ISSN 2664-3995 (Print) & ISSN 2664-6757 (Online)
South Asian Research Journal of Business and Management
Abbreviated Key Title: South Asian Res J Bus Manag

| Volume-8 | Issue-6 | Nov-Dec- 2026 | **DOI: https://doi.org/10.36346/sarjbm.2026.v08i06.001**

Original Research Article

Structural Monetary Policy and Corporate Guarantee Exposure: Evidence from China's A-share Market

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Article History
Received: 06.09.2026
Accepted: 30.10.2026
Published: 02.11.2026

Abstract: Structural monetary policy directs liquidity toward designated sectors and firms, but its implications for the non-price terms of corporate borrowing remain insufficiently understood. In a collateral-oriented banking system, targeted credit may relax financing constraints while simultaneously increasing the assets and guarantees that firms commit to obtain funding. This study examines the association between structural monetary policy (SMP) and corporate collateralization and guarantee exposure in China. Using 46,512 quarterly observations of non-financial A-share listed firms from 2007 to 2024, we construct a residual-based SMP indicator that removes the component associated with conventional monetary conditions. Firm fixed-effects estimates show that stronger SMP is positively associated with the Guarantee ratio, defined as collateralization and guarantee commitments scaled by net assets. The result is robust to lagged-policy specifications, sample exclusions, and random placebo tests. Mechanism tests indicate that SMP is associated with greater credit availability, although this channel does not translate into a higher Guarantee ratio in the estimated mediation tests. By contrast, the evidence is consistent with a capital-expenditure channel: policy-supported investment expands the stock of pledgeable assets and is associated with greater guarantee exposure. The association is stronger for smaller and lower-leverage firms, and factor-augmented time-varying analyses reveal substantial industry and temporal heterogeneity. These findings suggest that an assessment of targeted monetary policy should consider not only credit volumes and financing costs, but also the collateral and guarantee commitments embedded in credit contracts.

Keywords: Structural Monetary Policy, Collateralization, Corporate Guarantees, Credit Availability, Capital Expenditure, China.

INTRODUCTION

Structural monetary policy has become an important component of China's monetary-policy toolkit. In contrast to broad liquidity provision, its instruments seek to channel funding toward particular sectors, activities, and types of firms. Pledged supplementary lending, the medium-term lending facility (MLF), targeted reserve-requirement reductions, and specialized relending programmes are intended to improve access to finance for small and micro enterprises, agriculture and rural development, green projects, and technological innovation. Existing evidence accordingly focuses on whether these instruments improve credit allocation, financing conditions, innovation, green transformation, and environmental performance (Guo & Fang, 2021; Li & Li, 2025; Wang & Zhao, 2025). Yet the expansion of policy-supported credit does not, by itself, reveal the contractual conditions under which firms obtain that credit.

This distinction is consequential in a banking system in which collateral and guarantees remain central to loan screening and risk control. Stiglitz and Weiss (1981) show that information asymmetry can generate equilibrium credit rationing through adverse-selection and incentive effects. For firms, however, these arrangements encumber assets and may extend risk exposure through interfirm guarantee relationships. A guarantee can ease an individual borrower's financing constraint, but a dense guarantee network can also transmit distress across connected firms. The policy question

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is therefore not limited to whether targeted liquidity raises the supply of credit. It also concerns whether the institutional frictions associated with that credit increase corporate collateralization and guarantee exposure.

Theory offers competing predictions. On the one hand, targeted liquidity can reduce external finance premiums and relax financing constraints, thereby reducing firms' reliance on costly third-party guarantees. On the other hand, banks may preserve conventional risk-screening standards when extending policy-directed loans, particularly to borrowers with limited transparency or pledgeable assets. In that case, greater access to policy credit may be accompanied by a larger share of restricted assets or guarantee commitments. The financial accelerator further suggests that this relationship may be amplified through balance-sheet conditions: policy-induced investment can create new fixed assets that are subsequently pledged in financing contracts (Bernanke & Gertler, 1989; Bernanke *et al*., 1999).

The existing literature leaves this issue open. Research on structural monetary policy has largely examined its effects on firm investment, innovation, productivity, green transition, or risk taking. Studies of corporate guarantees, in turn, typically examine monetary tightening, group affiliation, mutual-guarantee networks, and contagion risk (Li & Liu, 2022; Wang *et al*., 2020). These two strands have rarely been brought together to assess whether targeted monetary support is associated with the credit-enhancement commitments made by recipient firms. This omission matters because an apparent improvement in financing access may coexist with a greater encumbrance of corporate assets and a larger potential exposure to guarantee-network risk.

This study addresses the gap by examining the association between structural monetary policy and corporate collateralization and guarantee exposure among Chinese listed firms. We use an unbalanced quarterly panel of non-financial A-share firms from 2007 to 2024, comprising 46,512 firm-quarter observations. Following the residual-based approach to measuring structural policy, we isolate the component of the People's Bank of China's balance-sheet support that is not explained by conventional monetary conditions and denote it by SMP. The outcome variable, Guarantee, is the ratio of a firm's collateralization and guarantee commitments to net assets. We estimate firm fixed-effects models, examine credit availability and capital expenditure as potential channels, and complement the firm-level analysis with factor-augmented vector autoregression (FAVAR) and rolling-window time-varying FAVAR evidence for industry and temporal dynamics.

The baseline estimates show a positive and statistically significant association between SMP and Guarantee. This pattern remains after lagging the policy measure, excluding potentially sensitive subsamples, and implementing random placebo tests. The channel estimates show that SMP is associated with greater credit availability, measured by interest-bearing debt relative to total assets; however, the estimated credit-availability channel does not support a positive mediation effect on Guarantee. In contrast, the results are consistent with a capital-expenditure mechanism through which policy-supported investment expands the stock of assets that can be pledged. The association is more pronounced among smaller and lower-leverage firms, while the FAVAR analyses indicate substantial variation across industries and over time. These results are interpreted as conditional empirical associations rather than as evidence of an unqualified causal effect.

The study makes three contributions. First, it shifts attention from the volume and price of policy-supported credit to the non-price contractual consequences of targeted liquidity. By treating collateralization and guarantee commitments as the principal outcome, the analysis links structural monetary policy to an underexamined dimension of corporate financial risk. Second, it distinguishes two plausible balance-sheet channels. The evidence shows why higher credit availability should not be equated automatically with higher guarantee exposure and identifies capital expenditure as the channel most consistent with the data. Third, by combining firm fixed-effects estimates with FAVAR and rolling-window time-varying analysis, the study documents heterogeneity that a single average coefficient cannot capture. The findings provide a more complete basis for evaluating targeted credit policies in collateral-intensive financial systems.

The remainder of the paper develops the institutional background and related literature, derives the hypotheses, describes the data and empirical design, presents the firm-level and dynamic results, and concludes with implications for the design and monitoring of structural monetary-policy instruments.

LITERATURE REVIEW

Credit-market frictions provide a starting point for understanding why monetary support may change firms' financing contracts. Stiglitz and Weiss (1981) show that adverse selection and incentive effects can sustain credit rationing even in equilibrium. Bernanke and Gertler (1989) link borrower net worth to the agency costs of external finance, while Bernanke *et al*., (1999) embed these frictions in a quantitative financial-accelerator framework. Kiyotaki and Moore (1997) show how the interaction between collateral values and borrowing limits can amplify and prolong shocks. These theories motivate attention to balance-sheet constraints, but do not determine whether targeted policy increases or reduces corporate guarantee commitments.

Central bank collateral eligibility is one channel through which liquidity provision can affect credit allocation. Nyborg (2017) explains how the Eurosystem's collateral rules can influence financial-market incentives and resource allocation, including possible distortions. Using Dutch mortgage data, Van Bekkum *et al*., (2018) find that a relaxation of ECB collateral eligibility increases lending and lowers mortgage rates among affected banks, while subsequent repayment performance deteriorates, especially for loans with state guarantees. These findings establish a potential trade-off between credit expansion and risk, although their institutional setting differs from Chinese corporate lending.

Chinese evidence documents both financing and market-liquidity effects. Wang and Wu (2019) use the June 2018 MLF collateral expansion and a triple-differences design to identify reductions in eligible bonds' credit spreads and broader market spillovers. Lei *et al*., (2024), using difference-in-differences and ARIMAX models, find that collateral expansion lowers bond yields and improves market liquidity, helping to restrain liquidity-related loss and margin spirals. These studies concern bond-market pricing and liquidity; their findings do not directly establish an increase in firms' restricted assets or guarantee obligations.

Targeted financing benefits also extend to green-credit borrowers and smaller firms. Guo and Fang (2021) find that accepting green-credit assets as MLF collateral improves credit availability and reduces financing costs, with different responses across ownership groups and industries. Guo and Geng (2022), using propensity-score matching and difference-in-differences for firms on the New Third Board, find that the inclusion of small-business loans in the collateral framework increases credit availability and lowers borrowing costs. In a model of targeted reserve-requirement reductions, Wei *et al*., (2020) identify benefits to lending and output alongside trade-offs involving inflation and financial instability. Policy benefits therefore need to be assessed together with their financing and risk consequences.

Research on green outcomes provides a complementary perspective. Li and Li (2025) find that the 2018 collateral expansion promotes firms' green transformation through financing-constraint relief and green innovation. Wan and Bu (2024) report an improvement in green firms' total factor productivity through similar channels. Using A-share firms from 2014 to 2022, Wang and Zhao (2025) find that including green bonds in the collateral framework improves corporate ESG performance. These outcome measures differ from collateralization and guarantees, so their positive responses cannot substitute for direct evidence on corporate credit-enhancement commitments.

Studies of corporate risk reveal distinct outcomes that should be considered separately. Wang *et al*., (2024) construct an investment-risk-preference measure from annual reports and find that collateral expansion increases risk preferences through cost and scale channels. Wang and Lai (2024) instead examine debt default and find that including AAA-rated bonds in the collateral framework lowers issuers' default probability through reduced credit spreads and financing constraints. These findings can coexist because investment risk preferences and debt default are different variables; neither is a direct measure of interfirm guarantee exposure.

Guarantee relationships create another dimension of financial risk. Li and Liu (2022) find that guarantees within listed business groups can ease financing constraints but amplify monetary-policy effects through contagion, particularly under monetary tightening. Wang *et al*., (2020) document the evolution of China's loan-guarantee network around the global financial crisis and stimulus programme, finding that the stimulus encouraged mutual guarantees and a more reciprocal, fragile network structure. These studies justify examining guarantee commitments alongside credit access, without assuming that a reduction in borrowing costs necessarily makes guarantee networks safer.

Financing choices and borrower characteristics help explain heterogeneous responses. Myers and Majluf (1984) show how asymmetric information can favour internal finance and debt over new equity, while Hadlock and Pierce (2010) identify firm size and age as useful predictors of financing constraints. Zhan *et al*., (2023) analyse structural monetary policy through heterogeneous financial-accelerator effects and construct a central-bank-balance-sheet residual to separate structural support from conventional policy. Their measurement approach informs the SMP indicator used here, while the implications for collateralization and guarantees remain an empirical question.

Dynamic methods complement firm-level policy evaluations. Sims (1980) provides a foundation for VAR analysis, and Bernanke *et al*., (2005) develop FAVAR to incorporate information from many series through common factors. He *et al*., (2013) apply FAVAR to China and compare the macroeconomic effectiveness of interest-rate and quantity-based instruments. Primiceri (2005) models changing coefficients and shock variances in a Bayesian time-varying structural VAR. These contributions motivate an examination of policy dynamics; the present study uses rolling-window FAVAR to trace changes over time, rather than implementing Primiceri's Bayesian model.

Taken together, the reviewed studies identify financing benefits, real and green outcomes, and several forms of risk associated with monetary support. The unresolved issue addressed here is how targeted support relates to the collateralization and guarantee commitments recorded on firms' balance sheets. The analysis therefore estimates firm-level

associations, examines credit availability and capital expenditure as potential channels, and compares industry and temporal responses. This design links the financing and guarantee literatures while allowing the channel estimates to differ in sign.

Theoretical Framework and Hypotheses

The hypotheses combine financing-choice and collateral-channel arguments. Myers and Majluf (1984) explain why information asymmetry can make external equity costly, while financial-accelerator models link financing conditions to borrower balance sheets (Bernanke & Gertler, 1989; Bernanke *et al*., 1999). Targeted funding may therefore change both the amount of credit available and the contractual commitments accompanying that credit.

A distinction is needed between collateral pledged by banks to the central bank and collateral or guarantees supplied by firms to lenders. Expansion of central bank eligibility may lower bank funding costs, but the resulting corporate loan contracts depend on borrower characteristics and banks' risk decisions. The hypotheses below concern firms' collateralization and guarantee commitments; their signs are predictions to be tested, rather than conclusions already established by collateral-framework studies.

Kiyotaki and Moore (1997) provide a theoretical link between productive assets and borrowing capacity. Policy-supported investment can increase assets that may subsequently be pledged, while easier credit could also reduce reliance on expensive credit enhancement. The analysis accordingly treats credit availability and capital expenditure as separate candidate channels and allows the evidence to support one channel but not the other.

Structural monetary policy can change credit allocation through targeted funding and collateral-framework expansion. When policy-supported borrowing finances investment and lenders retain collateral requirements, an increase in lending may raise the amount of encumbered assets or guarantee commitments. This is a proposed corporate-contract mechanism, rather than a result already demonstrated by studies of central bank collateral eligibility. The first hypothesis tests its net implication.

H1: Structural monetary policy increases corporate collateralization and guarantee commitments.

Structural monetary policy may improve credit availability for targeted firms. If incremental loans require pledged assets or additional guarantees, greater borrowing can increase restricted assets and credit-enhancement commitments. Easier financing may also reduce reliance on costly guarantees. H2 tests the proposed positive credit channel against this competing possibility.

H2: Structural monetary policy increases corporate collateralization by improving credit availability.

Monetary shocks can also affect the balance sheet by changing investment incentives and capital allocation. Structural monetary policy directs resources toward real investment in designated sectors such as green finance and technological innovation. When firms increase capital expenditure to purchase equipment or expand production, the resulting fixed assets provide high-quality collateral. Project finance often pledges newly purchased assets as soon as they are acquired. Investment expansion can therefore create an endogenous demand for credit enhancement.

H3: Structural monetary policy increases corporate collateralization by stimulating capital expenditure.

Hadlock and Pierce (2010) identify firm size and age as useful predictors of financing constraints. Together with financial-accelerator theory, this suggests that firms with different access to finance may respond differently to targeted support. Industry differences in asset structure and policy eligibility provide further reasons to test heterogeneity, without assuming that every smaller firm necessarily relies more heavily on guarantees.

H4: The effect of structural monetary policy on corporate collateralization and guarantees differs significantly across industries and firm-size groups.

Policy transmission may change as financial frictions, bank behaviour, and policy instruments evolve. Time-varying models permit these changes to be examined rather than assuming a constant response (Primiceri, 2005). This motivates a test of whether the association between structural policy and corporate credit-enhancement commitments differs across periods.

H5: The effect of structural monetary policy on corporate collateralization and guarantees varies significantly over time.

MATERIALS AND METHODS

The sample comprises firms from ten Wind Level-I industries, excluding the financial sector, and covers quarterly observations from 2007 to 2024. The final panel contains 46,512 firm-quarter observations. Macroeconomic variables, including the consumer price index (CPI), broad money growth (M2), and gross domestic product (GDP) growth, as well as firm characteristics and financial-statement data, are obtained from the Wind database. Claims of the People's Bank of China (PBOC) on other depository corporations are collected from the PBOC's official publications, and annual GDP growth targets are taken from the Government Work Reports.

The sample is screened as follows. First, firms designated ST or *ST are excluded. Second, observations with missing values for the principal variables are removed. Third, all continuous firm-level variables are winsorized at the 1st and 99th percentiles to reduce the influence of outliers.

Structural monetary policy is difficult to measure directly because its instruments are diverse and dispersed, and some instruments combine aggregate and structural functions. The medium-term lending facility (MLF), for example, both reallocates credit and supplies medium-term base money. Directly treating the PBOC's claims on other depository corporations—which include the MLF and other instruments—as structural policy could therefore overstate the intensity of structural intervention.

Following Zhan *et al*., (2023), this study constructs a residual-based indicator from the central bank balance sheet. Let BSS_t denote PBOC claims on other depository corporations divided by total PBOC assets, and let CMP_t denote the conventional monetary-policy factor. The first-stage regression is

$$BSS_t = c + \beta_1 CMP_t + \varepsilon_t. \quad (1)$$

The residual ε_t captures the component of balance-sheet support that cannot be explained by conventional monetary policy and is used as the structural monetary policy indicator, denoted SMP_t.

The SMP residual represents the net structural-policy shock after the effect of conventional monetary policy has been removed. It captures additional targeted liquidity support or withdrawal that is independent of aggregate monetary control. A positive residual indicates stronger support through targeted instruments, such as programs for small and micro enterprises, agriculture and rural development, green finance, and technological innovation. A negative residual indicates that the intensity of targeted support is below the level implied by conventional policy conditions.

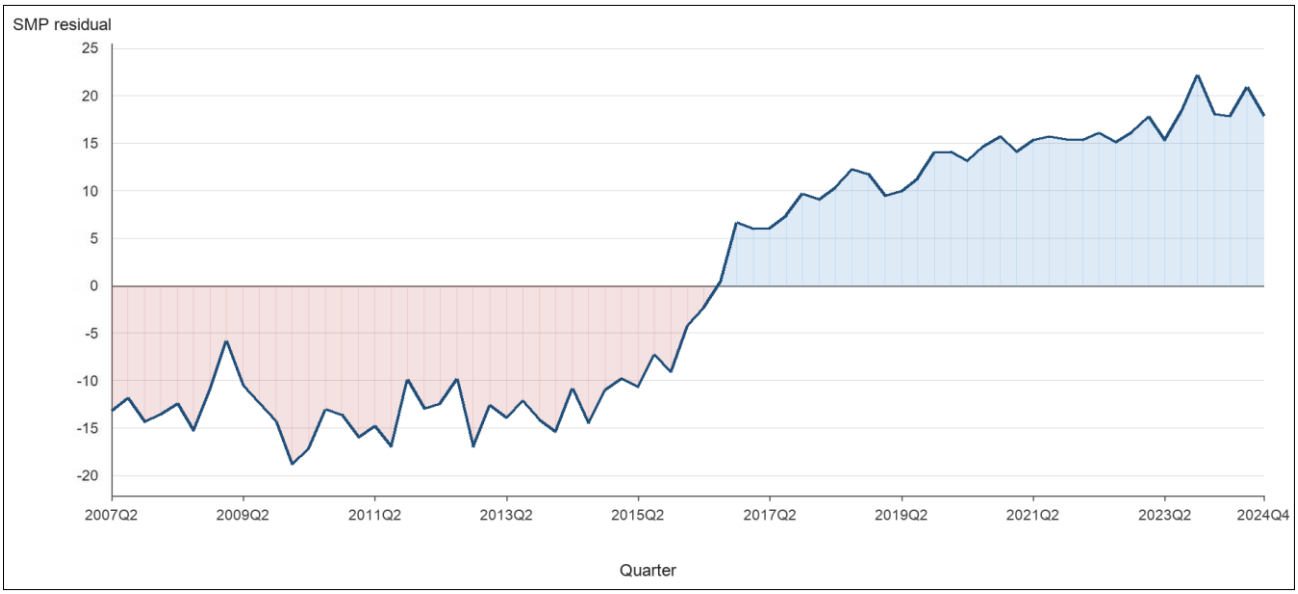


Figure 1: Residual-based structural monetary policy indicator.

First, BSS_t is calculated as PBOC claims on other depository corporations divided by total PBOC assets. This item reflects central-bank funding supplied to commercial banks, rural credit cooperatives, and other deposit-taking institutions through a range of policy instruments.

Second, the conventional monetary-policy factor is identified using a Taylor-rule-style specification:

$$g_{m,t} = \gamma_0 + \gamma_m g_{m,t-1} + \gamma_\pi(\pi_{t-1} - \pi^*) + \gamma_x(g_{x,t-1} - g^*_{x,t-1}) + \theta_t, \quad (2)$$

Where $g_{m,t}$ is money-supply growth, π_t is inflation, π^* is the inflation target, $g_{x,t}$ is output growth, and $g^*_{x,t}$ is the output-growth target. The estimated conventional policy factor is then used in Equation (1). Equivalently, the decomposition can be written as

$$BSS_t = \alpha_0 + \alpha_1 CMP_t + SMP_t, \quad (3)$$

Where SMP_t is the component attributable to structural policy after conventional policy conditions have been controlled for.

The dependent variable is the ratio of a firm's collateralization and guarantee commitments to its net assets: $GuaranteeRatio_{it} = \frac{GuaranteeAmount_{it}}{NetAssets_{it}}$.

This ratio measures the extent to which the firm's net assets are encumbered by collateral and guarantees. In the empirical analysis it is denoted $\mathrm{Guarantee}_{\mathrm{it}}$.

Credit availability is measured as interest-bearing debt divided by total assets. Capital expenditure is measured as net cash paid to acquire fixed assets, intangible assets, and other long-term assets, divided by total assets.

Financing constraints are proxied by the size-age (SA) index of Hadlock and Pierce (2010):
$SA_{it} = -0.737\, Size_{it} + 0.043\, Size_{it}^2 - 0.040\, Age_{it}$. (4)

Size is the natural logarithm of total assets measured in millions of currency units, and Age is the number of years since listing. Following the original study, Size is capped at $\ln(4{,}500)$ and Age at 37 years. More negative values indicate more severe financing constraints. Table 2 reports the absolute value of the SA index, |SA|, which accounts for its positive descriptive statistics.

The firm-level controls are return on assets, leverage, operating cash flow, revenue growth, firm size, listing age, financing cost, and the SA index. The FAVAR and time-varying analyses additionally include M2 growth, CPI inflation, GDP growth, and industry-average guarantee ratios.

Table 1: Variable definitions

Category	Variable	Symbol	Definition
Dependent	Guarantee ratio	Guarantee	Collateral and guarantee amount divided by net assets
Explanatory	Structural monetary policy	SMP	Residual-based intensity of structural monetary policy
Mediator	Capital expenditure	CapEx	Net cash paid to acquire fixed, intangible, and other long-term assets divided by total assets
Mediator	Credit availability	Credit	Interest-bearing debt divided by total assets
Control	Return on assets	ROA	Net income divided by total assets
Control	Leverage	Lev	Total liabilities divided by total assets
Control	Revenue growth	Growth	Year-on-year growth in operating revenue
Control	Firm size	Size	Natural logarithm of total assets
Control	Firm age	Age	Years since listing
Control	Financing cost	Cost	Interest expense divided by the sum of long- and short-term debt
Control	Cash flow	Cashflow	Net operating cash flow divided by total assets
Control	Financing constraints	SA	Size-age financing-constraint index; Table 2 reports absolute values
Macro control	Money supply	M2	Year-on-year growth in M2
Macro control	Economic growth	GDP	Year-on-year GDP growth
Macro control	Price level	CPI	Year-on-year CPI inflation

The baseline firm-level specification is
$Guarantee_{it} = \beta_0 + \beta_1 SMP_t + \sum_j \gamma_j\, Controls_{jit} + \mu_i + \varepsilon_{it}$, (5)

Where $\mathrm{Guarantee}_{\mathrm{it}}$ is the guarantee ratio of firm i in quarter t, $\mathrm{SMP}_{\mathrm{t}}$ is the structural monetary-policy indicator, $\mathrm{Controls}_{\mathrm{jit}}$ is the set of firm-level controls, μ_{i} denotes firm fixed effects, and $\varepsilon_{\mathrm{it}}$ is the error term. A positive β_1 is consistent with the credit-associated collateralization effect: targeted liquidity support is accompanied by a higher proportion of encumbered corporate assets.

The credit-availability channel is examined using
$Credit_{it} = a_0 + a_1 SMP_t + \sum_j a_j\, Controls_{jit} + \mu_i + u_{it}$, (6)
$Guarantee_{it} = b_0 + b_1 SMP_t + b_2 Credit_{it} + \sum_j b_j\, Controls_{jit} + \mu_i + v_{it}$. (7)

A positive a_1 indicates that structural policy improves credit availability. The sign and significance of b_2 determine whether the observed credit expansion is associated with a higher guarantee ratio.

The capital-expenditure channel is examined using

$$CapEx_{it} = c_0 + c_1 SMP_t + \sum_j c_j \, Controls_{jit} + \mu_i + \xi_{it}, \quad (8)$$

$$Guarantee_{it} = d_0 + d_1 SMP_t + d_2 CapEx_{it} + \sum_j d_j \, Controls_{jit} + \mu_i + \zeta_{it}. \quad (9)$$

Evidence of $c_1 > 0$ and $d_2 > 0$ supports the proposition that structural policy raises collateralization by stimulating real investment and increasing the stock of pledgeable fixed assets.

The factor-augmented vector autoregression (FAVAR) of Bernanke *et al.,* (2005) mitigates the curse of dimensionality encountered by conventional VAR models. It extracts a small number of common factors from a broad information set and combines them with observable policy and outcome variables.

The measurement equation is

$$X_t = \Lambda F_t + e_t, \quad (10)$$

Where X_t is the vector of macroeconomic, industry, and financial indicators; F_t is the low-dimensional vector of common factors extracted by principal components; Λ is the factor-loading matrix; and e_t is the idiosyncratic component.

The dynamic system is

$$\begin{bmatrix} F_t \\ SMP_t \\ Guarantee_t \end{bmatrix} = A(L) \begin{bmatrix} F_{t-1} \\ SMP_{t-1} \\ Guarantee_{t-1} \end{bmatrix} + u_t, \quad (11)$$

Where A(L) is a lag-polynomial matrix and u_t is the innovation vector. Orthogonalized impulse responses trace the reaction of industry-average guarantee ratios to a one-standard-deviation positive SMP shock.

The time-varying framework recognizes that economic relationships and policy effects evolve with institutional conditions, expectations, and external shocks. Its state representation is

$$Z_t = A_t(L) Z_{t-1} + u_t, \qquad u_t \sim N(0, \Sigma_t), \quad (12)$$

and the parameters evolve according to

$$A_t = A_{t-1} + \nu_t, \qquad \nu_t \sim N(0, Q),$$

$$\Sigma_t = \Sigma_{t-1} + \eta_t, \qquad \eta_t \sim N(0, R). \quad (13)$$

To reduce sensitivity to subjective priors and the convergence difficulties of high-dimensional Bayesian estimation in a limited sample, this study implements time variation through a rolling-window FAVAR. A standard FAVAR is re-estimated over a fixed-length historical window; the window is then advanced one quarter at a time, dropping the oldest observation and adding the newest. Orthogonalized impulse responses from all windows are assembled along the historical-time and response-horizon dimensions. The resulting three-dimensional surfaces provide a transparent, data-driven account of how policy transmission changes across macroeconomic regimes and industries.

RESULTS AND DISCUSSION

Table 2 reports descriptive statistics for the 46,512 firm-quarter observations. The guarantee ratio has a mean of 28.228 and a standard deviation of 38.717, indicating substantial cross-firm variation in collateralization and guarantee commitments. This dispersion provides useful variation for identifying the association between structural monetary policy and firm behavior. The SMP indicator ranges from −19.1 to 22.1 and has a mean of −0.2.

The average leverage ratio is 52.665%, average return on assets is 2.596%, and the mean listing age is approximately 23 years. The absolute SA index, |SA|, has a mean of 3.760 and a standard deviation of 0.354. Firm size is expressed in natural logarithms. Taken together, the distributions are broadly consistent with the financial characteristics of Chinese A-share listed firms.

Table 2: Descriptive statistics

Variable	N	Mean	SD	Minimum	Median	Maximum
Guarantee	46,512	28.228	38.717	0.000	14.330	222.192
SMP	46,512	−0.200	13.400	−19.100	−4.800	22.100
|SA|	46,512	3.760	0.354	2.131	3.028	5.980
Size	46,512	8.780	1.433	5.721	8.665	13.026
ROA	46,512	2.596	3.858	−8.232	1.708	17.477
Lev	46,512	52.665	17.514	12.291	53.673	89.735
Cashflow	46,512	0.049	0.069	−0.145	0.047	0.254

Variable	N	Mean	SD	Minimum	Median	Maximum
Growth	46,512	14.216	34.418	−57.413	9.300	170.772
Age	46,512	23.373	5.962	13.000	24.000	35.000
Cost	46,512	0.040	0.022	0.001	0.039	0.121
CapEx	46,512	0.060	0.060	−0.010	0.041	0.294
Credit	46,512	0.229	0.143	0.000	0.221	0.576
M2	3,600	13.153	4.962	6.200	12.100	29.310
CPI	3,600	2.326	1.924	−1.533	2.138	8.033
GDP	3,600	7.489	3.381	−6.800	7.000	18.900

Table 3 presents Pearson correlations. Guarantee is positively correlated with leverage and negatively correlated with profitability, consistent with theories of financial-distress costs and financing hierarchy. The strong negative correlation between SA and Age (−0.866) is mechanical because age enters directly into the construction of the SA index. With that exception, the pairwise correlations among the controls are below 0.70, suggesting that severe multicollinearity is unlikely to drive the panel estimates.

Table 3: Correlation matrix

Panel A. Correlations with variables 1–6

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) Guarantee	1					
(2) SMP	0.118***	1				
(3) SA	-0.057***	0.030***	1			
(4) Cost	0.082***	-0.268***	0.124***	1		
(5) Size	0.163***	0.388***	0.131***	-0.141***	1	
(6) ROA	-0.227***	-0.129***	0.167***	-0.036***	-0.089***	1
(7) Lev	0.470***	-0.041***	-0.026***	0.063***	0.304***	-0.267***
(8) Cashflow	-0.011**	0.163***	0.358***	-0.116***	0.550***	0.096***
(9) Growth	-0.023***	-0.122***	0.075***	-0.013***	-0.054***	0.248***
(10) Age	0.092***	0.032	-0.866***	-0.02***	0.124***	-0.148***
(11) CapEx	0.072***	0.267***	0.162***	-0.199***	-0.095***	0.248***
(12) Credit	0.397***	-0.056***	-0.104***	0.239***	0.216***	-0.318***

Panel B: Correlations with variables 7–12

Variable	(7)	(8)	(9)	(10)	(11)	(12)
(7) Lev	1					
(8) Cashflow	0.077***	1				
(9) Growth	0.013***	-0.002	1			
(10) Age	0.138***	-0.020***	-0.087***	1		
(11) CapEx	-0.075***	0.157***	0.173***	-0.182***	1	
(12) Credit	0.576***	-0.158***	-0.024***	0.129***	0.075***	1

Note: ** and *** denote significance at the 5% and 1% levels, respectively.

Table 4 reports the baseline estimates. Column (1) presents a bivariate specification; column (2) adds firm fixed effects; column (3) includes firm-level controls without fixed effects; and column (4) combines the controls with firm fixed effects. The coefficient on SMP is positive and statistically significant at the 1% level in every specification. In the preferred full model, a one-unit increase in SMP is associated with a 0.256-unit increase in the guarantee ratio. The result supports H1 and indicates that targeted monetary support is accompanied by greater collateralization and guarantee commitments at the firm level.

Table 4: Baseline regression results

Variable	(1)	(2)	(3)	(4)
SMP	0.339***	0.419***	0.408***	0.256***
	(25.53)	(35.77)	(31.39)	(6.25)
Size			-1.258***	4.374***
			(-9.93)	(17.83)
ROA			-0.701***	-0.745***
			(-14.86)	(-18.3)
Lev			0.985***	0.963***

Variable	(1)	(2)	(3)	(4)
			(96.27)	(86.97)
Cashflow			-15.393***	3.198
			(-6.34)	(1.58)
Growth			0.013***	-0.014***
			(2.64)	(-3.67)
Age	-		0.144***	1.635***
	-		(5.37)	(7.87)
Cost			1.592***	2.4684
			(13.32)	(0.33)
Firm fixed effects	NO	Yes	NO	Yes
Observations	46,512	46,512	46,512	46512
R^2	0.0138	0.5080	0.2522	0.6044

Note*:* The dependent variable is Guarantee. Reported t-statistics are in parentheses. *, ***, and**** denote significance at the 10%, 5%, and 1% levels, respectively.

Although structural monetary policy is a macroeconomic shock, firm financing conditions and guarantee decisions may be jointly determined. To mitigate reverse-causality concerns, all explanatory and control variables are lagged by one quarter. Column (1) of Table 5 shows that the lagged SMP coefficient remains positive and statistically significant, with an economically similar magnitude. This persistence is consistent with a delayed transmission of targeted credit support to corporate collateralization.

The balance-sheet structure and collateral practices of real-estate firms differ materially from those of other nonfinancial firms, and the COVID-19 shock in 2020 may have affected guarantee behavior asymmetrically. The model is therefore re-estimated after excluding the real-estate industry and all 2020 observations. As shown in column (2), the SMP coefficient remains positive and significant. The baseline result is thus not driven by a single industry or by the exceptional conditions of 2020.

Table 5: Robustness tests

Variable	Lagged explanatory variables	Restricted sample
SMP	0.258***	0.255***
	(8.124)	(6.711)
ROA	-0.515***	-0.585***
	(-15.11)	(-16.53)
Lev	1.027***	0.998***
	(81.76)	(78.21)
Cashflow	7.275***	8.053***
	(3.72)	(4.03)
Growth	-0.0171***	-0.0080*
	(-4.562)	(-1.822)
Size	4.528***	4.798***
	(15.76)	(16.36)
Age	-0.0283	0.0915
	(-0.176)	(0.472)
Cost	1.331**	2.256***
	(2.53)	(3.12)
SA	5.712	-5.083
	(0.457)	(-0.344)
Firm fixed effects	Yes	Yes
Observations	45858	32564
R^2	0.582	0.612

Note*:* Reported t-statistics are in parentheses. *, ***, and**** denote significance at the 10%, 5%, and 1% levels, respectively. The restricted sample excludes real-estate firms and observations from 2020.

A simulation-based placebo test is used to assess whether omitted variables or random assignment could generate the baseline estimate. The policy exposure is randomly reassigned 500 times, and the baseline model is re-estimated in each simulation. Figure 2 plots the distribution of the placebo coefficients. The actual estimate lies well outside the central mass of the simulated distribution, which is inconsistent with the effect being generated by random reassignment alone and lends further support to the baseline finding.

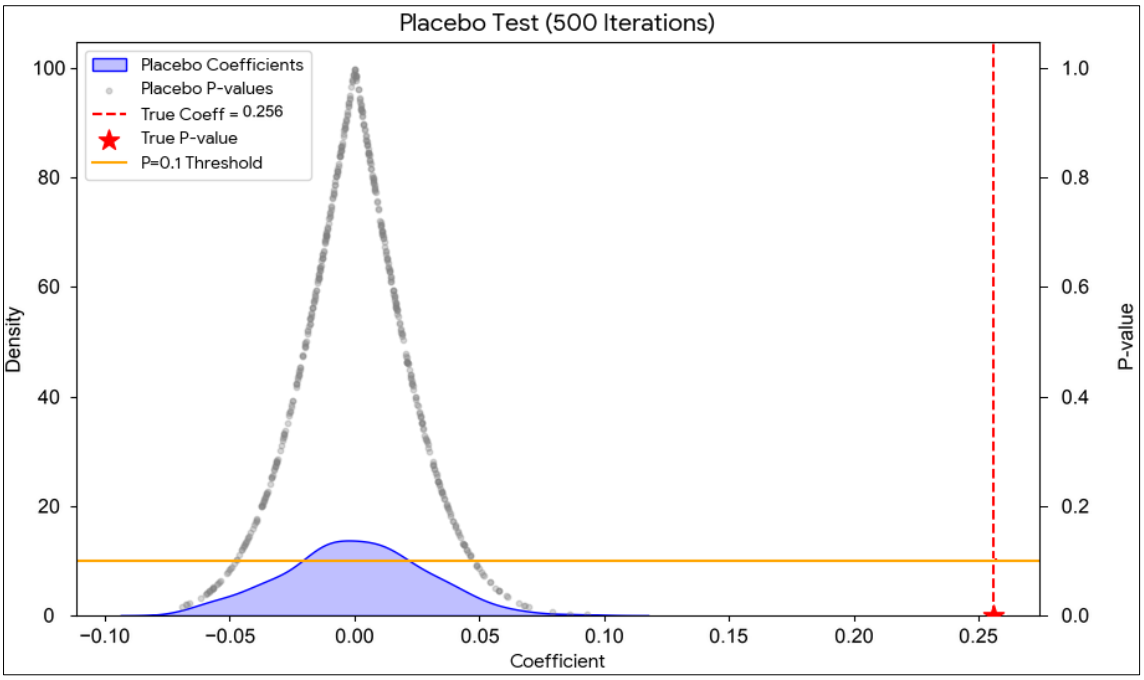


Figure 2: Distribution of coefficients from 500 placebo simulations.

Columns (1) and (2) of Table 6 examine the capital-expenditure channel. SMP is positively related to capital expenditure, and capital expenditure is in turn positively associated with the guarantee ratio. The coefficient of 0.6571 in column (2) implies that a one-unit increase in the capital-expenditure ratio is associated with a 0.6571-unit increase in the guarantee ratio. These results support H3: targeted policy encourages real investment, and newly acquired fixed assets may be pledged under the same financing arrangements.

Columns (3) and (4) examine credit availability. SMP is positively related to Credit, indicating that targeted policy increases interest-bearing debt relative to assets. Credit, however, enters the guarantee equation with a statistically significant negative coefficient. Accordingly, this specification does not support the positive mediation mechanism proposed in H2. The evidence indicates improved credit availability but a conditional reduction, rather than an increase, in the guarantee ratio once other factors are held constant. This result may reflect substitution toward less collateral-intensive credit, model sensitivity, or measurement limitations and should be interpreted cautiously.

The capital-expenditure result is consistent with the theoretical interaction between productive assets and borrowing capacity in Kiyotaki and Moore (1997). Firms may use targeted loans to purchase land, plants, or equipment and pledge those assets within the same lending contract. The credit result, by contrast, cautions against assuming that all incremental policy-supported lending necessarily requires more collateral. Its sign suggests that some programs may relax collateral requirements or substitute public risk sharing for firm-level asset pledges.

Table 6: Mechanism tests

Variable	(1) CapEx	(2) Guarantee	(3) Credit	(4) Guarantee
SMP	0.3286**	0.0942***	0.3021***	0.101***
	(2.316)	(14.271)	(4.943)	(31.502)
CapEx	-	0.6571***	-	-
		(4.666)		
Credit	--	-	-	-0.100***
	-	-	-	(-3.136)
Size	0.76***	-0.200***	0.0411***	0.4358***
	(23.038)	(-6.360)	(153.884)	(8.180)
Lev	0.036***	1.0719***	-0.02384***	1.0677***
	(24.432)	(48.198)	(-12.571)	(101.858)
ROA	-0.029***	-0.5662***	0.0980***	-0.6364***
	(-7.961)	(-10.027)	(14.325)	(-16.814)
Age	0.0080**	0.0936	0.0420***	0.1007***
	(1.982)	(1.527)	(7.604)	(3.305)

Variable	(1) CapEx	(2) Guarantee	(3) Credit	(4) Guarantee
Growth	-0.009	0.011	-0.015	0.02*
	(-1.517)	(0.553)	(-0.403)	(1.777)
SA	3.221***	5.863	3.665***	6.088
	(3.78)	(0.77)	(2.66)	(0.863)
Cost	1.875***	1.492***	2.361***	1.793***
	(3.62)	(2.62)	(3.55)	(3.88)
Observations	46512	46512	46512	46512
R^2	0.0888	0.2366	0.3444	0.2230

Note*:* Reported t-statistics are in parentheses. *, ***, and**** denote significance at the 10%, 5%, and 1% levels, respectively.

To sharpen the comparison across firm size, firms in the top quartile of total assets are classified as large and those in the bottom quartile as small. Table 7 shows that SMP is not significantly related to the guarantee ratio among large firms, whereas the coefficient is positive and significant among small firms. Small firms have shorter credit histories, less transparent information, and fewer unsecured financing options. They therefore tend to rely more heavily on collateral and guarantees when accessing targeted credit. This asymmetric response supports the firm-size component of H4.

Table 7: Heterogeneity by firm size

Variable	Large firms	Small firms
SMP	-0.107	0.363***
	(-1.47)	(3.79)
Size	-14.114***	0.384
	(-7.03)	(0.2)
ROA	-1.004***	-0.106***
	(-10.44)	(-2.79)
Lev	1.598***	0.581***
	(43.84)	(35.7)
Cashflow	-17.709***	-12.408***
	(-3.91)	(-5.71)
Growth	0.086	0.133
	(0.11)	(0.54)
Age	4.057***	0.508
	(6.21)	(0.8)
SA	3.440***	-2.734
	(3.90)	(-0.24)
Cost	-4.9	7.516***
	(-1.62)	(6.62)
Firm fixed effects	Yes	Yes
Observations	11628	11628
R^2	0.191	0.580

Note*:* Reported t-statistics are in parentheses. *, ***, and**** denote significance at the 10%, 5%, and 1% levels, respectively. Large and small firms are the top and bottom quartiles of total assets.

Firms in the top quartile of the leverage distribution are classified as high leverage, and those in the bottom quartile as low leverage. Table 8 shows that SMP has no statistically significant effect in the high-leverage group but a positive and significant effect in the low-leverage group. Firms with leverage above approximately 65.39% may have exhausted much of their pledgeable asset base and face stricter screening by lenders. Lower-leverage firms retain more collateral capacity and can therefore increase asset pledges to capture targeted credit opportunities. This result highlights a collateral-capacity margin in policy transmission.

Table 8: Heterogeneity by leverage

Variable	High leverage	Low leverage
SMP	-0.295	0.377***
	(-0.28)	(13.71)
Size	13.772***	-0.176
	(16.11)	(-0.69)
ROA	-0.22**	-0.041**

Variable	High leverage	Low leverage
	(-2.22)	(-2.02)
Lev	2.125***	0.325***
	(30.75)	(24.85)
Cashflow	0.276***	-0.075***
	(5.06)	(-5.81)
Growth	0.021	-0.0397
	(0.01)	(-1.19)
Cost	3.309***	-2.301
	(3.82)	(-0.50)
SA	-43.473***	-0.677
	(-7.91)	(-0.37)
Firm fixed effects	Yes	Yes
Observations	11628	11628
R^2	0.657	0.553

Note*:* Reported t-statistics are in parentheses. *, **, ***and*** *** denote significance at the 10%, 5%, and 1% levels, respectively. High- and low-leverage firms are the top and bottom quartiles of the leverage distribution.

The panel estimates identify average firm-level relationships but cannot fully describe the dynamic interaction between policy shocks, macroeconomic conditions, and industry characteristics. The FAVAR analysis therefore uses a broad information set containing 359 firm-level, industry-level, and macroeconomic indicators. Augmented Dickey–Fuller tests show that 83% of the series are stationary in levels or after initial transformations. The remaining nonstationary series are first-differenced or log-differenced; all transformed series are stationary, reducing the risk that spurious common factors contaminate the dynamic estimates.

Figure 3 reports the responses of average guarantee ratios in five representative industries to a one-standard-deviation positive SMP shock. The solid lines are point estimates and the dashed lines indicate 95% confidence intervals. Response direction and persistence vary substantially across industries.

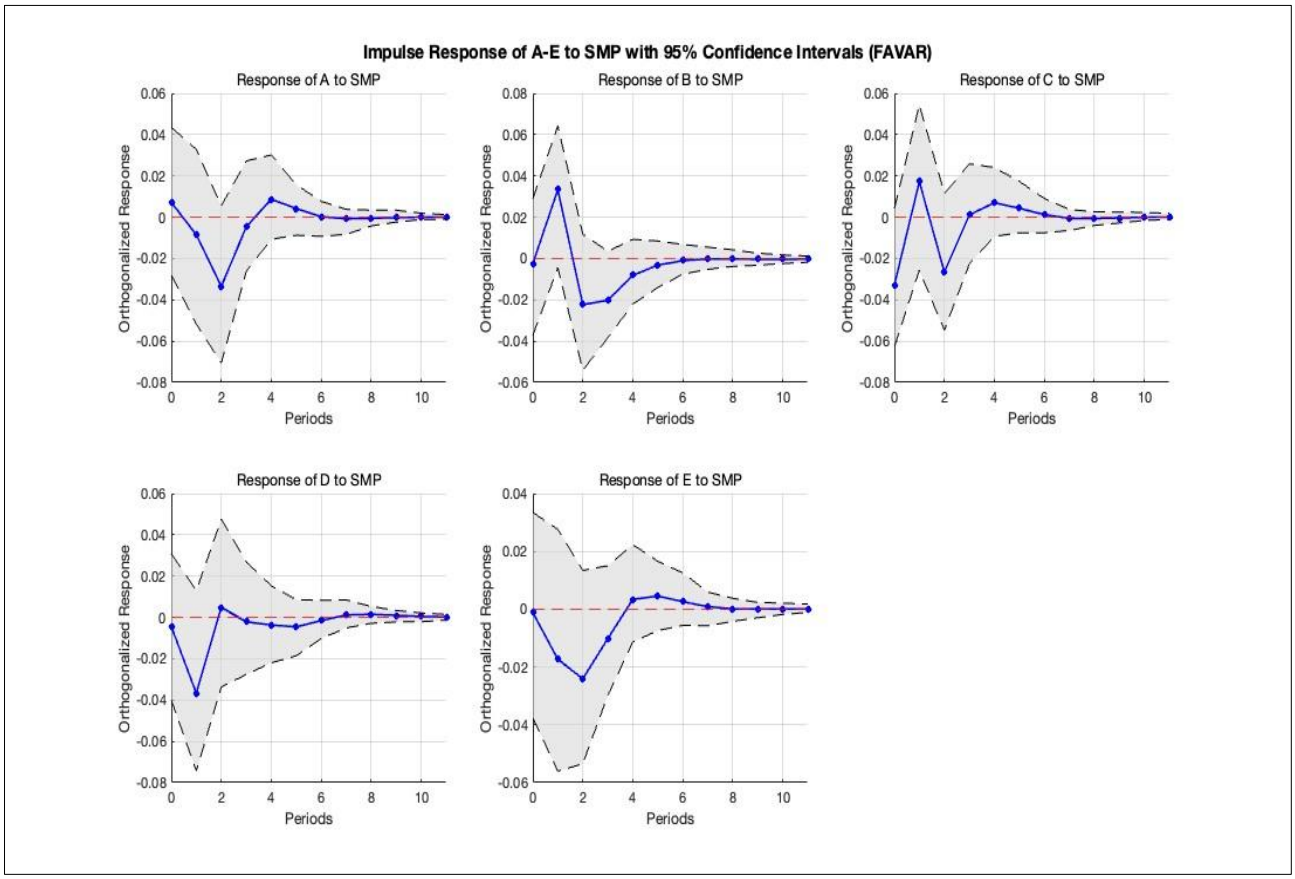


Figure 3: FAVAR impulse responses

Panels A–E Represent Real Estate, Media, Energy, Automobiles, and Consumer Staples, Respectively

Real estate shows a significant positive response on impact, followed by a decline and subsequent negative fluctuations. This pattern suggests an initial credit-associated increase in collateralization followed by a later liquidity-relief effect that reduces reliance on external guarantees. The media response fluctuates narrowly around zero, and its confidence interval includes zero throughout. This weak response is consistent with the industry's intangible-asset intensity and limited stock of conventional collateral. The energy response is also statistically insignificant, plausibly because large state-owned firms have diversified funding sources and rely less on guarantee-based finance.

The automobile response is negative from the outset and continues to decline, suggesting that direct credit support or industrial subsidies—especially in new-energy vehicles—may substitute for conventional guarantees. Consumer staples show a significantly negative short-run response that decays quickly and becomes insignificant. Because this industry contains many small and micro enterprises, inclusive-finance instruments may rapidly relieve financing constraints and reduce guarantee demand. The differences across industries support the industry component of H4.

Figure 4 presents three-dimensional impulse-response surfaces for the five industries. The horizontal axes indicate the response horizon in quarters and the historical estimation window; the vertical axis is the response of the guarantee ratio. The surfaces reveal substantial variation over both historical time and response horizon.

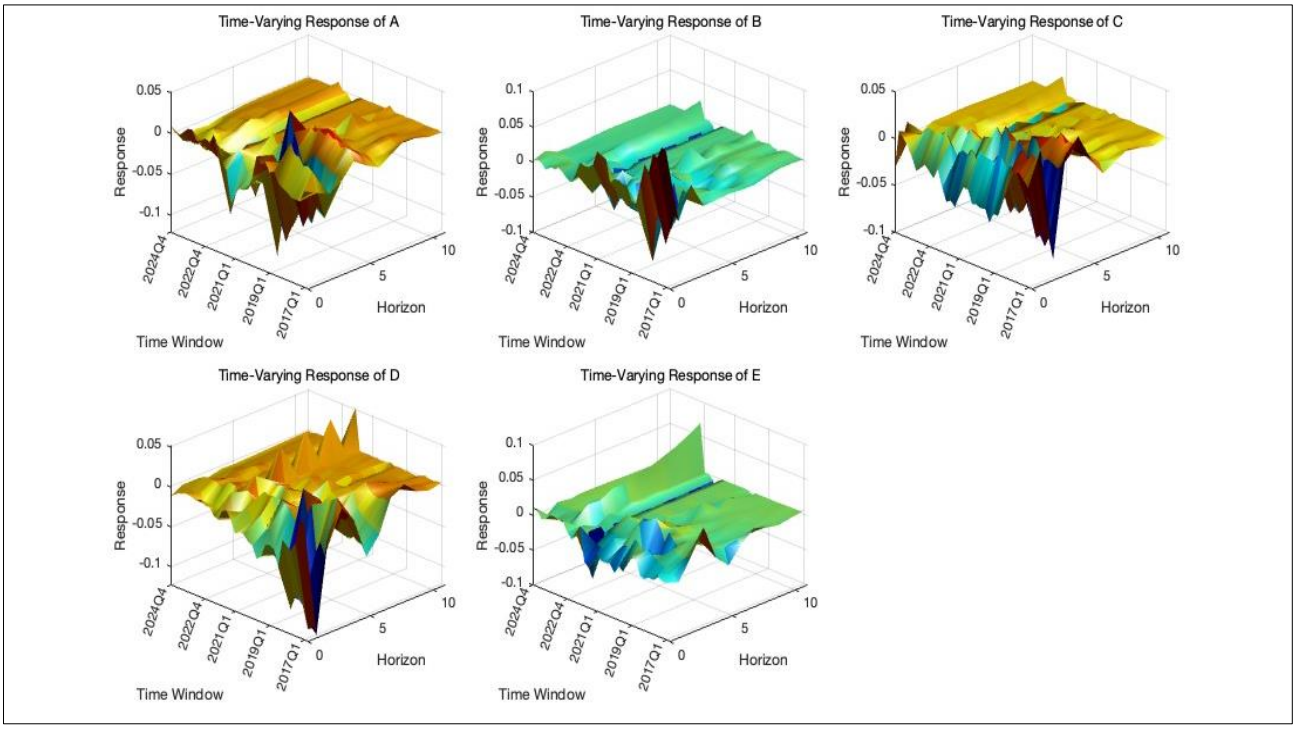


Figure 4: Time-varying FAVAR impulse-response surfaces by industry

The real-estate response is predominantly positive before 2015 and is strongest at horizons of two to four quarters. It becomes negative during 2016–2018 and turns positive again after 2020. This reversal indicates that the collateralization effect of structural policy is conditional on the macro-financial regime. The media surface is generally flat, apart from a brief and weak negative response in 2018–2019. The energy response remains close to zero throughout, reflecting the sector's stable financing structure and low reliance on guarantee-based borrowing.

The automobile industry displays stage-dependent movements similar to those in real estate, but with smaller amplitude. Its response is distinctly positive around 2015, turns negative thereafter, and shows a mild positive response again after 2021. Consumer staples exhibit more frequent sign changes: the response is mainly positive during 2015–2018 and significantly negative during the COVID-19 period. These patterns support H5 and show why a fixed-parameter model can obscure economically important regime changes.

For a direct comparison across exceptional macroeconomic environments, Figure 5 plots two-dimensional responses for 2018Q1, the beginning of the China–United States trade conflict, and 2020Q1, the onset of the COVID-19 pandemic.

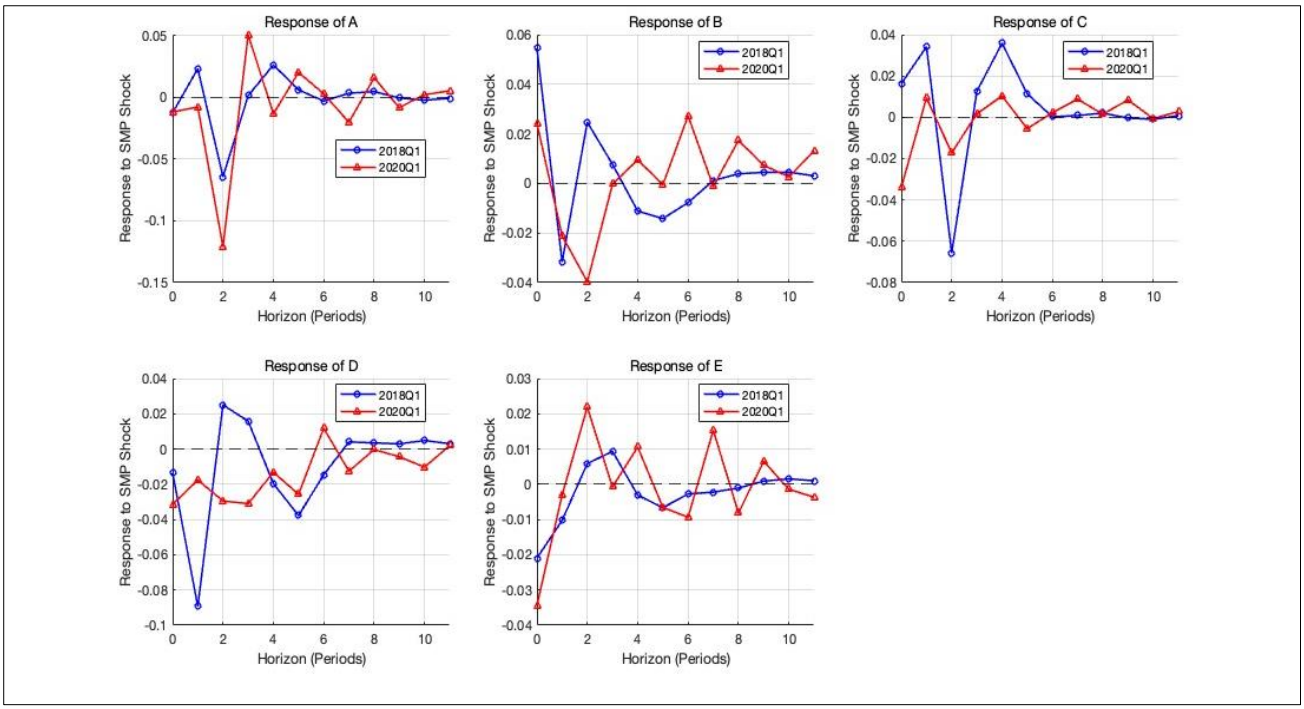


Figure 5: Comparison of impulse responses in 2018Q1 and 2020Q1

In 2018Q1, the real-estate guarantee ratio rises after approximately two quarters and then turns negative. This profile suggests that heightened external uncertainty initially increased financing demand and, through collateral constraints, raised guarantee commitments. In 2020Q1, by contrast, the response is negative throughout and larger in magnitude. Targeted pandemic-era instruments, including special relending and pledged supplementary lending, appear to have supplied funding more directly and substituted for external guarantees.

The media industry's responses are weak at both dates, although a small negative response emerges at horizons of four to six quarters in 2020Q1. Inclusive-finance support during the pandemic may have contributed to this movement, but the industry's limited collateral base constrained the overall response. The energy response remains insignificant at both dates. Overall, the time-varying results show that the direction, magnitude, and persistence of the same policy shock can differ across both industries and periods, reinforcing the methodological value of the rolling-window FAVAR framework.

CONCLUSION

This study integrates firm-level panel regressions with FAVAR and rolling-window time-varying FAVAR models to examine how structural monetary policy affects corporate collateralization and guarantee commitments. Four principal conclusions emerge.

First, structural monetary policy is associated with a significant increase in corporate collateralization and guarantees. In China's collateral-oriented lending environment, targeted liquidity provision can improve access to funding while simultaneously encumbering a larger share of corporate assets. The result remains robust when explanatory variables are lagged, real-estate firms and 2020 observations are excluded, and the policy exposure is subjected to placebo simulations.

Second, the macroeconomic evidence reveals substantial industry heterogeneity and temporal variation. The FAVAR results show asymmetric impulse responses across real estate, media, energy, automobiles, and consumer staples. Rolling-window estimates further demonstrate that response direction, magnitude, and persistence change over time and may even reverse sign. These results provide macro-level support for a state-dependent collateral channel of structural monetary policy.

Third, capital expenditure is supported as a transmission mechanism. Structural policy increases investment, and the associated acquisition of land, plants, machinery, and other fixed assets creates additional pledgeable collateral. Evidence for the credit-availability mechanism is mixed. Although structural policy increases the Credit measure, the estimated Credit coefficient in the conditional guarantee equation is negative rather than positive. The result therefore does

not establish the hypothesized positive credit-mediated increase in guarantees and warrants additional robustness analysis using alternative credit measures and specifications.

Fourth, the firm-level effect is asymmetric. Smaller firms appear to pay a higher collateral-related cost when accessing policy-supported funding, whereas the effect is insignificant among large firms. The increase in guarantees is also concentrated among low-leverage firms, which retain greater pledgeable capacity. High-leverage firms may already have encumbered much of their asset base and may face stricter lender screening.

The PBOC should continue to refine structural monetary-policy instruments by weakening the tight coupling between credit expansion and physical-asset collateral. When launching targeted relending facilities or special support programs, the central bank can broaden the set of eligible collateral, raise the share of unsecured or credit-based lending, and calibrate risk compensation to the business cycle and industry conditions. Forward-looking communication can further direct funding toward innovative firms with long-run growth potential but limited tangible assets.

Financial institutions should accelerate the transition from traditional collateral-based underwriting to data-enabled credit assessment. Tax records, electricity use, supply-chain transactions, and other verifiable nonfinancial data can improve borrower screening and reduce dependence on real-estate and equipment pledges. Banks should also expand financing backed by intellectual property and receivables, subject to prudent valuation and enforcement standards. Better contract design can improve policy transmission while reducing excessive balance-sheet encumbrance.

Regulators should establish multilayer risk-sharing arrangements and strengthen monitoring of restricted assets and guarantee networks. Public guarantee funds and compensation schemes can provide third-party credit enhancement in place of firm-level asset pledges. Within the macroprudential framework, differentiated supervisory incentives can encourage banks to lend to small firms on the basis of growth prospects rather than collateral alone. Regulators should also monitor industry-specific collateral saturation and guard against a decline in collateral values triggering procyclical credit contraction or cross-industry contagion.

Firms should preserve financial flexibility and improve information transparency. Investment and asset structures should be planned jointly so that low-cost policy funding does not lead to excessive asset lock-up. Stronger internal controls and environmental and financial disclosure can reduce information asymmetry and improve lending terms. Firms should also diversify funding through bonds and equity where feasible and incorporate guarantee spillovers and collateral liquidity into their internal risk-warning systems.

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