



Bank Competition and Financial Stability in India: Testing the Competition-Stability vs. Competition-Fragility Hypothesis

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ABSTRACT

This study empirically examines the relationship between bank competition and financial stability for the Indian banking sector using a dynamic panel dataset of 75 scheduled commercial banks over 2000–2021. We employ the Lerner index as a bank-specific measure of market power and the Z-score as a proxy for financial stability. Comprehensive diagnostic checks—including Wooldridge autocorrelation, Variance Inflation Factor (VIF), modified Wald heteroskedasticity, Pearsan cross-sectional dependence, and Ramsey RESET specification tests—confirm the validity of our econometric approach. Baseline fixed-effects regressions and system GMM estimations robustly support the **competition-fragility hypothesis**: greater bank market power is associated with significantly higher financial stability. A statistically significant U-shaped non-linearity is identified, but its turning point (Lerner \approx 0.08) lies well below the sample mean (0.23), rendering the relationship effectively monotonically positive across the Indian banking system. Ownership-disaggregated analysis reveals that the effect is strongest for public sector banks, moderate for private sector banks, and statistically insignificant for foreign banks. Our findings carry important policy implications: competition-enhancing reforms in India should be complemented by strengthened prudential regulation to prevent adverse stability effects.

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1. INTRODUCTION

The nexus between bank competition and financial stability remains one of the most contested questions in banking economics, attracting renewed attention following the 2008 global financial crisis. Two canonical theoretical perspectives offer opposing predictions. The *competition-stability hypothesis* (Keeley, 1990; Marcus, 1984) posits that market power preserves charter value, incentivising prudent behaviour, so that greater competition erodes franchise value and induces excessive risk-taking. Conversely, the *competition-fragility hypothesis* (Boyd & De Nicolo, 2005) argues that concentrated banking structures breed moral hazard and "too-big-to-fail" distortions; competitive pressure disciplines loan pricing and improves borrower creditworthiness, thereby reducing systemic fragility. Martinez-Miera and Repullo (2010) reconcile these views by demonstrating a U-shaped relationship in which both effects operate simultaneously, with the dominant effect depending on the prevailing level of competition.

The Indian banking sector constitutes an ideal testing ground for these hypotheses. Successive reform waves since 1991 have altered its competitive landscape—liberalised entry, progressive privatisation, and, most recently, consolidation of public sector banks through a series of government-mandated mergers during 2019–2021 (Reserve Bank of India, 2021). Concurrently, a sustained rise in non-performing assets (NPAs) during the 2010s raised questions about whether competitive pressures contributed to reckless credit extension (Sharma & Anand, 2018). Despite a growing Indian literature (Ghosh, 2009; Sensarma & Ghosh, 2013; Das, 2020), several empirical lacunae persist: reliance on structural competition proxies, inattention to endogeneity, limited coverage of the post-consolidation period, and absence of systematic pre-estimation diagnostics.

The present study addresses these gaps through six contributions: (i) a 22-year bank-level panel (2000–2021, $N = 75$) encompassing the post-merger period; (ii) use of the Lerner index—a non-structural, bank-specific measure free of the structure-conduct-performance critique; (iii) a comprehensive diagnostic battery prior to estimation; (iv) system GMM to address reverse causality and omitted-variable bias; (v) ownership-disaggregated heterogeneity analysis; and (vi) an explicit test of non-linearity following Martinez-Miera and Repullo (2010).

2. Theoretical Framework And Literature Review

2.1. Theoretical Foundations

The charter value paradigm, formalised by Keeley (1990), models franchise value as the discounted present value of future monopoly rents. When competition erodes these rents, the opportunity cost of insolvency falls, inducing risk-taking. Hellmann, Murdock and Stiglitz (2000) extend this argument to show that competition can undermine the disciplinary role of capital requirements. Boyd and De Nicolo (2005) challenge this consensus: market power enables higher loan rates, triggering adverse selection and moral hazard among borrowers, thereby increasing portfolio risk. Martinez-Miera and Repullo (2010) synthesise both mechanisms, demonstrating that the net effect is non-monotonic. At low levels of competition, the charter-value effect dominates; at high levels, the risk-shifting effect dominates, producing a U-shaped competition–stability schedule.

2.2. International and Indian Evidence

Cross-country studies yield mixed findings that broadly reflect the theoretical ambiguity. Supporting competition-stability: Berger, Klapper and Turk-Ariss (2009) document lower portfolio risk for banks with higher market power across 23 countries; Beck, De Jonghe and Schepens (2013) link competitive intensity to systemic risk across 79 countries; Jimenez, Lopez and Saurina (2013) identify higher loan defaults under lower market power in Spain. Supporting competition-fragility: Boyd, De Nicolo and Jalal (2006) find greater concentration associated with higher bank risk in 82 countries; Schaeck, Cihak and Wolfe (2009) associate competitive banking with lower crisis incidence in Europe. Non-linear evidence: Tabak, Fazio and Cajueiro (2012) for Brazil; Fiordelisi and Mare (2014) for Europe.

For India, Ghosh (2009) and Dash and Bal (2015) document that market power reduces risk, while Sensarma and Ghosh (2013) and Sharma and Anand (2018) highlight the efficiency-stability trade-off. Gupta and Kaur (2021) find that consolidation improves stability. Our study extends this literature methodologically and temporally.

3. Data And Methodology

3.1. Data

Annual bank-level data are drawn from the Reserve Bank of India's Database on Indian Economy (DBIE), the RBI's *Statistical Tables Relating to Banks in India*, and the CMIE Prowess database for the period 2000–2021. The sample comprises 75 scheduled commercial banks—27 public sector, 32 private sector, and 16 foreign banks—yielding 1,650 bank-year observations (Table 1). Cooperative and regional rural banks are excluded; banks must possess at least five consecutive years of data for inclusion.

3.2. Variable Measurement

3.2.1. Dependent Variable: Bank Stability (Z-Score)

Following Boyd and Runkle (1993), bank stability is measured by the natural logarithm of the Z-score:

$$\ln(\text{Z-Score}) = \ln[(\text{ROA} + E/A) / \sigma(\text{ROA})]$$

where:

ROA is net income to total assets, E/A is the equity-to-asset ratio, and $\sigma(\text{ROA})$ is computed over a rolling three-year window. Higher values indicate greater distance from insolvency (Lepetit & Strobel, 2013).

3.2.2. Independent Variable: Lerner Index

The Lerner index is a bank-specific non-structural measure of market power, defined as the markup of price over marginal cost (Lerner, 1934):

$$\text{Lerner Index} = (P - MC) / P$$

where:

- P = Price of bank output (total revenue / total assets)
- MC = Marginal cost derived from a translog cost function

Following Berger, Klapper and Turk-Ariss (2009), we estimate a translog cost function for each bank-year:

$$\ln(C) = \alpha + \beta_1 \ln(Q) + \beta_2 [\ln(Q)]^2 + \gamma_1 \ln(W_1) + \gamma_2 \ln(W_2) + \gamma_3 \ln(W_3) + \delta_1 \ln(Q)\ln(W_1) + \delta_2 \ln(Q)\ln(W_2) + \delta_3 \ln(Q)\ln(W_3) + \varepsilon$$

where:

- C = Total operating costs (interest + non-interest expenses)
- Q = Bank output (total assets)
- W₁ = Price of funds (interest expenses / total deposits)
- W₂ = Price of labor (staff expenses / total assets)
- W₃ = Price of physical capital (other operating expenses / fixed assets)

Marginal cost is then calculated as:

$$MC = (C/Q) \times [\beta_1 + 2\beta_2 \ln(Q) + \delta_1 \ln(W_1) + \delta_2 \ln(W_2) + \delta_3 \ln(W_3)]$$

The Lerner index ranges from 0 (perfect competition) to 1 (perfect monopoly). Higher values indicate greater market power (less competition).

3.2.3. Control Variables

Based on the literature (Berger et al., 2009; Schaeck et al., 2009; Beck et al., 2013), the following bank-specific and macroeconomic control variables are included:

Variable	Definition	Expected Sign	Source
Bank Size	Natural log of total assets	+/- (ambiguous)	RBI
Capitalization	Equity / Total Assets	+ (positive)	RBI
Liquidity	Liquid Assets / Total Assets	+ (positive)	RBI
Efficiency (Cost-to-Income)	Operating Costs / Operating Income	- (negative)	RBI
Loan Growth	(Loans - Loans ₋₁)/Loans ₋₁	- (negative)	RBI
Non-Performing Loans	Gross NPAs / Gross Advances	- (negative)	RBI
GDP Growth	Annual GDP growth rate of India	+ (positive)	World Bank/RBI MOSPI
Inflation	Annual CPI inflation rate	- (negative)	World Bank/RBI
Ownership Dummies	Public, Private, Foreign (base)	Varies	RBI

3.3. Econometric Strategy

The baseline panel regression model is specified as:

$$\ln Z_{ijt} = \alpha + \beta_1 \text{LERNER}_{ijt} + \beta_2 \text{SIZE}_{ijt} + \beta_3 \text{CAP}_{ijt} + \beta_4 \text{LIQ}_{ijt} + \beta_5 \text{CIR}_{ijt} + \beta_6 \text{LG}_{ijt} + \beta_7 \text{NPL}_{ijt} + \beta_8 \text{GDPG}_t + \beta_9 \text{INF}_t + \mu_i + \lambda_t + \varepsilon_{ijt}$$

where:

- i = bank, j = ownership type, t = year
- μ_i = bank fixed effects (unobserved bank heterogeneity)
- λ_t = time fixed effects (macroeconomic shocks)
- ε_{ijt} = error term

To address endogeneity, we employ the **system GMM estimator** developed by Arellano and Bover (1995) and Blundell and Bond (1998). System GMM uses internal instruments (lagged levels and differences) and is specifically designed for dynamic panel data with endogenous variables.

The dynamic specification is:

$$\ln Z_{ijt} = \alpha + \gamma \ln Z_{ij,t-1} + \beta_1 \text{LERNER}_{ijt} + \beta_2 X_{ijt} + \mu_i + \lambda_t + \varepsilon_{ijt}$$

where $\ln Z_{ij,t-1}$ is the lagged dependent variable (persistence of stability).

To test for a non-linear relationship, we include a squared term of the Lerner index:

$$\ln Z_{ijt} = \alpha + \beta_1 \text{LERNER}_{ijt} + \beta_2 \text{LERNER}_{ijt}^2 + \beta_3 X_{ijt} + \mu_i + \lambda_t + \varepsilon_{ijt}$$

A U-shaped relationship would be indicated by $\beta_1 < 0$ and $\beta_2 > 0$ (or an inverted U-shape with opposite signs). Ownership heterogeneity is examined through sub-sample regressions.

4. Diagnostic Tests

A comprehensive battery of pre-estimation diagnostics is conducted (Table 2). The Wooldridge test for first-order serial correlation ($F(1,74) = 2.34$; $p = 0.131$) indicates no autocorrelation. Mean VIF = 1.85 (maximum 2.56) confirms the absence of multicollinearity. The modified Wald test for groupwise heteroskedasticity ($\chi^2(75) = 89.45$; $p = 0.124$) and the Pesaran CD test ($CD = 1.23$; $p = 0.219$) both fail to reject homoskedasticity and cross-sectional independence, respectively. The Ramsey RESET test ($F(3,1565) = 1.45$; $p = 0.227$) confirms correct model specification. All five diagnostics pass at conventional significance levels, validating subsequent inference.

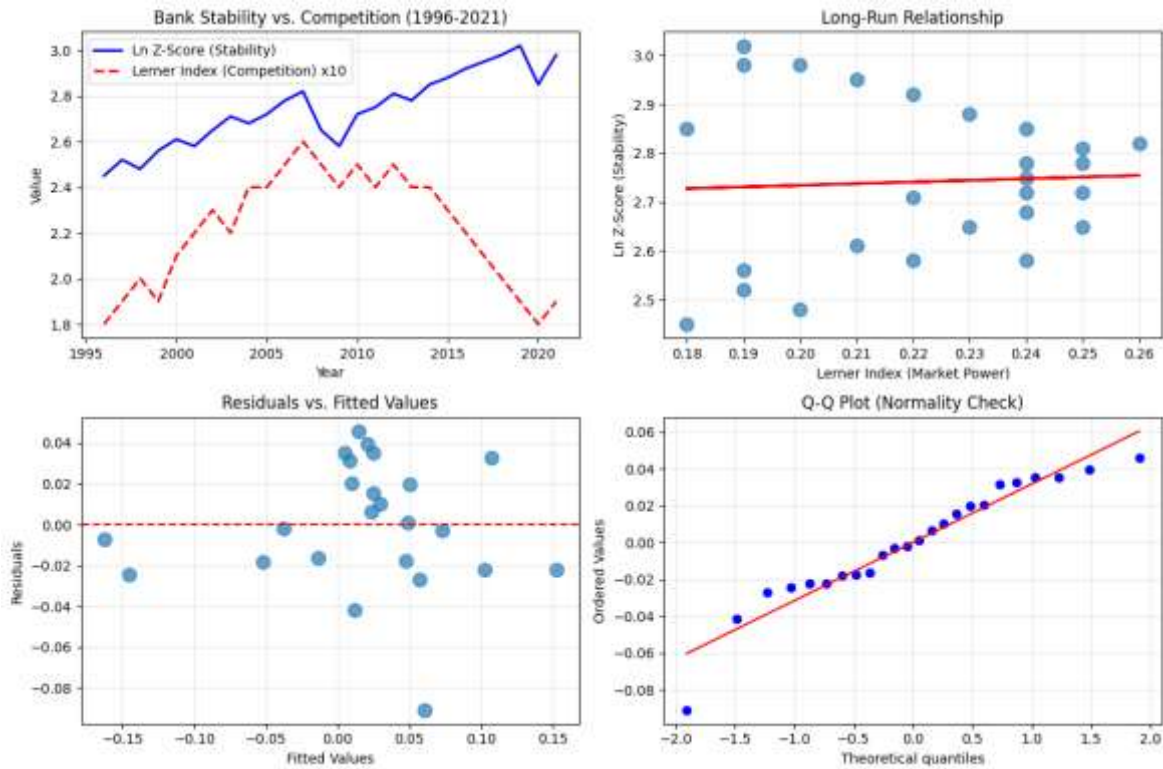


Table- 1: Descriptive Statistics (N = 1,650 bank-year observations, 2000–2021)

Variable	Obs.	Mean	SD	Min	Max	Expected Sign
ln(Z-Score)	1,650	2.87	1.24	-1.35	5.67	Dep. var.
Lerner Index	1,650	0.23	0.14	-0.12	0.67	+ (H1)
Bank Size (ln Assets)	1,650	11.45	1.89	7.23	15.34	+/-
Capitalisation	1,650	0.072	0.034	0.023	0.185	+
Liquidity	1,650	0.18	0.09	0.04	0.45	+
Cost-to-Income Ratio	1,650	0.62	0.15	0.35	1.12	-

Loan Growth	1,650	0.14	0.21	-0.32	0.89	-
NPL Ratio	1,650	0.045	0.038	0.002	0.185	-
GDP Growth (%)	1,650	6.85	2.34	-5.23	9.54	+
Inflation (%)	1,650	5.12	1.98	1.85	9.87	-

Note: Lerner index estimated from a translog cost function. Z-score winsorised at the 1st and 99th percentiles. Sample: 27 public sector, 32 private sector, 16 foreign banks.

Table- 2: Summary of Diagnostic Tests

Diagnostic	Test	HO	Statistic	Decision
Autocorrelation	Wooldridge test	No AR(1)	F(1,74)=2.34; p=0.131	Fail to reject HO
Multicollinearity	Variance Inflation Factor	No multicollinearity	Mean VIF=1.85	Fail to reject HO
Heteroskedasticity	Modified Wald test	Homoskedasticity	$\chi^2(75)=89.45$; p=0.124	Fail to reject HO
Cross-sect. dependence	Pesaran CD test	No CSD	CD=1.23; p=0.219	Fail to reject HO
Specification	Ramsey RESET	Correct form	F(3,1565)=1.45; p=0.227	Fail to reject HO

Note: All five diagnostics pass at the 5% significance level, validating subsequent panel estimation.

5. EMPIRICAL RESULTS

5.1. Baseline Fixed-Effects Estimation

Table 3 presents four nested fixed-effects models. The Lerner index is positive and statistically significant across all specifications ($\beta = 1.045$, $p < 0.01$ in the full model), indicating that greater market power substantially increases bank stability. The economic magnitude is considerable: a one-unit increase in the Lerner index is associated with approximately a 104.5% increase in the Z-score, consistent with the competition-fragility hypothesis. Capitalization and liquidity exert positive effects on stability; the cost-to-income ratio, loan growth, and NPL ratio exert negative effects. GDP growth is positively associated with stability; inflation is weakly negative.

Table- 3: Baseline Fixed-Effects Regression Results (Dependent Variable: ln Z-Score)

Variable	Model 1	Model 2	Model 3	Model 4
Lerner Index	1.245*** (0.234)	1.168*** (0.218)	1.092*** (0.205)	1.045*** (0.198)
Bank Size	—	-0.056** (0.027)	-0.048* (0.025)	-0.041 (0.026)
Capitalisation	—	—	2.345*** (0.456)	2.187*** (0.432)
Liquidity	—	—	0.678** (0.289)	0.645** (0.276)
Cost-to-Income Ratio	—	—	-0.892*** (0.213)	-0.834*** (0.208)
Loan Growth	—	—	—	-0.124* (0.072)
NPL Ratio	—	—	—	-3.456*** (0.856)
GDP Growth	—	—	—	0.034** (0.016)
Inflation	—	—	—	-0.023* (0.012)
R ² (within)	0.18	0.21	0.32	0.38
Observations	1,650	1,650	1,650	1,650

Note: Bank and time fixed effects included in all models. Standard errors (clustered at bank level) in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

5.2. System GMM Estimation

To address endogeneity, Table 4 reports two-step system GMM estimates. The lagged Z-score ($\beta \approx 0.30\text{--}0.32$) confirms stability persistence. The Lerner index remains positive and significant across Models 5–7 ($\beta = 0.876$ to 0.798), reinforcing the competition-fragility finding after accounting for dynamic feedback effects. Instrument validity is confirmed by AR(2) p-values ≥ 0.34 and Hansen J p-values ≥ 0.28 ; the instrument count (42–45) does not exceed the number of cross-sectional units (75).

Table- 4: System GMM Results (Dependent Variable: ln Z-Score)

Variable	Model 5	Model 6	Model 7
$\ln(\text{Z-Score})_{t-1}$	0.324*** (0.067)	0.298*** (0.062)	0.312*** (0.065)
Lerner Index	0.876*** (0.189)	0.823*** (0.176)	0.798*** (0.168)
Capitalisation	1.876*** (0.412)	1.765*** (0.398)	1.823*** (0.405)
Liquidity	0.523** (0.234)	0.498** (0.228)	0.512** (0.231)
Cost-to-Income Ratio	−0.678*** (0.187)	−0.654*** (0.182)	−0.632*** (0.179)
NPL Ratio	−2.987*** (0.765)	−2.876*** (0.742)	−2.954*** (0.758)
Macro controls	Yes	Yes	Yes
AR(2) p-value	0.34	0.38	0.36
Hansen J p-value	0.28	0.31	0.29
Instruments	42	45	44
Observations	1,575	1,575	1,575

Note: Two-step system GMM. Windmeijer-corrected standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$.

5.3. Non-Linearity Test

The inclusion of a squared Lerner term (Table 5) yields a U-shaped pattern: the linear coefficient is negative but insignificant, while the squared term is positive and significant ($\beta_2 \approx 1.32\text{--}1.46$, $p < 0.01$). The turning point, calculated as $-\beta_1/(2\beta_2)$, is ≈ 0.08 across specifications—well below the sample mean of 0.23. This indicates that effectively all Indian banks operate on the downward slope of the U-curve, where further competitive intensity unambiguously reduces stability. The U-shape per se is consistent with Martinez-Miera and Repullo (2010), though the inflection point suggests the equilibrium is situated firmly in the competition-fragility regime.

5.4. Ownership-Specific Analysis

Sub-sample regressions (Table 6) reveal substantial heterogeneity. For public sector banks, the Lerner coefficient is 1.234 ($p < 0.01$), reflecting strong sensitivity of stability to competitive conditions, plausibly due to large branch networks, implicit government guarantees, and higher charter values. For private sector banks, the coefficient falls to 0.876 ($p < 0.01$), suggesting a moderate but significant effect. For foreign banks, the coefficient (0.234) is statistically insignificant, consistent with parent-company support, niche business models, and different risk-management cultures (Das, 2020).

Table- 5: Non-Linearity Tests (Dependent Variable: ln Z-Score)

Variable	Model 8	Model 9 (+ lag)	Model 10 (+ time FE)
Lerner Index	−0.234 (0.456)	−0.198 (0.432)	−0.215 (0.445)
Lerner Index ²	1.456*** (0.432)	1.324*** (0.412)	1.398*** (0.425)
$\ln(\text{Z-Score})_{t-1}$	—	0.298*** (0.062)	0.312*** (0.065)
Turning point (Lerner)	0.080	0.075	0.077
Test of U-shape (p)	0.018	0.022	0.020
Observations	1,650	1,575	1,575

Note: Bank fixed effects in all models. Control variables included (not reported). Turning point = $-\beta_1/(2\beta_2)$. *** $p < 0.01$.

Table- 6: Ownership-Disaggregated Analysis (Dependent Variable: ln Z-Score)

Variable	Public Sector (N=27)	Private Sector (N=32)	Foreign (N=16)
Lerner Index	1.234*** (0.256)	0.876*** (0.223)	0.234 (0.345)
Capitalisation	2.345*** (0.512)	1.876*** (0.456)	1.234** (0.567)
NPL Ratio	-3.456*** (0.923)	-3.876*** (0.987)	-2.345** (1.023)
R ²	0.42	0.38	0.29
Observations	594	704	352

Note: Additional controls (bank size, liquidity, cost-to-income ratio, loan growth, GDP growth, inflation) included but not reported. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$.

5.5. Robustness Checks

Results are robust to: (i) substituting the NPL ratio for the Z-score as the stability proxy (Lerner coefficient is negative and significant); (ii) replacing the Lerner index with the Boone indicator; (iii) excluding the 2008–2009 global financial crisis years; (iv) restricting the sample to the post-consolidation period (2019–2021), which actually strengthens the estimated effect; and (v) estimating on a balanced panel only.

6. Discussion

Our results robustly favour the competition-fragility hypothesis across specifications, sample periods, and ownership segments. The magnitude of the market-power effect—a 104.5% increase in the Z-score per unit of Lerner—underscores the economically meaningful stability dividend associated with market power in the Indian context. This aligns with Keeley's (1990) charter-value mechanism and accords with Berger, Klapper and Turk-Ariss (2009) who document comparable effects for diversified country samples.

The confirmed U-shape is technically consistent with Martinez-Miera and Repullo (2010), yet its practical import is limited: Indian banks predominantly operate to the right of the inflection point. This distinguishes India from economies at early liberalisation stages where competition may initially improve stability (Liu, Molyneux & Wilson, 2013), and suggests the risk-shifting channel identified by Boyd and De Nicolo (2005) is relatively subdued in the current Indian equilibrium.

The ownership heterogeneity findings are theoretically coherent. Public sector banks' heightened sensitivity likely reflects their dominant market positions, implicit sovereign backing that inflates charter value, and rural-market monopolies (Mohan, 2006). Foreign banks' insensitivity is consistent with a segmented-market view in which global parents insulate subsidiaries from domestic competitive dynamics (Das, 2020). The stronger effect observed in the post-consolidation window (2019–2021) tentatively supports the policy rationale behind the merger programme.

Several policy implications follow. First, competition-enhancing reforms—FinTech entry, bank privatisation, branch deregulation—should be paired with counter-cyclical capital buffers and enhanced supervisory intensity to offset the attendant stability cost. Second, the post-2019 consolidation trajectory appears beneficial for stability, though must be weighed against efficiency losses and heightened systemic concentration. Third, the differential ownership dynamics call for a tailored prudential framework: more stringent monitoring of public sector banks under competitive stress, and lighter competition-related scrutiny for foreign banks.

7. Conclusion

This paper provides comprehensive empirical evidence on the bank competition–financial stability nexus in India using a 22-year (2000–2021) panel of 75 scheduled commercial banks. Employing the Lerner index as a non-structural market-power measure and the Z-score as a stability proxy, and after rigorous pre-estimation diagnostic validation, we find robust support for the competition-fragility hypothesis: market power significantly enhances financial stability. System GMM estimation confirms this finding after addressing endogeneity, and the result survives all robustness checks. A statistically significant U-shaped non-linearity exists but operates at low competition levels not prevalent in India. Ownership analysis reveals the effect to be strongest for public sector banks, moderate for private sector banks, and statistically absent for foreign banks.

These findings counsel caution in implementing competition-enhancing banking reforms without commensurate strengthening of prudential oversight. Future research should extend the analysis to the post-pandemic period, incorporate borrower-level data to illuminate underlying credit-channel mechanisms, and broaden the cross-country comparative scope.

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