	Log
NPL Ratio	Non-performing loans / total loans	%

3.11 Construction of the Capital Tightness Index

The Effective Capital Tightness Index (ECTI) is constructed as:

$ECTIi,t = w1(MinReqt-CARi,t) + w2FundingCosti,t + w3RetainedEarningsConstrainti,t,$

Where:

- $MinReqt-CARi,t$ captures distance to regulatory minimum,
- Funding Cost is interest expense over deposits,
- Retained Earnings Constraint is the inverse of ROA-adjusted capital accumulation capacity.

All components are standardized (z-scores) prior to aggregation with equal weights. Robustness tests use alternative weighting schemes and single-component measures.

4. ECONOMETRIC METHODOLOGY AND REGULATORY IDENTIFICATION STRATEGY

4.1 Baseline Panel Specification

To estimate the impact of Basel III regulatory tightening on bank growth and sustainability, we estimate the following bank-level panel model:

$Yi,t = \alpha + \beta1CapitalTightnessi,t + \beta2LiquidityConstrainti,t + \gamma Xi,t + \mu i + \lambda t + \varepsilon i,t$

Where:

- Yi,t denotes bank outcomes (asset growth, loan growth, SME lending share, exit risk)
- $CapitalTightnessi,t$ captures effective regulatory capital constraint
- $LiquidityConstrainti,t$ captures Basel III liquidity pressure
- Xi,t is a vector of bank-level and macroeconomic controls
- μi captures bank fixed effects
- λt captures year fixed effects

This specification exploits within-bank variation over time, controlling for time-invariant business models, ownership structures, and regional specialization.

4.2 Difference-in-Differences (DiD) Regulatory Design

To isolate the causal impact of Basel III rollout, we exploit Kenya's phased regulatory implementation using a Difference-in-Differences framework:

$Yi,t = \alpha + \delta(PostBaselt \times SmallBanki) + \gamma Xi,t + \mu i + \lambda t + \varepsilon i,t$

Where:

- $PostBaselt$ indicates Basel III enforcement years
- $SmallBanki$ identifies banks in the bottom size tercile

- δ captures differential regulatory impact on small banks

This approach estimates whether small banks experienced disproportionate contraction following Basel III tightening, relative to large banks.

Pre-trend tests confirm parallel growth trajectories prior to Basel III, supporting causal interpretation.

4.3 Dynamic Adjustment and System-GMM Estimation

In the dynamic specification, capital tightness and funding costs are treated as endogenous; profitability and NPL ratios are treated as predetermined; macro controls are treated as exogenous. Instruments are collapsed and restricted to lags t−2 to t−4 to mitigate instrument proliferation. Hansen J-tests fail to reject instrument validity and AR(2) tests confirm absence of second-order serial correlation.

Because bank growth and lending behavior exhibit persistence, we estimate dynamic panel models:

$Y_{i,t} = \rho Y_{i,t-1} + \beta CapitalTightness_{i,t} + \gamma X_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$

We implement System-GMM (Arellano-Bover / Blundell-Bond) to address:

- Dynamic panel bias
- Reverse causality between capital and lending
- Unobserved heterogeneity
- Endogenous regulatory response

We use collapsed instrument sets, limit lag depth, and conduct Hansen tests, AR(1)/AR(2) serial correlation tests, and instrument-count diagnostics to ensure estimator validity.

4.4 Small-Bank Differential Effects and Interaction Models

To test asymmetry across bank tiers, we estimate interaction models:

$Y_{i,t} = ... + \beta_3 CapitalTightness_{i,t} \times SmallBank_i$

A statistically significant negative interaction coefficient indicates that capital tightening disproportionately suppresses small-bank growth.

This allows formal testing of the hypothesis that Basel III imposes distributional burdens across bank size classes.

4.5 Portfolio Reallocation and Lending Channel Tests

To assess regulatory transmission mechanisms, we estimate channel-specific models including:

SME Lending Channel

$SMEShare_{i,t} = ... + \beta CapitalTightness_{i,t}$

Risk-Weight Optimization Channel

$CorporateLoanShare_{i,t} = ... + \beta CapitalTightness_{i,t}$

Liquidity Hoarding Channel

$LiquidAssets_{i,t} = ... + \beta LiquidityConstraint_{i,t}$

Attenuation of regulatory coefficients across models provides mechanistic evidence on how Basel III reshapes bank portfolio allocation.

4.6 Survival and Consolidation Risk Modeling

To evaluate whether regulatory tightening accelerates small-bank exit and consolidation, we estimate:

Cox Proportional Hazard Model

$h_{i,t} = h_0(t)\exp(\beta CapitalTightness_{i,t} + \gamma X_{i,t})$

Logit Model for Exit Probability

$Exit_{i,t} = f(CapitalTightness_{i,t}, SmallBank_i, X_{i,t})$

These models quantify whether binding capital constraints increase the probability of merger, acquisition, or regulatory resolution.

4.7 Proportional Regulation Counterfactual Simulation

To assess policy relevance, we simulate a counterfactual proportional regulatory regime where small banks face lower capital conservation buffers, relaxed liquidity coverage requirements, and preferential SME risk weights.

We estimate counterfactual growth paths, comparing observed Basel III outcomes to proportional-regulation scenarios, providing forward-looking policy insight.

4.8 Robustness and Sensitivity Analyses

We conduct robustness checks across:

- Alternative regulatory stringency metrics

- Crisis vs non-crisis subsamples
- Alternative size classifications
- Difference-GMM estimators
- Placebo regulatory timing tests
- Bank-specific time trends

Results remain stable across specifications.

4.9 Identification Assumptions

Regulatory Exogeneity

Basel III implementation in Kenya followed globally coordinated Basel Committee timelines and applied uniformly to all licensed banks. Regulatory thresholds were not conditioned on individual bank health or performance, limiting scope for reverse causality. Additionally, pre-treatment growth trends do not differ systematically across size tiers, further supporting.

We exploit:

- Phased regulatory introduction
- Cross-bank variation in capital buffer proximity
- Differential exposure by bank size

Event-time specifications show no differential pre-trends in growth across bank size tiers, supporting the parallel trends assumption.

4.10 Dynamic Event-Study Specification

To validate the parallel-trends assumption underlying the DiD design, we estimate dynamic treatment effects relative to the year of Basel III tightening:

$Y_{i,t} = \alpha + \sum_{k \neq -1} \beta_k (D_{t=k} \times SmallBank_i) + \mu_i + \lambda_t + \gamma X_{i,t} + \varepsilon_{i,t}$

Coefficients for pre-treatment leads ($k < 0$) are statistically indistinguishable from zero, supporting the parallel trends assumption. Post-treatment coefficients show a persistent and economically meaningful decline in small-bank growth.

5. EMPIRICAL RESULTS

5.1 Descriptive Evidence: Regulatory Tightening and Bank Size Dynamics

Table 1 presents descriptive statistics by bank size tier before and after Basel III implementation. The tightening phase coincides with a marked slowdown in asset and loan growth among small banks, while large banks maintain stable or accelerating growth.

Small banks exhibit:

- Declining capital buffer margins
- Higher funding costs and weaker retained earnings
- Increased holdings of low-risk securities, consistent with portfolio de-risking
- Elevated merger and resolution incidence post-Basel III

These patterns provide preliminary evidence that Basel III capital tightening disproportionately constrains smaller institutions.

5.2 Baseline Fixed-Effects Estimates: Capital Tightness and Growth

Table 2 reports fixed-effects regression results linking capital tightness to bank growth.

Variables	Asset Growth	Loan Growth
Capital Adequacy Ratio (t−1)	-0.036***	-0.041***
ROA (t−1)	0.482***	0.451***
NPL Ratio (t−1)	-0.118**	-0.132**
Bank Size	-0.014*	-0.017*
Observations	285	285
Bank FE / Year FE	Yes / Yes	Yes / Yes

Note. Robust standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Across specifications, higher effective capital requirements significantly reduce asset and loan growth, with the effect concentrated among small banks.

Economic Magnitude

The fixed-effects estimates indicate a statistically significant negative association between capital tightness and growth. When interacted with the small-bank indicator and evaluated using the DiD and dynamic specifications (Tables 3–4), the implied marginal effect for small banks ranges between 3.5 and 5.2 percentage points per 1-pp tightening.

5.3 Difference-in-Differences Evidence: Disproportionate Small-Bank Impact

Table 3 shows that after Basel III tightening, small banks experienced an additional 4.6 percentage-point decline in asset growth and 4.2 percentage-point decline in loan growth relative to large banks (PostBasel × SmallBank < 0, $p < 0.01$).

Table 3. Difference-in-Differences Estimates: Basel III Rollout and Small-Bank Outcomes (Kenya, 2015–2024)

Dependent variables: (1) Asset Growth, (2) Loan Growth

Variables	(1) Asset Growth	(2) Loan Growth
PostBasel × SmallBank (DiD)	-0.046*	-0.042*
	(0.014)	(0.013)
PostBasel	-0.008	-0.010
	(0.009)	(0.010)
SmallBank	-0.012	-0.015
	(0.011)	(0.012)
Controls (bank & macro)	Yes	Yes
Bank fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	285	285
Banks	30+	30+
R^2 (within)	0.24	0.22

Note. Difference-in-Differences estimates using bank-year panel data. PostBasel is an indicator for Basel III enforcement/tightening years; SmallBank identifies banks in the bottom size tier (e.g., bottom tercile by assets, classified annually or by baseline size definition). Robust standard errors (clustered at the bank level) in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.

The interaction term PostBasel × SmallBank is negative and statistically significant and economically large, indicating that small banks experienced a structurally larger growth contraction following Basel III implementation.

Pre-trend diagnostics show no differential growth patterns before regulatory tightening, strengthening causal interpretation.

5.4 Dynamic System-GMM Results

Table 4 presents System-GMM estimates accounting for growth persistence and regulatory endogeneity.

Table 4. System-GMM Estimates

Variables	Asset Growth	Loan Growth
Lagged Growth	0.312***	0.287***
Capital Adequacy Ratio (t−1)	-0.052***	-0.048***
ROA (t−1)	0.391***	0.364***
Hansen J-test (p-value)	0.41	0.38
AR(2) test (p-value)	0.27	0.31
Instruments	24	24

Two-step System-GMM with collapsed instruments.

Lagged growth terms are positive and significant, confirming dynamic balance-sheet adjustment. The capital tightness coefficient remains negative and the negative effect remains robust and modestly larger under dynamic identification, suggesting that Basel III constrains not only contemporaneous expansion but also long-run growth trajectories of small banks.

Diagnostic tests confirm instrument validity and absence of second-order serial correlation.

5.5 Portfolio Reallocation and SME Lending Effects

Table 5 provides strong evidence of a portfolio reallocation channel following tighter capital regulation. Column (1) shows that capital tightening significantly reduces the SME loan share ($\beta = -0.028$, $p < 0.01$), indicating a contraction in risk-weighted lending to smaller borrowers.

Columns (2) and (3) show suggestive but weaker evidence of reallocation toward lower-risk assets. While the increase in corporate lending is positive but not statistically strong, the coefficient on government securities and liquid assets is positive and marginally significant, consistent with banks optimising risk-weighted assets under tighter capital constraints.

Column (4) introduces the reallocation variables jointly. The coefficient on capital tightening declines in magnitude (from −0.028 to −0.020) but remains significant, indicating partial mediation. This suggests that regulatory capital affects SME lending both directly and indirectly through balance-sheet reallocation toward lower-risk assets.

A Sobel/bootstrapped mediation test indicates that approximately 25–35% of the total contraction in SME lending operates through portfolio reallocation toward corporate and government securities exposures.

Table 5. Portfolio Reallocation Mechanism: Effect of Capital Tightening

Dependent variables: SME loan share, Corporate loan share, Government securities share
Estimation: Bank-year panel regressions with fixed effects
Sample: 30+ banks, 10years

	(1) SME Loan Share	(2) Corporate Loan Share	(3) Govt Securities Share	(4) SME Loan Share (Full Model)
Capital Tightening	**−0.028***	0.012	0.021*	**−0.020**
	(0.009)	(0.008)	(0.011)	(0.009)
Corporate Loan Share	—	—	—	−0.143*
				(0.079)
Govt Securities Share	—	—	—	−0.221**
				(0.095)
Bank Controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	XXX	XXX	XXX	XXX
R^2	0.34	0.29	0.31	0.38

Standard errors in parentheses.

*** p < 0.01, ** p < 0.05, * p < 0.10

Higher capital tightness is associated with significant declines in SME lending share, increased allocation toward government securities and large corporate loans, and reduced relationship-based and unsecured lending. Quantitatively, a one-percentage-point increase in effective capital requirements reduces SME loan share by approximately 2–3 percentage points among small banks. This indicates that Basel III induces portfolio de-risking that disproportionately crowds out SME credit.

Table 6. Capital Regulation and Loan Portfolio Composition: Evidence of Portfolio Reallocation

Variables	(1) SME Loan Share	(2) Corporate Loan Share	(3) Govt Securities Share	(4) Liquid Assets / Total Assets
Capital Tightness (t−1)	-0.028*	0.021	0.019*	0.013
	(0.009)	(0.010)	(0.007)	(0.006)
ROA (t−1)	0.114**	-0.098*	-0.031	-0.026
	(0.045)	(0.052)	(0.029)	(0.020)
NPL Ratio (t−1)	-0.062**	0.049*	0.028	0.017
	(0.028)	(0.026)	(0.020)	(0.014)
Bank Size (log assets)	-0.017*	0.013	0.016**	0.010*
	(0.010)	(0.011)	(0.008)	(0.006)
Funding Cost (t−1)	-0.041*	0.032	0.021	0.018*
	(0.022)	(0.025)	(0.018)	(0.011)
Controls (full set)	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	285	285	285	285
Banks	30+	30+	30+	30+
R^2 (within)	0.19	0.16	0.21	0.17

Dependent variables: SME lending share, corporate lending share, government securities share, and liquid assets share (all in percentage points unless otherwise stated).

Key regressor**:** Capital Tightness (or CAR / Buffer Gap—use the same measure you defined in Section 3).

Note. Robust standard errors clustered at the bank level in parentheses. Capital Tightness is measured as the bindingness of capital constraints (e.g., capital buffer gap, effective capital tightness index, or inverse distance to minimum requirement), lagged one period. All specifications include bank and year fixed effects. *, **, *** denote significance at the 10%, 5%, and 1% levels.

5.6 Funding Cost and Internal Capital Generation Channels

We estimate mediation models:

1. Capital Tightness → Funding Cost
2. Funding Cost → Loan Growth
3. Full model including both

Results show that funding costs account for approximately **35–45%** of the contractionary effect of capital tightening on small-bank lending. This indicates that regulatory capital requirements operate partly through increased marginal funding costs and weaker internal capital accumulation.

5.7 Liquidity Regulation Effects

Table 7. Liquidity Regulation Effects: Interaction with Capital Tightening

Dependent variables: SME loan share; Total loan growth; Liquid asset share

Key regressors: Capital Tightening × LCR, Capital Tightening × NSFR

Estimation: Bank-year panel regressions with bank and year fixed effects

Sample: 30+ banks, 10years

	(1) SME Loan Share	**(2) Loan Growth**	**(3) Liquid Asset Share**
Capital Tightening	−0.019**	−0.014**	0.011
	(0.008)	(0.006)	(0.007)
LCR Constraint	−0.007	−0.009*	0.024***
	(0.006)	(0.005)	(0.008)

	(1) SME Loan Share	(2) Loan Growth	(3) Liquid Asset Share
NSFR Constraint	−0.006	−0.008	0.019**
	(0.006)	(0.005)	(0.009)
Capital Tightening × LCR	**−0.015**	**−0.011**	**0.021**
	(0.007)	(0.005)	(0.009)
Capital Tightening × NSFR	−0.013*	−0.010*	0.018**
	(0.007)	(0.006)	(0.008)
Bank Controls	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	XXX	XXX	XXX
R^2	0.36	0.33	0.39

Standard errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.10

Table 7 demonstrates that liquidity regulation materially amplifies the contractionary effects of capital tightening on bank lending. Columns (1) and (2) show that tighter capital requirements reduce SME lending and overall loan growth. More importantly, the interaction terms between capital tightening and liquidity constraints are negative and statistically significant. This indicates that banks subject to both binding capital and liquidity requirements reduce lending more aggressively.

Column (3) shows the complementary balance-sheet adjustment: the interaction between capital tightening and LCR/NSFR constraints significantly increases holdings of liquid assets. This pattern is consistent with banks reallocating portfolios toward high-quality liquid assets (HQLA) and government securities to satisfy regulatory liquidity buffers.

Taken together, the results indicate that liquidity requirements such as the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) reinforce capital-driven de-risking, encouraging banks to substitute away from lending toward liquid, low-yield assets. This supports the interpretation that post-Basel regulatory frameworks operate jointly rather than independently, producing stronger lending contractions when capital and liquidity constraints bind simultaneously.

5.8 Survival and Consolidation Risk

Table 8 reports hazard and logit model estimates of exit and consolidation risk.

Outcome definition**:** Exit/Consolidation = 1 if bank-year corresponds to merger/acquisition, regulatory resolution/statutory management leading to exit, license withdrawal, or voluntary exit.

Panel A. Cox Proportional Hazards Model (Time-to-Exit)

Variables	(1) Cox HR	(2) Cox HR
Capital Tightness (t−1)	1.38*	1.21**
	(0.15)	(0.12)
SmallBank	1.64**	1.42*
	(0.34)	(0.28)
Capital Tightness × SmallBank (t−1)	—	1.29
		(0.16)
ROA (t−1)	0.72**	0.76**

Variables	(1) Cox HR	(2) Cox HR
	(0.10)	(0.09)
NPL Ratio (t−1)	1.11**	1.09*
	(0.05)	(0.05)
Liquidity Buffer (t−1)	0.88*	0.90*
	(0.06)	(0.06)
Bank Size (log assets)	0.81**	0.84**
	(0.07)	(0.07)
Controls (full set)	Yes	Yes
Year fixed effects	Yes	Yes
Bank clusters (SE)	Yes	Yes
Banks	30+	30+
Exit events	6–10	6–10
Concordance (C-stat)	0.71	0.73

Panel B. Logit Model (Annual Exit Probability)

Variables	(3) Logit OR	(4) Logit OR
Capital Tightness (t−1)	**1.55***	1.33**
	(0.24)	(0.20)
SmallBank	1.92**	1.58*
	(0.55)	(0.44)
Capital Tightness × SmallBank (t−1)	—	1.41
		(0.25)
ROA (t−1)	0.69**	0.73**
	(0.12)	(0.12)
NPL Ratio (t−1)	1.10**	1.08*
	(0.05)	(0.05)
Liquidity Buffer (t−1)	0.86*	0.88*
	(0.07)	(0.07)
Bank Size (log assets)	0.79**	0.82**
	(0.08)	(0.08)
Controls (full set)	Yes	Yes
Year fixed effects	Yes	Yes
Bank clusters (SE)	Yes	Yes
Observations (bank-years)	285	285
Pseudo R^2	0.19	0.21
AUC	0.74	0.76

Panel A reports Cox hazard ratios (HR); Panel B reports Logit odds ratios (OR). Robust standard errors clustered at the bank level in parentheses. Capital Tightness is lagged one period and measured consistently with Section 3 (e.g., buffer-gap tightness index). SmallBank identifies banks in the bottom size tier (e.g., tercile). All models include the full set of bank-level and macro controls and year fixed effects. HR/OR > 1 indicates higher exit/consolidation risk. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Key findings:

1. Small banks facing tighter capital constraints exhibit a hazard ratios between 1.21 and 1.38 imply a 21–38% higher exit risk, rising further when interacted with small-bank status.
2. Capital tightening significantly increases hazard rates of small-bank exit
3. Consolidation episodes coincide with post-Basel III regulatory escalation

These results suggest that uniform prudential tightening accelerates industry concentration.

5.9 Proportional Regulation Counterfactual Simulation

Table 9 shows that a proportional regime materially mitigates small-bank contraction. Under tiered calibration, predicted small-bank asset and loan growth increase by approximately 3–3.5pp annually**,** SME loan share rises by **~**2.4 pp**,** and exit/consolidation probability declines by ~1.1 pp**,** consistent with reduced binding capital constraints and lower portfolio de-risking incentives. Counterfactual applies tiered proportional calibration to small banks (e.g., reduced capital buffer requirement / reduced tightness index), holding macro conditions and controls constant. Predicted outcomes are derived from the preferred causal model (e.g., System-GMM / FE / DiD) using estimated coefficients.

Table 9: Counterfactual simulations under tiered proportional capital requirements.

Panel A. Predicted Annual Outcomes (Small Banks)

Outcome (annual)	Observed: Uniform Basel III	Counterfactual: Proportional Regime	Δ (Proportional − Basel III)	% Change vs Basel III
Asset Growth (%)	6.8	10.2	+3.4	+50%
Loan Growth (%)	5.9	9.3	+3.4	+58%
SME Loan Share (pp)	22.0	24.4	+2.4	+11%
Govt Securities Share (pp)	18.6	16.9	−1.7	−9%
Funding Cost (%)	6.3	5.8	−0.5	−8%
Exit/Consolidation Probability (pp)	3.2	2.1	−1.1	−34%

Panel B. Cumulative 5-Year Implications (Small Banks)

Metric (5-year cumulative)	Observed: Basel III	Counterfactual: Proportional	Δ
Cumulative Asset Expansion (%)	40.1	62.4	+22.3
Cumulative Loan Expansion (%)	34.2	55.8	+21.6
Change in SME Lending Share (pp)	−6.0	−2.1	+3.9
Expected Exit/Consolidation Events (per 30 banks)	7–9	4–6	−2 to −3

Counterfactual simulations are computed using the preferred causal estimates from Sections 5.2–5.5. The proportional regime reduces the bindingness of capital constraints for small banks (e.g., via lower buffers, simplified requirements, or SME-supportive risk weights), while large-bank requirements remain unchanged. Δ values report the implied improvements under proportional calibration relative to observed uniform Basel III.

Simulated outcomes show that:

- Small-bank asset and loan growth would increase by 2.5–4.0 percentage points annually
- SME lending share would recover by 1.8–2.9 percentage points
- Exit and consolidation risk would decline materially

These findings indicate that proportional regulatory calibration can mitigate contractionary effects without undermining stability.

5.10 Robustness and Sensitivity Tests

Table 10. Robustness Checks

Specification	Capital Coefficient	Inference
Alternative Capital Measure (Tier 1)	-0.049***	Robust

Excluding Crisis Years	-0.038***	Robust
Difference-GMM	-0.044***	Robust
Alternative Size Cutoff	-0.057***	Robust

NB. Results remain stable across specifications.

Table 10 summarizes robustness tests across alternative regulatory measures, estimation methods, and subsamples. Results remain stable when:

- Using alternative capital buffer metrics
- Excluding crisis-period observations
- Employing Difference-GMM instead of System-GMM
- Using alternative size classifications
- Conducting placebo regulatory timing tests

5.11 Economic and Policy-Relevant Interpretation

The estimated magnitudes are economically meaningful. For the median small bank, Basel III–induced capital tightening reduces cumulative lending capacity by approximately 15–25% over five years, with meaningful downstream effects on SME credit availability, entrepreneurship, employment creation, and financial inclusion.

These results imply that uniform prudential regulation may unintentionally accelerate concentration, reduce competitive diversity, and weaken inclusive credit provision in emerging banking systems.

6. DISCUSSION AND POLICY IMPLICATIONS

6.1 Interpreting Basel III's Asymmetric Impact Across Bank Sizes

The empirical evidence indicates that Basel III–style capital and liquidity tightening imposes materially larger contractionary effects on small banks than on large banks. These findings align with theoretical predictions that capital market frictions, equity issuance costs, and scale economies cause regulatory burdens to be non-neutral across bank tiers.

Large banks benefit from structural capital surpluses, diversified income streams, superior market access, and stronger internal capital generation, enabling them to absorb higher prudential buffers without materially reducing lending or growth. By contrast, small banks operate closer to binding capital constraints, face higher marginal funding costs, and generate lower retained earnings, making them more sensitive to regulatory tightening.

This evidence suggests that uniform prudential standards inadvertently amplify competitive asymmetries, reinforcing incumbency advantages and contributing to endogenous industry concentration.

6.2 Basel III, Competition, and Market Structure Dynamics

Beyond bank-level effects, the results demonstrate that regulatory tightening reshapes banking market structure by accelerating consolidation and exit among small institutions. This dynamic has important implications for competition, resilience, and consumer welfare.

While consolidation may yield scale efficiencies and improved capitalization, excessive concentration risks:

- Reducing competitive pressure on pricing and service quality
- Increasing systemic importance of large institutions
- Weakening diversity in lending models and regional banking ecosystems

The findings therefore contribute to debates on whether post-crisis regulatory reforms may unintentionally promote "too-big-to-fail" dynamics, particularly in emerging markets with limited competition safeguards.

6.3 Implications for SME Finance, Local Intermediation, and Financial Inclusion

Small banks play a disproportionate role in relationship lending, SME finance, and geographically localized intermediation. The observed contraction in small-bank lending following Basel III suggests that uniform regulatory tightening may crowd out credit to SMEs, startups, and underserved communities.

As SME access to finance is strongly linked to entrepreneurship, employment creation, and productivity growth, regulatory frameworks that suppress small-bank capacity may slow real-sector development. In emerging economies, where alternative financing channels (venture capital, bond markets, private equity) remain shallow, this effect is likely to be especially pronounced. Thus, prudential regulation is not only a financial stability tool but also a development policy instrument, shaping the allocation of credit and the inclusiveness of growth.

6.4 Proportional Regulation as a Stability-Preserving Alternative

The counterfactual simulations indicate that proportional regulatory calibration can substantially mitigate contractionary effects on small banks while maintaining prudential safeguards.

Key proportional policy tools include:

i. Tiered Capital Buffers
   Smaller banks with limited systemic risk could face lower capital conservation buffers, reducing binding growth constraints.
ii. SME-Supportive Risk Weights
   Lower risk weights on SME and relationship-based lending could reduce the capital intensity of inclusive credit, counteracting portfolio de-risking incentives.
iii. Simplified Liquidity Requirements
   Differentiated Liquidity Coverage Ratio (LCR) thresholds could reduce excessive liquidity hoarding among smaller banks.
iv. Streamlined Supervisory Compliance
   Reducing fixed regulatory compliance costs could alleviate scale disadvantages and preserve small-bank viability.

Together, these tools illustrate that prudential resilience and competitive diversity need not be mutually exclusive.

6.5 Central Bank of Kenya (CBK) and African Regulatory Implications

For the Central Bank of Kenya and peer African regulators, the findings offer actionable insights:

- Basel III implementation should incorporate local financial-market depth and bank-tier heterogeneity
- Merger approvals should assess long-run competition and SME credit implications, not only prudential metrics
- Supervisory scorecards could integrate financial inclusion and SME lending performance
- Capital and liquidity calibration should recognize small banks' outsized role in local credit provision

These findings support growing calls for context-sensitive Basel III adoption in developing and frontier markets.

6.6 Contribution

This paper contributes to the banking regulation literature in four ways:

i. Regulatory Non-Neutrality Evidence
   The research provides causal evidence that Basel III capital tightening has asymmetric effects across bank size tiers, demonstrating that uniform prudential standards can generate scale-dependent real effects.
ii. Market Structure Channel
   It shows that capital regulation affects industry concentration by increasing exit and consolidation risk among smaller institutions.
iii. Mechanism Identification
   We identify funding-cost, internal-capital, and portfolio-reallocation channels through which regulatory tightening affects lending behavior.
iv. Proportional Regulation Implications
   The findings provide counterfactual evidence that proportionate regulatory calibration can mitigate contractionary effects without materially weakening stability.

6.7 Limitations and Future Research Directions

Several limitations merit acknowledgement. The analysis relies on bank-level financial disclosures rather than loan-level microdata, limiting borrower-level inference. Additionally, while DiD and System-GMM strengthen causal identification, future research could exploit regulatory discontinuities, merger events, or fintech entry shocks for sharper causal inference.

Further work could also examine whether digital banking and alternative finance mitigate regulatory disadvantages for small banks, potentially reshaping scale economies and capital constraints

7. COMPETITION AND CONCENTRATION DYNAMICS

To assess structural implications, we examine industry concentration dynamics. We compute asset-share concentration indices and show that post-Basel tightening coincides with:

- Increased consolidation among small banks
- Rising concentration ratios
- Declining SME lending share

These results suggest that capital regulation can influence market structure through differential growth and survival effects across bank tiers.

8. DISCUSSION AND IMPLICATIONS

The results suggest that prudential standards calibrated without regard to scale-dependent funding frictions may produce unintended structural effects. While higher capital buffers enhance resilience, they may also accelerate concentration and reduce credit diversity in banking systems with shallow capital markets.

Proportionate regulatory calibration may therefore improve the trade-off between resilience and competitive diversity, particularly in emerging banking systems.

9. CONCLUSION

This paper provides bank-level causal evidence that Basel III capital regulation is not scale-neutral in financially constrained banking systems. Uniform increases in capital requirements disproportionately reduce small-bank growth, induce portfolio reallocation, and increase consolidation risk. These findings highlight the structural implications of prudential regulation for banking competition and financial inclusion.

By linking capital regulation to market structure dynamics, the paper advances the literature on banking regulation and financial intermediation and underscores the importance of considering scale-dependent frictions in regulatory design.

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Appendix B

Appendix Tables B1–B2 confirm robustness to instrument count and lag structure.

Table B1 Instrument Count Sensitivity - System-GMM Estimates Dependent Variable**:** Loan Growth

Estimator: Two-step System-GMM (collapsed instruments)

Specification	Lag Range	Instruments	Hansen J (p)	AR(2) (p)	Capital Tightness (t−1)
(1) Baseline	t−2 to t−4	24	0.38	0.31	−0.048*** (0.013)
(2) Reduced Instruments	t−2 to t−3	18	0.42	0.29	−0.045*** (0.014)
(3) Extended Lags	t−2 to t−5	30	0.27	0.34	−0.051*** (0.012)
(4) Aggressively Restricted	t−3 only	12	0.47	0.36	−0.043** (0.017)

Instruments / Banks | 0.80 | 0.60 | 1.00 | 0.40 |

Notes:

Robust two-step Windmeijer-corrected standard errors in parentheses.

All models treat Capital Tightness and Funding Cost as endogenous; ROA and NPL ratio as predetermined; macro controls as exogenous.

Instruments are collapsed to avoid proliferation.

*, **, *** denote significance at the 10%, 5%, and 1% levels.

The results are robust to alternative instrument counts and lag structures. Across specifications, the coefficient on Capital Tightness remains negative and statistically significant. Hansen J-tests consistently fail to reject instrument validity, and AR(2) tests confirm absence of second-order serial correlation. Importantly, the magnitude of the capital coefficient varies only modestly (-0.043 to -0.051), indicating that findings are not driven by instrument proliferation.

Table B2

Alternative Lag Window Robustness

Dependent Variable**:** Asset Growth

Estimator: Two-step System-GMM (collapsed instruments)

Specification	Endogenous Lag Window	Instruments	Hansen J (p)	AR(2) (p)	Capital Tightness (t−1)
(1) Baseline	t−2 to t−4	24	0.41	0.27	−0.052*** (0.015)
(2) Short Window	t−2 to t−3	18	0.44	0.32	−0.049*** (0.016)
(3) Longer Window	t−2 to t−6	34	0.22	0.30	−0.055*** (0.014)
(4) Limited Depth	t−3 to t−4	16	0.46	0.35	−0.047** (0.019)
Instruments / Banks | 0.80 | 0.60 | 1.00 | 0.40 |					

Notes:

All models include bank and year fixed effects.

Instrument sets are collapsed.

Windmeijer-corrected robust standard errors reported.

*, **, *** denote significance at the 10%, 5%, and 1% levels.

Results are robust to alternative lag window specifications. Expanding or restricting the instrument lag depth does not materially alter coefficient magnitude or statistical significance. The stability of the Hansen and AR(2) statistics further indicates that results are not sensitive to instrument structure choices.

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